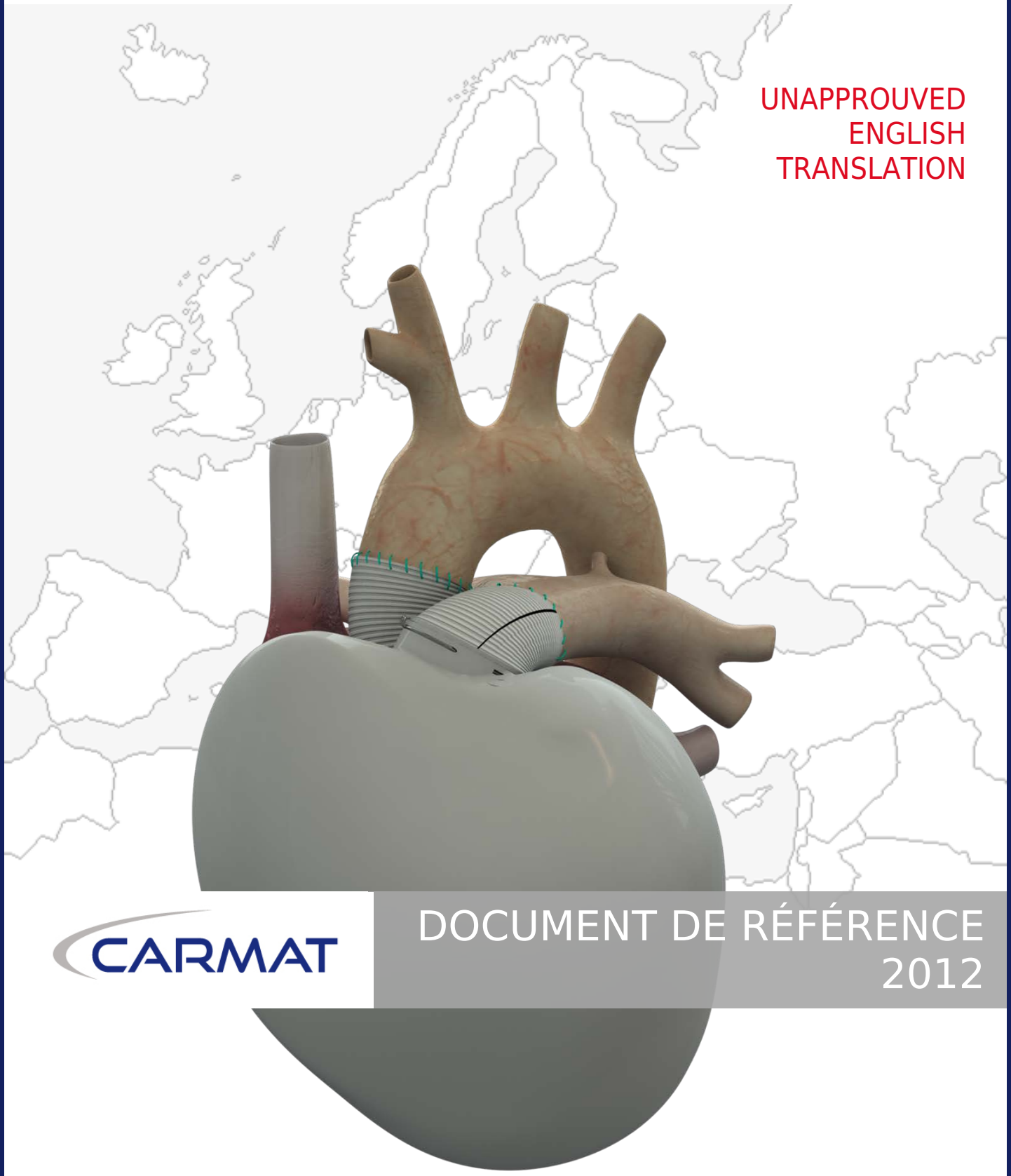
UNAPPROUVED
ENGLISH
TRANSLATION



CARMAT

DOCUMENT DE RÉFÉRENCE 2012

This page is intentionally blank.

IMPORTANT NOTICE

IF YOU DO NOT AGREE TO THE TERMS AND CONDITIONS CONTAINED IN THIS NOTICE, YOU SHOULD NOT READ THE FOLLOWING ENGLISH LANGUAGE DOCUMENT AND SHOULD DELETE IT UNDER ANY FORMAT.

You must read the following before continuing.

The following applies to the English language convenience translation of the original French-language version of the "Document de Référence", dated 27 April 2011, published by CARMAT ("the Company") and registered with the Autorité des Marchés Financiers ("AMF"), the French Financial Markets Authority, under number R.13-027 on 30 May 2013 (the "Unapproved English Translation of the Document de Référence") following this notice. In accessing the Unapproved English Translation of the Document de Référence, you agree to be bound by the following terms and conditions.

The original French-language version of the "Document de Référence" has been translated into English for the benefit and convenience of the recipients of this Unapproved English Translation of the Document de Référence. The following Unapproved English Translation of the Document de Référence may not be forwarded or distributed to any other person and may not be reproduced in any manner whatsoever. Failure to comply with this requirement may result in a violation of applicable laws.

This Unapproved English Translation of the Document de Référence has not been reviewed or approved by any French, foreign or national regulatory authority.

To the fullest extent permitted by applicable laws, CARMAT disclaims all liability arising from the translation and any inconsistencies between the French-language registered "Document de Référence" and this Unapproved English Translation of the Document de Référence. In the event of a discrepancy between this Unapproved English Translation of the Document de Référence and the French-language registered "Document de Référence", the French-language registered document shall prevail.

The publication of this Unapproved English Translation of the Document de Référence in certain countries may violate applicable regulations. The information contained therein does not constitute an offer of securities in the United States, Canada, Australia or Japan or in any other jurisdiction. This Unapproved English Translation of the Document de Référence should not be published, transmitted or distributed, directly or indirectly, into the United States, Canada, Australia or Japan or in any other jurisdiction.

Nothing in the Unapproved English Translation of the Document de Référence constitutes an offer of securities for sale in any jurisdiction.

No public offering of securities will be conducted in France prior to the delivery by the AMF of a visa on a prospectus that complies with the provisions of Directive 2003/71/EC and no public offering of securities will be conducted abroad.

This Unapproved English Translation of the Document de Référence is not an offer for sale or a solicitation of offers to purchase CARMAT securities in the United States. The securities of CARMAT may not be offered or sold in the United States absent registration or an exemption from registration under the U.S. Securities Act of 1933, as amended. CARMAT does not intend to register any portion of the offering in the United States or to conduct a public offering of securities in the United States.

This Unapproved English Translation of the Document de Référence is for distribution only to persons who (A) are outside the United Kingdom, or (B) are qualified investors as described in section 86(7) of the Financial Services and Markets Act 2000 and (i) have professional experience in matters relating to investments falling within the definition of "investment professionals" in Article 19(5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (the "Order"), or (ii) are persons falling within Article 49(2)(a) to (d) ("high net worth companies, unincorporated associations etc") of the Order (all such persons together being referred to as "relevant persons"). This Unapproved English Translation of the Document de Référence is directed only at relevant persons and must not be acted on or relied on by persons who are not relevant persons. Any investment or investment activity to which this document relates is available only to relevant persons.

This Unapproved English Translation of the Document de Référence must not be used as the basis of an investment decision. This Unapproved English Translation of the Document de Référence contains forward-looking statements. No guarantee can be given as to any of the events anticipated by the forward-looking statements, which are subject to inherent risks, including, but not limited to, those described in the original French-language documents registered with the AMF, changes in economic conditions, the financial markets or the markets in which CARMAT operates.

This page is intentionally blank

A Société Anonyme with share capital of €166,427.80
Registered address: 36, avenue de l'Europe
Immeuble l'Étendard Energy III
78140 Velizy-Villacoublay
Versailles Trade and Companies' Register 504 937 905

DOCUMENT DE RÉFÉRENCE 2012

In accordance with its General Regulations, in particular Article 212-13, the Financial Markets Authority has registered this Document de Référence on May 30, 2013 under number R.13.027.

Pursuant to the provisions of Article L. 621-8-1-I of the Financial and Monetary Code, registration took place after the AMF had established that the document was complete and understandable, and that the information it contains was coherent. Registration does not imply that the AMF has authenticated the accounting and financial information presented.

This document may be used in connection with a financing operation if it is supplemented by an operation note signed by the Financial Markets Authority. This Document de Référence has been drawn up by the issuer and liability is borne by its signatories.

This document incorporates by reference:

- The 2010 Document de Référence registered by the Financial Markets Authority on April 27, 2011 under number R.11-017 (the "**2010 Document de Référence** ").
- The 2011 Document de Référence registered by the Financial Markets Authority on Wednesday, September 12, 2012 under number R.12-044 (the "**2011 Document de Référence**").

Copies of this Document de Référence are available free of charge from the head office of CARMAT, 36 avenue de l'Europe – Immeuble l'Etendard Energy III – 78140 Vélizy Villacoublay. This Document de Référence can also be consulted on the CARMAT website (www.carmatsas.com) and on the website of the Financial Markets Authority (www.amf-france.org).

CONTENTS

GENERAL REMARKS

In this Document de Référence, the terms “CARMAT” or the "Company" shall mean the company, CARMAT.

This Document de Référence contains information on the Company’s objectives and its avenues for development. This information is sometimes identified by the use of the future or the conditional, and terms that refer to the future, such as “consider”, “envisage”, “think”, “have as an objective”, “expect”, “intend”, “must”, “aspire”, “estimate”, “believe”, “wish”, “can” or, where appropriate, the negative form of these verbs, or any other variation or similar terminology.

The reader’s attention is drawn to the fact that these objectives and avenues for development depend on circumstances or events which may or may not occur.

These objectives and avenues for development are not historical data and must not be interpreted as guarantees that the events and data set out will occur, that the hypotheses will be verified or that the objectives will be achieved.

By their very nature, the objectives and avenues for development in this Document de Référence could be affected by known and unknown risks, or by uncertainties linked specifically to the regulatory, economic, financial and competitive environment or by other factors which could lead to the Company’s future results, performance and achievements being significantly different from the objectives that have been formulated or suggested here.

In particular, these factors may include the factors set out in Chapter 4, “Risk Factors”, of this Document de Référence. It is therefore possible that these objectives and avenues for development may not be achieved, and the statements or information in this Document de Référence may turn out to be erroneous. As such, the Company will under no circumstances be required to provide updates, subject, that is, to the applicable regulations, and in particular the General Regulations for the Financial Markets Authority.

This Document de Référence also contains information relating to the Company’s activity, as well as the market and industry in which it operates. This information specifically comes from studies carried out by internal and external sources (analysts’ reports, specialist studies, sector publications and any other information published by market research companies and public bodies and corporations).

The Company considers that this information presents a faithful picture of the market and the industry in which it operates, and that it faithfully reflects its competitive position. However, although this information is considered to be reliable, it has not been verified by an independent expert, and the Company cannot guarantee that a third party using different methods to gather, analyze or calculate data on the markets would obtain the same results.

Investors are invited to consider carefully the risk factors described in Chapter 4 “Risk Factors” in this Document de Référence before deciding to invest. If some or all of the risks materialize, this could have a negative impact on the Company’s activity, its position, its financial performance or its objectives.

Moreover, other risks which have yet to be identified or which are not deemed to be significant by the Company, may have the same negative effect, and investors may lose all or part of their investment.

Drawings, images, graphics and photographs used in this document are used purely for illustration purposes, and shall in no case constitute a commitment of any kind on the part of CARMAT.

To assist the reader’s understanding, this Document de Référence has a glossary attached. Words identified by an asterisk “*” when they first appear can be found in this glossary. A summary of references used in the document and their sources is provided at the end of the document.

1 AUTHOR

1.1 AUTHOR OF THE DOCUMENT DE RÉFÉRENCE

Mr. Marcello Conviti, Chief Executive Officer of CARMAT (hereinafter the "Company" or "CARMAT").

1.1.1 DECLARATION OF THE AUTHOR OF THE DOCUMENT DE RÉFÉRENCE

"Having taken all reasonable steps to verify the contents of this Document de Référence, I affirm that the information contained therein is accurate to the best of my knowledge, and that no material information has been omitted.

I have obtained a completion letter from the Statutory Auditors, in which they state that they have verified the information concerning the financial situation and the accounts set out in this Document de Référence, and that they have read the entire Document de Référence".

The financial information for the year ending December 31, 2012 set out in this Document de Référence was the subject of the auditors' report which appears in paragraph 20.3 of this Document de Référence, and which contains no observations.

The historical financial information as at December 31, 2010 and December 31, 2011 that is incorporated by reference into the present Document de Référence was previously presented in the 2010 Document de Référence and the 2011 Document de Référence, which were registered with the Financial Markets Authority respectively on April 27, 2011 under number R.11-017 and on September 12, 2012 under number R.12-044, and was the subject of reports by the auditors which contained no observations."

Marcello Conviti
Chief Executive Officer, CARMAT

2 AUDITORS

2.1 STATUTORY AUDITORS

PricewaterhouseCoopers Audit, member of the Regional Auditors' Association of Versailles.
Represented by Mr. Pierre RIOU
63, rue de Villiers – 92200 Neuilly-sur-Seine

Date of commencement of duties: appointed upon the incorporation of the Company on June 25, 2008.
Duration of current term: six financial periods from the date the Company was incorporated,
Expiry of current term: at the end of the general shareholders' meeting to approve the accounts for the year ending December 31, 2014

Ms. Lison CHOURAKI, member of the Auditors' Association of Paris
13, rue Spontini – 75016 Paris

Date of commencement of duties: October 16, 2008,
Duration of current term: six financial periods from October 16, 2008,
Expiry of current term: at the end of the general shareholders' meeting to approve the accounts for the year ending December 31, 2014

2.2 ALTERNATE AUDITORS

Mr. Etienne BORIS, member of the Regional Auditors' Association of Versailles
63, rue de Villiers – 92200 Neuilly-sur-Seine

Date of commencement of duties: appointed upon the incorporation of the Company on June 25, 2008.
Duration of current term: six financial periods from the date the Company was incorporated,
Expiry of current term: at the end of the general shareholders' meeting to approve the accounts for the year ending December 31, 2014

Ms. Soulika BENZAQUEN, member of the Auditors' Association of Paris
5, rue de Prony – 75017 Paris

Date of commencement of duties: October 16, 2008.
Duration of current term: six financial periods from October 16, 2008,
Expiry of current term: at the end of the general shareholders' meeting to approve the accounts for the year ending December 31, 2014

2.3 STATUTORY AUDITORS WHO RESIGNED, WERE DISMISSED OR WERE NOT REINSTATED

Since their appointment, the statutory auditors and their substitutes have not been dismissed from their positions, nor have they resigned.

2.4 AUDITORS' FEES

	PricewaterhouseCoopers Audit				Lison Chouraki			
In euros (excl. VAT)	2012	%	2011	%	2012	%	2011	%
Auditing, certification, examination of individual accounts- Issuer	24,450	91.7	45,200	95.8	20,450	90.3	25,075	92.6
Other activities and services directly linked to the audit task - Issuer	2,200	8.3	2,000	4.2	2,200	9.7	2,000	7.4
Total	26,650	100	47,200	100	22,650	100	27,075	100

3 SELECTED FINANCIAL INFORMATION

The Company was founded on June 25, 2008. Since then, the Company has completed an initial accounting period ending on December 31, 2009, the accounts for which were approved by the auditors and cover the first 19 months of the Company's existence, followed by three accounting periods ending respectively on December 31, 2010, December 31, 2011 and December 31, 2012. The accounts for these three accounting periods, each covering a period of 12 months, were approved by the auditors.

The data below are taken from the balance sheet, the income statement and the cash flow statement in the accounts for the years ending December 31, 2012, December 31, 2011 and December 31, 2010, drawn up in accordance with French accounting standards.

Summary balance sheet	*12 months*	*12 months*	*12 months*
ASSETS (in euros)	12/31/2012	12/31/2011	12/31/2010
Net fixed assets	2,266,763	3,147,942	3,582,600
including intangible fixed assets	168,468	234,707	324,112
including tangible fixed assets	1,556,204	2,448,058	2,832,276
including financial fixed assets	542,090	465,178	426,212
Current assets	17,430,133	34,278,141	17,465,088
including cash and cash equivalents	11,134,438	29,369,693	11,415,823
TOTAL ASSETS	19,696,896	37,426,083	21,047,688

LIABILITIES (in euros)	12/31/2012	12/31/2011	12/31/2010
Equity	9,941,228	26,890,919	13,474,075
Other equity*	3,743,141	3,743,141	2,018,892
Provisions for risks and charges	73,304	35,660	18,357
Creditors	5,939,193	6,756,362	5,536,364
including financial payables	460,054	217,066	78,096
including operational payables	5,326,771	6,152,251	5,355,111
TOTAL LIABILITIES	19,696,896	37,426,083	21,047,688

Summary income statement	*12 months*	*12 months*	*12 months*
(in euros)	2012	2011	2010
Turnover	0	0	0
Subsidies	10,500	6,051,177	5,048,697
Operating expenses	22,403,502	22,192,807	15,530,940
Operating result	- 22,385,513	- 16,091,054	- 10,482,243
Financial result	110,099	97,271	- 20,807
Earnings before interest and tax	- 22,275,415	- 15,993,783	- 10,503,050
Extraordinary result	70,290	37,234	16,066
Research tax credit	- 5,015,433	- 2,515,527	- 2,750,499
Net result	- 17,189,691	- 13,441,022	- 7,736,485

Summary cash flow statement	*12 months*	*12 months*	*12 months*
(in euros)	2012	2011	2010
Net result	- 17,189,691	- 13,441,022	- 7,736,485
Self-financing capacity	- 15,505,462	-11,927,757	- 6,495,140
Cash flow from operations	-17,952,868	- 9,705,912	- 6,951,146
Cash flow from investment operations	-522,387	-1,061,303	- 1,566,896
Cash flow from financing operations	240,000	28,721,085	19,221,028
Change in cash and cash equivalents	-18,235,255	17,953,870	10,702,986
Opening cash	29,369,693	11,415,823	712,837
Closing cash	11,134,438	29,369,693	11,415,823

* Other equity represents advances received from OSEO. These advances are repayable under the terms set out in the notes to the annual accounts (Notes 4.7.1 and 6.1.1 for the year ending December 31, 2012). In the event that the projects in question succeed, they will therefore constitute debt.

4 RISK FACTORS

Investors are invited to take into consideration all the information appearing in this Document de Référence, including the risk factors described in this chapter. When preparing this Document de Référence, the Company carried out a review of the risks which might have a significant unfavorable impact on its activity, its financial situation, its performance or its capacity to achieve its objectives, and it considers that there are no other significant risks than those presented.

4.1 RISKS RELATING TO THE COMPANY'S ACTIVITY

4.1.1 Risks of failure or delays in the development of the total artificial heart

CARMAT is developing a total* orthotopic* and bioprosthetic* artificial heart* that is fully implantable, as well as its electricity supply system and its remote monitoring system.

This innovative system aims to treat an often-fatal disease and answer a real medical need which has not yet been met.

The development plan for the total artificial heart is broken down into three phases:

- a preparatory phase in advance of clinical investigations which involves examining, designing and manufacturing CARMAT total artificial heart systems for implantation in humans as well as the performance of all tests and validations required to obtain Clinical Trial Authorization (CTA) from the ANSM*[1] in France or authorization for human implantation in other countries;
- a clinical trials phase including a feasibility trial and a pivotal trial;
- a development phase aimed at finalizing the design of the system and its *in vitro* and clinical validation file with a view to submitting an application for CE Marking. This third phase will take place in parallel with the clinical trials.

The purpose of this structure is to obtain clinical validation data quickly, and also to validate the specific technical choices made for the CARMAT total artificial heart (anatomy – miniaturization, physiology - self-adjustment, hemocompatability*, reliability) and to provide feedback on the design with equal responsiveness.

In France, the CARMAT artificial heart project has been presented to the French Agency for the Safety of Health Products (AFSSAPS[1]) on a number of occasions since 2004. The reception was favorable, as no alternative to such a device is currently on the market. The methodology used - a product of the aviation and space industries - should open the way to more modern development methods in the field of complex medical devices.

As part of its role in supporting innovation, the AFSSAPS/ANSM offers a specific application procedure whereby applications are filed in advance of the official request for Clinical Trial Authorization (CTA). This procedure allows data to continue to be added to the file as it becomes available. The main advantage of such a procedure lies in significantly reduced delays in comparison to those normally needed to obtain trial authorization once the formal CTA request is submitted.

A submission was made under this specific procedure in the spring of 2011. Additional information was submitted on several occasions in 2011 and 2012. Regular meetings and written exchanges have taken place between CARMAT and the AFSSAPS/ANSM[1] in order to review progress made in the development of the total artificial heart and the possible form of a clinical trial.

Human clinical trials can begin once approvals have been obtained from the Patient Protection Committee* (CPP) and the French National Agency for Medicines and Health Products Safety (ANSM[1]).

Approval from the CPP was obtained on November 28, 2011 and renewed in November 2012. *In vitro* preclinical trials were completed at the end of 2012. The outcome of *in vivo* trials (on animals) will determine whether a CTA application is made to the ANSM (see paragraphs 4.2 "Regulatory and legal risks" and 6.3.3 "Process and development stage of the CARMAT bioprosthetic artificial heart")

Outside France, authorization can be obtained center by center, when there is no one centralized authority. In May 2013, the Company obtained agreement from four world-renowned cardiac surgery centers to proceed with the first human implantations following completion of the appropriate training (see the press release of May 14, 2013 and paragraph 6.3.3.1, pages 58 to 62).

---

1 French Law no. 2011-2012 of December 29, 2011 regarding the reinforcement of health safety for drugs and healthcare products and Decree no. 2012-507 of April 27, 2012 specify the organization of the French National Agency for Medicines and Health Products Safety (ANSM) which the legislature has established to replace the French Agency for the Safety of Health Products (AFSSAPS). In this document, the abbreviation AFSSAPS is used only when referring to events prior to the Decree.

It is possible for the Company to obtain CE Marking without having obtained approval from the ANSM to conduct human clinical trials in France if the company has conducted conclusive human clinical testing in other countries.

Nevertheless, approval must be obtained from the ANSM to conduct clinical trials in France in order to receive funding from OSEO, in particular milestone 4 which represents a €2.9m subsidy plus a €3.8m repayable advance, in other words total funding of €6.7m (see paragraph 22.1.3 "Milestones of the project, associated deliverables and specific conditions for the continuation of the project" and subsequent paragraphs).

The Company is therefore conducting the required preclinical tests and aims to submit a formal request for clinical trial authorization to the ANSM at the end of the first half of 2013.

The significant scientific and regulatory stages described in paragraphs 6.1, 6.4.7, 22.1.6, 22.1.7 and 22.1.8 must still be completed successfully before implantations of the prosthesis can begin. At the earliest, implantations will begin during the first half of 2013, with sales commencing no earlier than 2014.

Any failure or delay in developing the total artificial heart during the validation phases for commencing the clinical trials or during the clinical trials, or any delay in obtaining approvals from the CPP or ANSM, could have a significant, unfavorable impact on the Company's activity, its performance, its financial situation and its prospects.

4.1.2 Risks involved with dependence on the total artificial heart

As at the date of registration of this Document de Référence, the Company is dependent on the development and commercial success of its total artificial heart. The development of this complex bioprosthesis required significant investments from the Company in terms of time and financial resources, as well as the involvement of highly qualified staff, and this requirement will continue until the product is put on the market.

CARMAT's future success and its capacity to generate revenue will depend on the technical and commercial success of this medical device, and specifically on a number of conjectural factors, such as:

- the authorization and success of clinical trials for the total artificial heart;
- obtaining CE Marking* in the European Union and Pre-Market Approval* ("PMA") from the Food and Drug Administration* ("FDA") in the United States;
- the success of the commercial launch, and;
- the acceptance of the total artificial heart by the medical community, and more particularly by cardiologists and cardiac surgeons, as well as third party payers (e.g. social security systems).

If CARMAT does not manage to develop and market its total artificial heart, there could be a significant impact on the Company's activity, its prospects, its financial situation, its performance and its development.

4.1.3 Risks relating to competition

Potential competition to CARMAT comprises:

- on the one hand, total artificial hearts, whether on sale or still in development, and implantable Biventricular Assist Devices (BIVADs) with a high potential to serve as substitutes for the heart developed by CARMAT;
- on the other hand, and to a lesser degree, implantable Right/Left Ventricular Assist Devices, RVAD/LVAD), which are less apt to serve as substitutes as they only support one ventricle.

A detailed analysis of the competition appears in paragraph 6.4.2, "Technologies and Market Players".

CARMAT is not currently aware of any existing device or project which involves or plans to involve the use of either biological materials or self-regulation via multiple integrated sensors. These two characteristics are at the core of the technological breakthrough made by CARMAT.

Nevertheless, the medical devices market is highly competitive and rapidly evolving. In particular, the Company competes with larger companies which possess greater industrial and commercial experience and superior resources. Consequently, the Company cannot warrant that its product will:

- obtain the necessary regulatory approvals and reach its intended markets faster than rival products;
- be competitive vis-à-vis other products that have been developed or are in development, which may prove to be cheaper, safer or more efficient;
- adapt rapidly enough to new technological developments and scientific advances;
- be accepted by medical establishments, physicians or patients in place of existing treatments, or;
- compete effectively with other products for treatment of the same pathologies.

It is likely that new developments will continue to occur in the medical device industry and in public and private research institutions. In addition to developing products that are cheaper, safer or more efficient than the Company's product, competitors could manufacture and market their products under better conditions.

The Company cannot, therefore, exclude the possibility that companies or public institutions that currently compete with it will merge or reach joint venture agreements or other types of mutual accord and consequently become more aggressive competitors. Furthermore, rapid technological developments by these competitors could render the Company's product obsolete before it yields a return on the research, development and selling costs incurred.

Even if the Company's product is marketed successfully, it may be slow to gain acceptance in the market, leaving the Company in a position where its revenues are insufficient to recoup the costs incurred. In order to ensure that its product is accepted by the market ahead of existing products, the Company will have to make significant efforts in terms of both marketing and capital investment. To date, as the product is in the development phase, the Company has not undertaken any significant marketing activity.

Lastly, the Company's contracts with its employees do not contain non-competition clauses. The Company therefore does not enjoy the protection afforded by such clauses; however, it intends to maintain and develop a policy of securing staff loyalty by awarding shares in the enterprise's capital to all of its personnel.

4.1.4 Risks of a commercial failure

If the Company succeeds in obtaining CE Marking in the European Union and PMA from the FDA in the United States for the CARMAT total artificial heart, thus enabling it to market its total artificial heart, it may take time to secure the backing of the medical community, especially cardiologists, cardiac surgeons and third-party payers.

Market acceptance, speedy or otherwise, of the total artificial heart depends on a number of factors:

- the medical profession’s perception of the therapeutic benefit of the total artificial heart;
- the number of establishments likely to carry out these artificial heart implant operations;
- the process and the quality of the training of cardiac surgeons, who need to master a new surgical technique;
- the cost of the treatment;
- the healthcare payment policies of governments and other third parties;
- the effective implementation of a publicity strategy, and;
- the support of recognized experts.

Poor market penetration resulting from any one of these factors could have a significant, unfavorable impact on the Company's activity, its prospects, its financial situation, its performance and its development.

Nevertheless, because the CARMAT total artificial heart responds to a growing global public health problem, which to date has not had a satisfactory response, and because CARMAT works in collaboration with eminent cardiac surgeons on its ex-vivo* trials and animal experimentation, the Company considers this risk to be limited.

4.1.5 Dependence risks relating to current and future strategic partnerships and collaborations

In order to develop and market its total artificial heart, CARMAT has benefited as project leader from an exceptional €33 million grant from OSEO Innovation under the Strategic Industrial Innovation (“**ISI**”) program (see Chapter 22 “Important Contracts”). It is also collaborating with the following four partners:

- DEDIENNE SANTE in the preparation of implantable PEEK* parts;
- PAXITECH in the development of a portable fuel cell*;
- VIGNAL ARTRU INDUSTRIE to develop the motor pump group;
- IREIS (formerly HEF R&D) regarding the approval of the motor pump group.

As the Company is not involved in producing the different components of the total artificial heart, but rather assembles them in order to create and market this complex bioprosthesis itself, it could be dependent on these partners or other suppliers of raw materials, components, sub-assemblies or essential services.

Indeed, the Company cannot control the amount or the timetable of the resources which its existing or future partners and suppliers will devote to the total artificial heart. It is possible that these partners and suppliers may not fulfill their obligations in line with the Company's expectations. As a result, the Company could face operational delays which could have a significant, unfavorable impact on the Company’s activity, its performance, its financial situation and its prospects. However, under the OSEO Innovation contract, each partner has undertaken to take the necessary steps to make the project to develop a total artificial heart and its components a success.

Since its foundation, furthermore, CARMAT has always collaborated with renowned cardiac surgery teams. Three French centers have been selected and trained to participate in the first phase of human clinical trials: the Georges Pompidou European Hospital in Paris, the Marie Lannelongue Surgical Center in Le Plessis-Robinson, near Paris, and the Laënnec Hospital, Nantes.

If the first implants of total artificial hearts are successful, the Company could become dependent on these first French transplantation centers and their cardiac surgery teams. This could slow down the general acceptance of the artificial heart and the transfer of surgical procedure and skills acquired during the first clinical trials to other transplantation centers and, as a result, could have negative consequences on the Company's expansion and development.

In order to limit this risk, the Company has already identified other transplantation centers in Europe and elsewhere with a potential interest in artificial heart implantation.

4.1.6 Risks connected with a slowdown in the Company's efforts to train cardiac surgeons

In order to ensure the success of the Company's marketing efforts, it is essential that a sufficient number of cardiac surgeons are trained and that they have at their disposal the necessary instructions to implant the total artificial heart.

This training process could turn out to be longer than predicted and thus affect the progress of the Company's sales. If they are not adequately trained, the surgeons are at risk of carrying out inappropriate operations or surgical procedures that could cause the death of the patient. This type of situation could undermine the image of the Company and indeed could lead to legal proceedings being brought against it. All these consequences could have an unfavorable impact on the widespread expansion of the use of the total artificial heart and the Company's activity in general.

The Company considers that its methods for training surgeons comply with FDA regulations and with relevant legislation in the European Union countries in which it will initially market the total artificial heart. However, these methods for training surgeons may be subject to specific local regulations governing relations between manufacturers of medical devices and health professionals. Thus in France, training programs are subject to the prior approval of the the Ordre des Médecins (the French Order of Physicians *), issued at the request of the medical device manufacturer.

In addition, any competent authority, such as the FDA in the United States and the ANSM in France, may in particular:

- decide that the training constitutes publicity for unauthorized usage;
- order the Company to modify its training program;
- order the suspension of training by the Company, or;
- where the breach of the regulations in question constitutes a criminal offense, report this fact to the State Prosecutor or any other competent body in this field with a view to commencing legal proceedings against the manufacturer.

However, given that the CARMAT total artificial heart constitutes an innovation for patients and cardiac surgeons, the Company considers that these risks are limited.

4.1.7 Risks connected with outsourcing the manufacture of the components of the total artificial heart

The Company's role is to assemble various components into the total artificial heart, the manufacture of numerous components being outsourced to different suppliers. CARMAT's capacity to market its total artificial heart depends in part on its capacity to obtain from its suppliers components that have been manufactured in strict compliance with the regulatory provisions and established protocols, in a profitable manner and in the quantities requested.

It is not possible for the Company to control the amount or the timetable of the resources which its suppliers will devote to the manufacture of the components of the total artificial heart.

In addition, problems might arise during the manufacturing process for various reasons, such as equipment failure, breach of specific protocols and procedures, or problems with the supply of raw materials.

Problems arising during the production phase could cause delays in the supply of components, which could have the following consequences:

- an increase in costs;
- delays and costs from identifying the cause of the problem;
- delays in the manufacture of the prostheses required for preclinical trials, clinical trials or for sale.
- the Company becoming liable where the problems are not discovered before the product is put on sale.
- a deterioration in relations with clients;
- a fall in sales;

Certain suppliers may not wish to make commitments beyond the pre-production phase due to specific regulatory or legal risks related to the field of active implantable medical devices.

If relations with its suppliers break down or deteriorate, the Company might find itself unable to form new relations with other suppliers under commercially acceptable conditions, or even at all, which could damage its ability to produce, develop and market its total artificial heart successfully.

Moreover, dependence on third party manufacturers creates additional risks which the Company would not have had to face if it produced the components itself, namely:

- non-compliance of components manufactured by third parties with regulatory provisions and quality control;
- breach of agreements with the Company by third parties; and
- termination or non-renewal of these agreements for reasons outside the Company's control.

If it turns out that products manufactured by third parties do not comply with regulatory provisions, sanctions could be imposed on the Company. These sanctions might include fines, injunctions, claims for damages, the refusal of regulatory authorities to allow it to carry out clinical trials or to grant it CE Marking or PMA for its total artificial heart, delays in obtaining authorizations the suspension or withdrawal of authorizations, the revocation of licenses, the seizure or recall of its products, operational restrictions and criminal prosecutions. All these measures could have a considerable negative impact on its activity.

If the Company changes its product manufacturers, it would be required to revalidate the manufacturing process and procedures in accordance with current regulations. This revalidation could be costly and time consuming, and it could require the attention of the Company's most qualified staff. If revalidation were to be refused, the Company could be forced to find an alternative supplier, which could delay the production, development and marketing of the total artificial heart and increase its manufacturing cost.

These events could have a significant, unfavorable impact on the Company's activity, its prospects, its financial situation, its performance and its development.

4.1.8 Risks connected with supplies and increases in costs of raw materials

Due to the very wide range of different materials (PEEK, polyurethanes, expanded PTFE and silicone oil), biological products (chemically treated animal pericardium*) and electronic and electromechanical components that are necessary for the manufacture of the total artificial heart, its electricity supply system and its remote monitoring system, the Company is dependent on a large number of suppliers and sub-contractors for these supplies.

Even if the Company endeavors to formalize long term contractual relations with its strategic suppliers and sub-contractors, the procurement of any one of these materials, products or components could be reduced or interrupted. If that were the case, the Company might not be able to find other suppliers of materials, biological products, electronic and electromechanical components of acceptable quality in appropriate volumes and at an acceptable cost. If its principal suppliers or sub-contractors defaulted, or if its procurement of products, materials, or components was reduced or interrupted, the Company might not be able to continue to develop its total artificial heart for the purposes of the clinical trials, and then to produce and market its total artificial heart in time and competitively.

These materials, products and components are subject to extremely strict specifications, comprising a demanding manufacturing process and rigorous tests. Delays in the manufacture of these materials, products or components by the suppliers or sub-contractors could affect the Company's capacity to carry out its clinical trials and to market its total artificial heart, its electrical energy supply and its remote monitoring system profitably and within reasonable time limits.

Although the Company has always sought to develop sources of procurement from several suppliers and sub-contractors so as to reduce the risks referred to above, CARMAT is still dependent on a single supplier for the provision of the following items:

- Long-lasting implantable PEEK, for which CARMAT concluded an agreement on August 28, 2012 with INVIBIO Ltd. (see chapter 22, "Significant Contracts") and other implantable polyurethanes;
- Implantable expanded PTFE, and;
- Carpentier-Edwards® biological heart valves, for which CARMAT concluded an agreement on November 5, 2010 with EDWARDS LIFESCIENCES (see Chapter 22 "Significant Contracts").

Faced with the problem of recurring surcharges from certain suppliers in the high-tech sector, CARMAT has already begun to identify or put in place secondary suppliers for the most critical parts of the prosthesis and external subsets, in order to ensure the reliability of supplies and thus ensure sufficient production capacity. This selection must be conducted in line with strict criteria for the quality, skills and production facilities of the suppliers. Consequently, CARMAT must undertake surplus production, validate the industrial processes and verify that the products obtained are identical to those from its first procurement source. In some cases, CARMAT will probably have to vertically integrate certain outsourced processes.

If the Company were to encounter difficulties in the procurement of these materials, biological products or electronic or electromechanical components, if new standards for the use of these materials were to come

into force, if it were unable to keep to these sub-contracting agreements, enter into new agreements or obtain the materials or biological products needed to develop and manufacture its total artificial heart, electrical energy supply system and remote monitoring system in the future, its activity, prospects, financial situation, performance and development might be significantly impacted.

In time, during the marketing phase of the total artificial heart, the Company's gross margin could be affected by fluctuations in the market prices of raw materials, such as animal pericardium, PTFE and other implantable polyurethanes and biological valves; these are difficult to predict or control and could have an unfavorable impact on the financial situation, performance and prospects of the Company.

4.1.9 Risks connected with the lack of sales resources and means of distribution

At present, the Company does not have a marketing structure designed to support its future activity following the sale of the total artificial heart, nor does it have its own sales resources. In order to ensure the success of the sales of the total artificial heart on a large scale, the Company will have to adapt its structure, develop itself at an international level, develop a distribution network and recruit dedicated, qualified staff.

The Company is already able to draw on the experience of some of its senior managerial staff in the implantable medical devices industry (see paragraph 14.1.3 "Other Members of the Board of Directors"). Studies are currently underway with a view to continuing recruitment in this area and to adapt CARMAT's organizational structure (see paragraph 6.4.3 "Marketing strategy")

However, if the Company were to prove unable to put such a structure in place, or if there were delays in organizing marketing and distribution measures or the recruitment and training of a sales team or a distribution network, this could have an unfavorable impact on the Company's activity, its prospects, its financial situation, its performance and its development.

4.1.10 Risks connected with growth management

The Company expects to grow significantly and to extend its field of activity to designing and producing medical devices other than the total artificial heart. It will therefore need to adapt its organizational structure and implement new skills, recruit personnel and extend its operational capacities; this could place significant demands on its internal resources.

To this end, the Company will have to:

- train, manage, motivate and hold on to a growing number of qualified staff and/or distributors;
- anticipate the expenses connected with this growth and the associated financing needs;
- anticipate demand for its products and the revenues they might generate, and;
- increase the capacity of its existing operational, financial and management computer systems.

The Company's inability to manage growth or unexpected difficulties encountered during its expansion could have a significant, unfavorable impact on its activity, its performance, its financial situation and its prospects. However, as regards its growth at an international level, the Company has established a scientific committee to advise it throughout the development phases of the total artificial heart (see paragraph 16.3.3 "Medical and Scientific Committees").

4.1.11 Risks relating to the need to keep, attract and retain key personnel and scientific advisors

The Company's success depends largely on the work and expertise of the members of the board of directors and key scientific personnel, in particular Professor Alain Carpentier, Scientific Director, Marcello Conviti, Chief Executive, Patrick Coulombier, Assistant Chief Executive, Dr. Petrus Jansen, Medical Director, Marc Grimmé, Technical Director and Hervé Bocquet, Industrial Director. To date the Company has not taken out any so-called "key man" insurance (insurance policies to cover permanent incapacity/death) and the loss of their skills would affect the Company's capacity to attain its goals. Although the Company has for several years conducted management and knowledge transfer programs, thereby creating a know-how base which is not confined to specific individuals, the simultaneous departure of several important employees from its executive management or its research and development activities would significantly affect the Company's capacity to attain its goals.

Furthermore, the Company will need to recruit new executives and qualified scientific personnel in order to develop its activities as and when it expands into areas which require supplementary skills such as manufacturing, marketing and regulatory affairs.

The Company is competing with other companies, research bodies and academic institutions in order to recruit and retain highly qualified scientific, technical and management personnel. As this competition is very intense, the Company may not be able to attract or retain key personnel in conditions that are acceptable from an economic point of view. The Company's inability to attract and retain this key personnel would prevent it from attaining its objective overall, and would thus have a significant, unfavorable impact on its

activity, its performance, its financial situation and its prospects.

In order to motivate and retain the loyalty of the directors and employees who were present in the Company during CARMAT's first year, the Company put in place share option schemes ("**BSA**") and start-up share option schemes ("**BCE**") (see paragraph 17.2 "Shareholdings and share option schemes held by members of management and supervisory bodies"), and it created a remunerations committee made up of Jean-Claude Cadudal and Philippe Pouletty. In order to complement this measure and retain the loyalty of staff joining the company after its first year, the Company introduced two further BCE schemes in 2012.

4.2 REGULATORY AND LEGAL RISKS

4.2.1 Risks connected with an increasingly stringent regulatory environment

Research and development work, preclinical studies, clinical studies and the manufacture and marketing of medical devices are very strictly supervised and governed by numerous legislative or regulatory provisions, in particular those relating to health and safety, and they are subject to controls by competent administrative bodies, notably the ANSM.

The regulations on medical devices which CARMAT is subject to are complex, and they are becoming increasingly strict. The regulations of the FDA (for the United States) and Directive 90/385 EEC of June 20, 1990, as amended by Directive 2007/47/EEC of September 5, 2007, regarding active implantable medical devices (for the European Union, transposed into the Public Health Code in France), and similar laws and regulations in other countries in the world, govern numerous aspects of medical devices, notably:

- design, development and manufacture of products;
- product testing and clinical trials carried out on humans;
- product storage;
- product marketing, including advertising and promotion;
- approvals and market authorizations;
- procedures for storing data, and;
- supervision after products are put on the market and reporting deaths.

The direct or indirect costs associated with complying with current or future regulations, obligations or directives may rise. In particular, a regulatory proposal of the European Parliament and of the Council concerning medical devices, intended to replace Directive 90/385/EEC, is in the investigatory stage

Furthermore, data from preclinical and clinical trials can produce divergent interpretations, which could delay the obtaining of or restrict the scope of regulatory authorization, or force the Company to repeat trials in order for them to meet the requirements of the different regulators. The regulatory requirements and processes vary significantly from one country to another, and so the Company or its partners might not be able to obtain authorization in every country concerned in good time. Changes to regulations during the development of the total artificial heart and its regulatory review can lead to delays or to the refusal of authorization.

In Europe, the United States and in other countries, regulations may:

- delay and/or significantly increase the cost of developing, testing, manufacturing and marketing the Company's total artificial heart;
- limit the pathologies for which CARMAT would be authorized to market its total artificial heart;
- impose new, stricter requirements, suspend authorization of the total artificial heart, or put a stop to clinical trials;

In addition, a proposed revision of Directive 2007/47/EEC on medical devices was published on September 28, 2012[2], with a view to adoption in 2014 and progressive implementation from 2015 to 2019. The year 2012 also saw the introduction of the FDA Safety and Innovation Act[3] in the US, which provides for the enhanced traceability of components and for an increase in submission costs, in exchange for clearer directions concerning requirements which could reduce the time needed to obtain approvals.

Any change in regulation or any breach of compliance obligations can lead to sanctions, including fines, injunctions, civil sanctions, refusal of CE Marking or PMA, delays, suspension or withdrawal of authorizations, the seizure or recall of products, restrictions on use or criminal prosecutions. Each of these could significantly increase the costs borne by the Company, delay the development and marketing of its total artificial heart, and thus have a significant unfavorable impact on its activity, its performance, its financial situation and its prospects.

2 http://ec.europa.eu/health/medical-devices/files/revision_docs/citizen_summary_20120926_en.pdf
3 http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/Overview/ucm310927.htm

4.2.2 Specific risks connected with preclinical studies and clinical trials

The Company is currently in the phase of preparing for clinical investigations. Test bench studies recreating the bloodstream and mimicking human activity (activity, rest and sleep cycle), endurance tests and validation tests on the assembly process have been conducted, and animal experimentation is underway (see paragraph 6.3.3 "Process and development stage of CARMAT'S artificial heart project").

To this end, CARMAT has begun the industrial assembly of prostheses for preclinical trials. The next key stage of development for the CARMAT total artificial heart will be implantation in humans. The CARMAT bioprosthesis will first have to be evaluated on patients who cannot benefit from any other therapy and whose condition is life threatening, then, depending on the results, on patients with a better prognosis. CARMAT will then have to produce new series of implantable prostheses for the clinical trials.

The human clinical validation phase can begin once approval has been obtained from the ANSM or from the competent authorities in other countries. The competent regulatory authorities will evaluate all of the production development, test and clinical trials data.

These regulatory authorities could require additional preclinical testing or put a stop to the clinical trials or to the pursuit of clinical development if it the data submitted prove not to have been produced in accordance with the applicable regulations, or if they consider that the benefits expected from the product do not sufficiently outweigh its potential risks to justify the trial.

It should be noted that the Company could decide, or indeed the regulatory bodies could demand, that the Company suspend or put an end to the clinical trials if the patients were exposed to unexpected, serious risks. Deaths and other undesirable events might occur in connection with the trials, thus causing delays or interrupting a trial and consequently preventing the Company from pursuing the development of its total artificial heart in the targeted direction or indeed in other directions.

The Company's inability to carry out and complete these preclinical and clinical trials successfully could have a significant, unfavorable impact on its activity, its prospects, its financial situation, its performance and its development. In order to limit these risks, the Company has established two scientific committees, including a medical committee whose purpose is to prepare these clinical trials (see paragraph 16.3.3, "Medical and Scientific Advisory Boards").

Clinical and preclinical trials are costly. If the results of these trials are unsatisfactory or inconclusive, the Company may be required to choose between abandoning its program, resulting in the loss of the corresponding investment in time and money, or continuing, with no guarantee that the additional expenses incurred will lead to a successful outcome.

4.2.3 Specific risks connected with obtaining CE Marking and the agreement of the FDA to market the CARMAT total artificial heart

The total artificial heart will be used initially for research purposes under IUO ("*Investigational Use Only*") regulatory status, in the context of the clinical trials. Nevertheless, in order to be able to market its total artificial heart in European Union countries, the Company will have to obtain CE Marking (see 6.4.1 for the procedure for obtaining CE Marking).

Similarly, the Company will be obliged to obtain the agreement of the FDA in the United States and the agreement of the regulatory authorities in other counties where the Company wishes to begin marketing its total artificial heart.

Each regulatory body may impose its own conditions, refuse to grant authorization or require additional data before granting marketing authorization, even if that authorization had already been granted by other comparable bodies. (See paragraph 4.2.1, "Risks connected with an increasingly stringent regulatory environment").

The process of obtaining regulatory authorizations is long and onerous, and the precise date of granting the authorization to place a medical device on the market is difficult to predict. Every delay or failure by the Company to obtain authorization to place the artificial heart on the market could have a significant unfavorable impact on its activity, its performance, its financial situation and its prospects.

4.2.4 Risks connected with product liability

Cardiac surgery involves significant risks of serious complications that can have mortal consequences. The clinical trials and marketing of the total artificial heart involve a risk of incurring the manufacturer's liability for defective goods. If CARMAT were faced with a liability claim for defective goods, and if it did not manage to defend that claim successfully, its liability could be significant.

As the Company has not entered the sales phase for the total artificial heart, it has not taken out insurance against liability for defective goods. The Company has taken out an insurance policy in relation to the clinical

trials phase in accordance with the Huriet Law of December 20, 1988 and consequently possesses the level of insurance cover required under current regulations.

However, the Company cannot guarantee that its insurance cover will be sufficient to meet liability suits that may be filed against it. If CARMAT were held liable and the Company were unable to obtain and maintain appropriate insurance cover at an acceptable cost, or to protect itself in any way against liability suits arising out of defective goods, this would have a serious impact on the marketing of the total artificial heart and more generally it would damage its reputation, its activities, its performance, its financial situation and its prospects.

4.2.5 Risks connected with uncertain protection of patents and other intellectual property rights

It is important for the success of the Company's activity that it is able to obtain, maintain and ensure respect for its patents and other intellectual property rights and thus protect its technologies against possible unlawful use by third parties. However, patents and other intellectual property rights may only offer limited protection and may not prevent the unlawful use of technologies belonging to CARMAT. The unauthorized exploitation of the Company's technologies by third parties may lead in particular to the loss of CARMAT's competitive advantage.

The efforts made by CARMAT to protect its technologies might not be successful for various reasons. Indeed, the possibility cannot be excluded that:

- patents granted might be contested or held to be invalid, or that the Company may be unable to ensure that they are respected;
- patents for which applications are being considered, including certain important patents in several jurisdictions, might not be granted;
- the extent of the protection conferred by a patent might be insufficient to provide effective protection from competitors;
- the Company's products will not infringe, or be accused of infringing patents belonging to third parties;
- third parties might claim rights over patents or other intellectual property rights owned by the Company.

The grant of a patent does not guarantee its validity or its enforceability, and third parties may call into question these two features. The granting and enforceability of a patent in the area of medical devices are highly uncertain and raise complex legal and scientific questions. Until now, no uniform global policy has emerged on the content of patents granted in the area of medical devices and the scope of the claims allowed. It may be that legal action proves necessary to ensure respect for intellectual property rights, to protect commercial secrets or to determine the validity and scope of the Company's intellectual property rights. Any dispute could result in significant expenditure. It could also distract the management team from its priorities and reduce profits, and it might not provide the protection sought by the Company. Competitors may successfully contest patents granted before a court or as part of other proceedings, which might have the effect of reducing the scope of the Company's patents. Furthermore, patents may be successfully infringed or bypassed as a result of innovations.

There is great disparity in the laws of the different countries where the Company has registered or is protecting its intellectual property rights. These differences might prevent the Company from satisfactorily protecting its technologies in one or more countries or from ensuring the same level of protection in the different countries.

If one of these factors concerning one of the patents or intellectual property rights occurs, it could have an unfavorable impact on the activity, prospects, financial situation, performance and development of the Company.

Bearing in mind the key importance of patents in its sector of activity, the Company has commissioned a study by a firm of specialists to confirm that it has freedom of exploitation, both in the United States and in Europe, for American and European patents with claims over every apparatus, system and method pertaining to the total artificial heart. According to the conclusions of the study, the Company's patents do not infringe the American and European patents highlighted in the research carried out.

In addition, CARMAT implements a policy of applying for patents at an early stage in order to optimize priority rights.

4.2.6 Risks connected with the inability to protect the confidentiality of Company information and its know-how

The Company may be required to provide public or private bodies with information in order to conduct certain tests for the purposes of researching or validating its commercial projects. The Company also relies on its own technologies, methods, processes, know-how and data that are not patented and which it considers to be industrial and technical secrets. In both cases, their protection is specifically insured by confidentiality

agreements between the Company and its employees, consultants and third parties. It cannot be excluded that these agreements or other methods of protecting commercial and technical secrets will not ensure the protection sought, or are not respected, or that the Company may not have an appropriate response to such breaches, or that its commercial and technical secrets are divulged to potential competitors or developed independently by third parties.

If one or more of these risks materialized, this could have a significant, unfavorable impact on the Company's activity, its performance, its financial situation and its prospects.

4.2.7 Risks connected with pricing and changes in reimbursement policies for medical devices

The Company's capacity to make sufficient profits on the sale of the total artificial heart will depend in part on the level of costs assumed by the public health authorities, private health insurance, healthcare management organizations and other organizations.

If patients were not sufficiently reimbursed for the cost of the total artificial heart and the costs connected with the implant surgery, CARMAT could see sales volumes of the total artificial heart being unfavorably affected.

Governments and other third party payers are engaged in a drive to contain health costs by limiting both the cover and the amount of the reimbursement for new therapeutic developments. The Company expects increasing and constant changes from the draft legislation aimed at imposing government controls. If these proposals or reforms are adopted, this could have a significant negative impact on the Company's activity and the level of its revenue.

Moreover, governments and other third party payers are intervening more and more against medical and pharmaceutical sector undertakings on the pricing of products and medical services. There is a great deal of uncertainty over the reimbursement status of these new healthcare products and the possibility that healthcare authorities or third party payers will assume enough of the cost. This could have a significant negative impact on the Company's activity and level of revenue.

As CARMAT aims to market the total artificial heart worldwide, particularly in the United States, its acceptance by the total artificial heart market will also depend in part on the mode of reimbursement being used in the systems for paying healthcare expenses in the countries in question.

CARMAT's failure to obtain adequate funding for the total artificial heart in countries where the Company wishes to expand would have a negative impact on its acceptance by the market in the country where these applications for funding have failed.

CARMAT is not able to anticipate how much funding there might be or the level of reimbursement for its products, as this is normally decided by the payers. Any funding levels or any changes to the funding and the resulting situation could have significant, unfavorable effects on the activities, prospects, financial situation, performance and development of the Company.

However, as the CARMAT total artificial heart responds to a global public health need, namely advanced heart failure, which so far does not have a satisfactory response, and as the price of the total artificial heart and the associated costs are calibrated so that they are lower than those of a heart transplant (i.e. all pre- and post-operative costs as well as the costs of the transplant itself – see paragraph 6.4 "Market and strategies"), the Company considers these risks to be limited. Furthermore, the development of the CARMAT system and in particular the portable external part of the system which could allow the patient to be discharged more rapidly from the hospital to return home, and which could improve the patient's quality of life, must enable health systems to reduce their direct and indirect costs.

4.2.8 Risks connected with changes to the tax on medical devices

In France, manufacturers of medical devices (including those implanted in full or in part in the human body) who place their products on the French market must pay the tax set out in Article L.5211-5-2 of the Public Health Code if their annual turnover (excluding VAT) in relation to the sale of these products is equal to or greater than €763,000.

This tax is levied at 0.25% of total annual turnover (excluding VAT) from medical devices, and the Company must submit a tax return along with payment to the ANSM accounting officer by March 31 each year. If no return is filed within the time limit set or if the return is inaccurate, the ANSM can carry out its own assessment, which will result in a fine of 10% being imposed for filing a late return or 50% for failing to file a return or filing an inadequate return. If the tax is not paid, the outstanding portion, including any penalties imposed, is increased by 10%.

The introduction of these taxes in other countries or their increase could have a significant, unfavorable impact on the activity, performance, financial situation and prospects of the Company.

4.2.9 Risks relating to hygiene, safety, technical installations and the environment

In connection with search for non-thrombogenic* material, CARMAT decided to follow a path originally opened by Professor Alain Carpentier's work on biological valves, which uses animal pericardium that has been chemically treated to render it inert and biologically stable, so that rejection by the body is avoided. In designing the total artificial heart, the Company is therefore subject to chemical and biological risks, obliging it to put in place preventative and protective measures for the benefit of its operators and for waste management in line with current environmental and safety regulations governing the use, storage, handling and disposal of hazardous materials. The Company complies with these regulations.

If the Company did not comply with the regulations, it would be subject to fines, and it may have to suspend all or part of its activities. Compliance with legislation relating to the environment and health and safety produces additional costs, and it could require the company to incur significant expenses in order to comply with future legislation and regulations on the environment in the relevant jurisdictions. Complying with environmental legislation and regulations could mean that the Company has to buy equipment, adapt its installations and more generally incur other sizable expenses.

If one or more of these risks materialized, this could have a significant, unfavorable impact on the activity, prospects, financial situation, performance and development of the Company.

4.2.10 Risks connected with the loss of Young Innovative Enterprise status

CARMAT opted to take Young Innovative Enterprise ("**JEI**") status in September 2008. On July 8, 2009, the Yvelines Tax Office approved the Company's application for JEI status,

JEI status is intended to provide significant support to young enterprises which are very active in research and development by allowing them to benefit from exemptions from employers' social security contributions and tax reliefs.

JEIs thus enjoy exemptions from employers' social security contributions for researchers, technicians, research and development project managers, lawyers responsible for industrial protection and drawing up technology agreements connected with the project, and personnel responsible for carrying out pre-competitive tests. This exemption is also open to company officers in relation to the general social security system.

Article 78 of the 2011 Finance Law reduced the social security exemptions associated with JEI status with effect from January 1, 2011. Article 37 of the 2011 Finance (Amendment) Law of December 28, 2011 further modified the social security and tax exemption measures associated with JEI status with effect from January 1, 2012.

The exemption from social security charges, capped since January 1, 2011 at three times the annual social security ceiling (€106,056 in 2011), was raised with effect from January 1, 2012 to five times the annual social security ceiling (€181,860 in 2012). The monthly gross remuneration ceiling for individual employees, set at 4.5 times the French minimum wage in 2011, was not modified by the 2011 Finance (Amendment) Law. This ceiling was set at €6,293 on January 1, 2012. This represents a threshold above which the exemption does not apply.

The exemption reduces gradually over time. As in 2011, the exemption applies in full until the last day of the third year following the year of the company's establishment. However, the progressive exemption rates have been brought back up with respect to contributions due in relation to salaries paid on or after January 1, 2012, meaning that the exemption applies:

- in full up to the final day of the 3rd year following the year of the company's establishment
- at a rate of 80% for the 4th year (as against 75% in 2011)
- at a rate of 70% for the 5th year (as against 50% in 2011)
- at a rate of 60% for the 6th year (as against 30% in 2011)
- at a rate of 50% up to the final day of the 7th year (as against 10% in 2011)

The above reform represents a cost overrun for CARMAT of €0.4 million for the year 2012 and €3 million overall for the years 2011 to 2015, the eighth and final year in which CARMAT can benefit from JEI status.

In order to benefit from JEI status, the company must comply with the following five conditions:

- it must be an enterprise within the European Union, which, in the financial year or tax period for which it wishes to benefit from JEI status (1) employs fewer than 250 people and (2) either has turnover of less than €50 million or has total balance sheet assets of less than €43 million;
- at the end of each financial year, it must have incurred research expenses representing at least 15% of its tax deductible costs for that year (these research expenses are calculated on the basis of the expenses used for the research tax credit);
- it must be less than eight years old;

- it must not have been created as part of a concentration, a restructuring, the extension of a pre-existing activity or the recommencement of such an activity within the meaning of Article 44 sexies, III of the General Tax Code;
- it must be independent within the meaning of Article 44 sexies-0 A of the General Tax Code, that is, at least 50% must be continuously owned by:
  - individuals, or;
  - a company that fulfills the same conditions whose capital is at least 50% owned by individuals, or;
  - venture capital companies, venture capital investment funds, regional development companies, innovation finance companies, or single member risk investment companies, provided the JEI and these companies are not dependent on each other, or;
  - recognized non-profit science foundations or associations, or by another company with JEI status which carries on research and development projects, or;
  - public research and teaching establishments or their affiliates;

This condition as to the ownership of capital must be complied with throughout the financial period for which the enterprise in question wishes to benefit from the special status.

If the Company loses JEI status for failing to comply with one of the above conditions, this could have an unfavorable effect on the performance, the financial situation and the prospects of the Company.

4.3 FINANCIAL RISKS

4.3.1 History of operational losses – Risks connected with forecast losses

The Company was established in June 2008. As at December 31, 2012, accumulated losses amounted to €43,089,202. This loss comes from research costs and the costs of developing the CARMAT total artificial heart; such costs cannot be capitalized as intangible assets under French accounting rules.

The Company is expected to incur further significant operational losses in the course of the next few years, particularly in view of:

- the extension of preclinical trials in advance of obtaining clinical trial authorization
- the completion of research and clinical trials on the total artificial heart in Europe and then the United States in order to obtain sales authorizations;
- costs connected with marketing the CARMAT total artificial heart;
- the expansion of its portfolio of products through the future implementation of projects to develop new breakthrough medical devices using skills and know-how developed by CARMAT for the total artificial heart.

As of the date of registration of this Document de Référence, the total artificial heart has not generated any operational revenue. The Company's profitability will be dependent on the results of its clinical trials and on sales of the total artificial heart, which could be commenced once CE Marking has been obtained. The Company considers that before revenues are generated from sales of the total artificial heart, its only sources of financing will come from funds raised on the NYSE/Euronext Alternext market in Paris, state grants, research tax credits (CIR) and, to a lesser extent, income from cash investments and current financial instruments, and that this will enable it to deal with short and medium term liquidity risks (see paragraph 4.4.2 "Liquidity Risks").

Cash reserves as at December 31, 2012 were bolstered by funds obtained by virtue of entering the next milestones of the OSEO Innovation program and by the reimbursement of the 2012 CIR, which should enable the Company to cover its requirements into December 2013. Nevertheless, additional financing, particularly in the form of capital increases, will be required for the Company to be able to finance, in particular, the sales phase of the total artificial heart (see paragraph 4.3.3 "Dilution risk connected with issuing shares giving immediate or long term access to the Company's capital")

The increase in these expenses, particularly in the event of an absence or cutting off of revenue sources could have a significant, unfavorable impact on the Company's activity, its performance, its financial situation and its prospects.

4.3.2 Unreliable capital resources and unreliable additional funding

The Company has made significant investments in research and development since it began its operations in 2008, which has produced operating losses of €5,983,982, €10,482,243, €16,091,054 and €22,385,513 respectively for the periods ended December 31, 2009, December 31, 2010, December 31, 2011 and December 31, 2012.

Overall, the financial cost to the Company of developing the total artificial heart - excluding costs relating to preparations for sales and industrial production - is likely to be in the order of €100 million. This will be

financed:

- firstly:

- by subsidies and repayable advances from the OSEO Innovation program (see chapter 22 "Important contracts"); fulfillment of milestone 4, which represents a maximum payment of €6.7m (see paragraph 22.1.3), is dependent on obtaining conditional authorization from the ANSM to proceed to human clinical trials;
- by subsidies already received from the Yvelines Departmental Council;
- by the reimbursement of research tax credits.
- This first category represents a total amount of some €46 million (excluding reimbursements of research tax credits not yet received)

- secondly, by capital increases to be made or already made to date, the latter having already reached the cumulative total of some €41 million. This figure includes the net total of €14.2 million raised when the Company's shares were floated on NYSE-Euronext's Alternext market in Paris in July 2012 and €26.7 million raised from the rights issue on the Alternext market in August 2011.

The aforementioned financing should enable the Company to finalize development of the artificial heart and to perform the clinical trials necessary to submit an application for CE Marking (see the timetable under paragraph 6.1. Overview of the Company's activities - General overview). However, its future capital needs will depend on a number of factors, such as:

- higher costs and slower progress than had been expected for its program to develop the total artificial heart;
- higher costs and longer delays than had been expected in obtaining regulatory authorizations, including the preparation time for the application files submitted to the regulatory authorities;
- the costs of preparing, lodging, defending and maintaining patents and other intellectual property rights, and;
- new opportunities to develop new promising products or acquire new technologies, products or companies.

The Company also expects to require capital to prepare for and commence sales of the total artificial heart once CE Marking has been obtained. At this stage in its development, the Company will not be able to fund its own growth and will be obliged to seek other funding sources, in particular through further capital increases, potentially of some €50 million, in order to begin sales of the total artificial heart and finance industrial production costs (see paragraph 21.1.6 "Common stock authorized but not issued, and also the resolutions of the general meetings")

It is possible that the Company may fail to raise sufficient funds within acceptable conditions, or that it may fail to raise any funds at all when it needs to. If the necessary funds are not available, the Company may have to:

- Delay or scale down its development or marketing program;
- Cut staff;
- Obtain funds through partnership agreements which could force it to give up rights over certain technologies, rights which it would not have given up in different circumstances;
- Grant licenses or conclude collaboration agreements that might be less attractive than those which it would have been possible to obtain in different circumstances, or;
- consider hiving off assets, or even approaching another company.

If one or more of these risks were to materialize, this could have a significant, unfavorable impact on the Company's activity, its performance, its financial situation and its prospects, as well as the situation of its shareholders.

4.3.3 Dilution risk connected with issuing shares giving immediate or long term access to the Company’s capital

Since its creation, the Company has allocated or issued BCEs and BSAs as part of its policy of motivating its executives and employees, The Company could in the future allocate or issue new instruments giving access to its common stock to employees and/or consultants. As at the date of registration of this Document de Référence, exercising all the instruments allocated by the Company giving access to its common stock would result in the issue of 295,300 new shares, representing a total of 7.10% of the share capital currently in issue. The exercise of instruments giving access to issued capital and all new allocations or issuances would lead to a significant dilution for the shareholders.

4.3.4 Risks connected with state subsidies and research tax credits

If the Company were to breach the contractual conditions in the agreements for subsidies and repayable advances concluded with OSEO Innovation for an overall sum of €31.9 million (see Chapter 22 “Important Contracts”), it would not receive the expected aid.

If the Company were to breach the conditions of its agreements with OSEO Innovation, it could be required to repay the sums advanced. These situations could deprive the Company of the financial means to complete its research and development. The Company will not necessarily have the additional financial means available or the time to replace these financial resources with others.

Furthermore, to finance its activities, the Company also opted to take the Research Tax Credit ("CIR") for the 2009, 2010, 2011 and 2012 financial periods. This mechanism involves offering a tax credit to enterprises which invest significantly in research and development. Research expenditure eligible for the CIR specifically includes wages and salaries, services sub-contracted to approved research organizations (public or private) and intellectual property costs.

The CIR relating to the 2012 period was recorded under Income taxes in the income statement and appears under Other debtors in the balance sheet. The income statement for the period includes a CIR of €5,015,433, comprising €5,022,922 in relation to the CIR for the period from January 1, 2012 to December 31, 2012 and a €7,489 adjustment to the CIR for 2011, representing the difference between the amount recorded in the 2011 accounts (€2,566,103) and the actual amount reimbursed by the tax authorities in July 2012 (€2,558,614).

The CIR is an important source of finance. It could be jeopardized by a change in regulations or by an objection from the tax authorities, even though the Company complies with the requirements concerning documentation and the eligibility of costs.

4.4 MARKET RISKS

4.4.1 Interest rate risks

The Company's financial debts are made up of a repayable advance provided by OSEO Innovation which amounted to €3,743,141 as at December 31, 2012. This repayable advance carries interest at a contractual rate of 5.59%. Accrued interest at year end was €460,054 (see Chapter 22 "Important Contracts").

As at the end of 2012, cash instruments comprised certificates of deposit totaling €5,000,000. This amount was made up of two deposit agreements made in November and December 2012, maturing respectively on January 26, 2013 (€1,000,000) and February 6, 2013 (€4,000,000). Accrued interest of €6,854 was recorded in the accounts as at December 31, 2012 in relation thereto. These investments present no risk to the invested capital.

4.4.2 Liquidity risks

The Company finances its growth through equity increases made by way of capital increases or convertible bonds. At the date of registration of this Document de Référence, the Company has no banking debts, and it is therefore not exposed to any liquidity risks from the enforcement of clauses on the early repayment of bank loans.

Given the Company's historic deficit situation, which results from the fact that it is still in a development phase during which it is incurring expenditure on research and development without earning regular revenues, the Company faces a liquidity risk.

The Board of Directors has assumed that the business is a going concern, having taken the following points in particular into account:

- cash, cash instruments and liquid marketable securities totaling €11,134,438 as at December 31, 2011;
- the payment of subsidies (€3,033,000) and refundable advances (€10,764,000) still to be claimed between now and the end of the project under the OSEO aid program signed in 2009.

The Company will be able to cover its requirements up to December 31, 2013, taking into account the following points:

- available cash of €11,134,438 as at December 31, 2012;
- the payment during 2013 of OSEO subsidies up to a maximum of €3,033,000 after completion of milestones 4 and 5 of the OSEO program, in accordance with the amendments to the CARMAT framework and project beneficiary contracts signed in June 2011 (see paragraph 6.3.3 "Process and development stage of the total artificial heart" and chapter 22 "Important contracts")
- OSEO repayable advances, up to a maximum of €3,772,000 and €5,251,000 upon passing milestones 4 and 5 respectively of the OSEO program, to be paid in accordance with the amendments to the framework and beneficiary contracts for the CARMAT program signed in June 2011 (see paragraph 6.3.3 "Process and development stage of the total artificial heart" and Chapter 22 "Important Contracts");
- It should be noted that the receipt of subsidies and repayable advances linked to milestone 4 is subject to conditional approval being given by the ANSM for the commencement of human clinical trials, for which the Company expects to submit an application during the first six months of 2013 (see paragraph 22.1.3 ff.)

- the reimbursement of the 2012 CIR (€5,022,922) received in April 2013.

Additional financing will be necessary for the Company to be able to finance its continued development, notably via future capital increases potentially totaling some €50 million, in particular to prepare for and commence the sales phase.

These funds will be needed in particular to:

- finance the training of additional surgical centers in addition to those trained for the clinical trials phase of the feasibility study.
- develop and run a direct or indirect sales force, and to provide technical and clinical support to implant centers and their patients;
- carry out clinical activities such as implant registries or comparative or medico-economic studies, upon request by regulatory authorities or voluntarily for marketing purposes.
- implement improvements to the systems or pursue activities necessary to secure the willingness of healthcare providers to pay for the total artificial heart, its external systems and ancillary services in various countries;
- ramp up industrial production by developing automated production processes, securing alternative suppliers for critical supplies and by setting up additional production capacity.

4.4.3 Exchange risks

The Company bears exchange risks only in regard to its purchases. The Company estimates that:

- 0.3% of its purchases are in US dollars;
- 0.005% of its purchases are in Swiss francs.

Future exposure of the Company to exchange risks will essentially depend on the currency in which it receives its income and incurs all or part of its costs. The extent of this risk will depend on the countries where the Company conducts its developments, the marketing of the total artificial heart and other products it might develop and the currency in which it pays its operational expenses.

If the Company is able to carry on its industrial and commercial activities in countries outside the Eurozone, it is likely that it will realize turnover and incur costs in other currencies. The Company will then consider the most appropriate method for monitoring and managing its exchange risk.

4.4.4 Share risks

At the time of registration of this Document de Référence, the Company has no shareholdings in third-party listed companies and is therefore not exposed to risks in relation to third-party shares.

In 2010 the company entered into a liquidity agreement with an independent financial services provider, the purpose of which is to improve the liquidity of transactions and regularize the CARMAT share price, without hampering the normal functioning of the market and without misleading third parties.

To this end the company made an amount of €300,000 available to this provider. Treasury shares acquired through the implementation of this liquidity agreement are recorded under financial assets at their purchase price. Where appropriate, a valuation allowance is recorded with reference to the average official stock market price for the month preceding the financial year end (see note 3.2.4 "Financial assets" in the Annex to the 2012 financial statements at paragraph 20.1)

4.4.5 Risk related to changes in the stock price and market capitalization of the Company

Upon flotation in July 2010, the price of CARMAT shares was set at €18.75, representing a market capitalization of €71.3 million.

As at May 27, 2013, the stock price stood at €124.97, representing a rise of 567% and corresponding to a market capitalization of €515 million. Between those two dates, CARMAT's stock price fluctuated significantly, as the graph opposite shows.

CARMAT's share price has fluctuated essentially as a result of investors' perceptions regarding whether or not the Company will reach, or whether it

will be delayed in reaching, further scientific or regulatory stages in the development of the total artificial heart project.

Given the price level and the market capitalization, and given their evolution since flotation (+567%), any failure or delay in the achievement of further scientific or regulatory stages could have a significant unfavorable impact on the stock price and market value of the Company.

4.4.6 INSURANCE AND COVER FOR RISKS

As at the date of registration of the Document de Référence, the Company considers that it has the insurance cover for the principal insurable risks appropriate to its activities and their nature, with cover limits which it considers compatible with the nature of its activity.

As the Company has not entered the sales phase for the total artificial heart, it has not taken out insurance against liability for defective products. The Company has taken out an insurance policy in relation to the clinical trials phase, in accordance with the Huriet Law of December 20, 1988, as a result of which it possesses the level of insurance cover required under current regulations. The terms of this policy are given in the table below.

The Company does not foresee any particular difficulties in maintaining adequate levels of insurance cover under market conditions. The Company has taken out several insurance policies. the most significant of which are summarized in the table below

.

Risks covered	Insurer	Cover limit	Excess per claim
Professional Liability	Allianz		
- All personal injuries, damage to property and financial losses combined		€1 500 000 per annum	€1 500
Operating Liability	Allianz		
Losses not arising out of harm to the environment			
- All combined loss or damage, but not exceeding the following limits:		€10 000 000 per claim	€1 500
- Damage to property and consequential financial losses, except in cases of theft by servants		€7 000 000 per claim	
- Non-consequential financial losses		€30 000 per claim	€1 500
- Damage to property entrusted to others		€1 000 000 per claim	€1 500
		€1 000 000 per claim	€1 500
Losses arising out of accidental harm to the environment			
- All combined loss or damage			
Harm to servants			
- Personal injuries and ancillary damage to property		€1 500 000 per claim	€1 500
		€1 500 000 per claim	
Directors' and Officers' Liability	Allianz	€10 000 000 per annum	
Individual Accident Insurance	Ace Europe		
Professional assignments throughout the world (risks of civil or foreign war and similar risks: strikes, riots, popular uprisings, sabotage, insurrections, sedition,invasion, attacks, acts of terrorism, kidnap or hostage taking)		Maximum limit 90 Social Security monthly limits	10%
Individual Accident Insurance			
Repatriation, medical expenses, travel, death	Ace Europe		
Indemnity Insurance: Insured capital	Allianz		
Direct loss or damage			
- Damages to property, contents and fixtures and fittings		€8 000 000	
Additional expenses			
- Additional operating costs:		€5 000 000	
- Indemnity periods		12 months	
Property damage insurance		Limited to €13 000 000 per claim, subject to the following limits:	All loss or damage: €5 000
Direct loss or damage:			Except:
- Plant and equipment everywhere		€1 500 000 per claim	
- Natural events excluding natural disasters		€2 000 000 per claim	Plate-glass breakage:
- Land transport			€1 000
- Machinery breakdown		€500 000 per claim	
- Electrical damage		€2 000 000 per claim	
- Automatic guarantee on investments		€2 000 000 per claim	Theft:
- Related expenses and losses		€500 000 per claim	€1 000
- Claims from neighbors and third parties, claims from tenants, loss of peaceful enjoyment, loss of rent, liability of the owner or lessee		€1 000 000 per claim	
		€5 000 000 per claim	Natural disaster: Legal excess
- Theft and damage to real or personal property arising out of a theft or an attempted theft		€500 000 per claim	
Additional operating costs:			All loss or damage: 5 days
- Additional operating costs including Wages and salaries Indemnity periods		€5 000 000 per claim €3 500 000 per claim 12 months	Natural disaster: Legal excess
Vehicle fleet - Road traffic liability - Legal protection	AXA Corporate Solutions		
personal injury		Unlimited	
damage to property and financial losses arising out of damage to property		€100 000 000 per claim	
Civil liability - Medical research promoter	*Allianz*	*€1 000 000 per victim* *Limited to:* - *€6 000 000 per research protocol* - *€10 000 000 for all claims made during one insurance year for several research protocols*	
"*Clinical studies for the evaluation of the CARMAT total artifical heart*"			

4.5 SPECIAL CIRCUMSTANCES AND DISPUTES

There are no administrative, judicial or arbitration proceedings, including any proceedings the Company is aware of which are pending or which are being threatened, which are capable of having or which in the course of the last 12 months have had a significant impact on the financial situation or the profitability of the company and/or group.

5 INFORMATION CONCERNING THE ISSUER

5.1 HISTORY AND DEVELOPMENT OF THE COMPANY

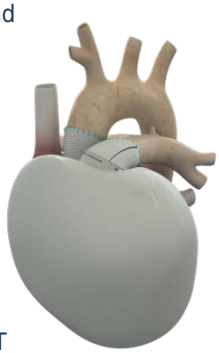
CARMAT and its total artificial bioprosthetic heart project are the fruit of the collaboration between a world-class medical team - that of Professor Alain Carpentier - and a high-technology company Matra. The total artificial heart project started in 1988 when Professor Alain Carpentier filed his first patent and carried out initial design work with CETIM, the Technical Center for Mechanical Industries.

The bioprosthesis was born of a meeting in the early 1990s between Professor Alain Carpentier and the then Chairman of Matra, Jean-Luc Lagardère. The resulting close ties gave rise to very active cooperation from 1993 onwards, with the objective of designing a bioprosthetic total artificial heart with ventricles, sensors and electronic controls integrated into a single device. Within this partnership, Professor Alain Carpentier contributed his extensive knowledge of bioprosthetic valves* and the chemical treatments for animal-origin biological tissues which he had developed (Carpentier-Edwards valves.®). For its part, Matra brought its expertise in embedded systems and their constraints (reliability, severe environments, mass and volume), thus allowing their engineers to work on the concept using simulations, modeling and test benches. The objective is to develop the most physiologically compatible artificial heart possible, capable in particular of:

- Offering a bioprosthetic blood flow interface so as to reduce the major thromboembolic* complications encountered by previous projects;
- Providing the patient with an immediate response appropriate to his or her metabolic needs in terms of flow and heart rate

In 2001, the project gained new impetus thanks to successful implantations of the first prototype in calves. These implantations highlighted the efforts that were still to be made but confirmed the feasibility of the concept. A dedicated team of a dozen complementary experts (system design, biocompatible materials, specific polymers, integrated technologies and electronics) was then set up. This team worked in close cooperation with the medical team under the supervision of Professor Alain Carpentier in the prosthesis and transplants laboratory at the Université Pierre et Marie Curie and at the Georges Pompidou European Hospital to optimize the prosthesis.

The joint work of these two multidisciplinary teams, with backgrounds in both medicine (doctors and biologists) and the field of aviation and space research, enabled considerable progress to be made, specifically resulting in the miniaturization of the integrated system in terms of volume, energy consumption, weight and human biocompatibility, through the development of unique biomaterials and procedures (see paragraph 6.3.2 "Innovations and competitive advantages of the CARMAT total artificial heart").



A large number of processes were patented, including the architecture, the hybrid membrane which is both impervious and hemocompatible, the locking interface device (connecting to the patient's atria* thanks to an interface device which allows an easy suture to which the prosthesis is then connected), the pump and the physiological regulation system.

Thus, after fifteen years of research and development, a new prototype weighing 900g (compared to the previous 1200g prototype designed 4 years earlier) and completely optimized (savings in volume, mass and energy consumption of approx. 25%) allowed CARMAT to be founded in June 2008.

CARMAT's objective is to finalize the development of a bioprosthetic artificial heart with a lifespan equivalent to that of a donor graft and at a global cost inferior to a cardiac transplant, and to bring it to full-scale industrial production and sale.

To date, CARMAT has devoted its activity entirely to the research and development of the bioprosthetic total artificial heart and has thus not yet generated any revenue. To finance its project, the Company has benefited from:

- in September 2008, a capital increase of €7.25m (€5m invested by the funds managed by Truffle Capital, €2.25m by Matra Défense and Professor Alain Carpentier);
- in September 2008, a total of €33m in subsidies and repayable advances granted by OSEO Innovation in connection with the Industrial Strategic Innovation program, the largest amount of aid ever given to a Young Innovative Company by this body (see chapter 22 “Important contracts”);
- in June 2009, a €1.5m subsidy granted by the Yvelines General Council;
- in February 2010, a capital contribution of €0.95m by the funds managed by Truffle Capital;
- in May 2010, the raising of €2m from an issue of convertible bonds, underwritten by the funds managed by Truffle Capital and converted at the time of CARMAT's flotation on the NYSE/Euronext Alternext Paris market;
- in July 2010, a capital increase of €16m in connection with the stock market flotation by public offering of the company on the NYSE/Euronext Alternext Paris market.

- in August 2011, a capital increase of €29.3 million from a rights issue on the NYSE/Euronext Alternext Paris market.

The Company aims to start clinical trials of its total artificial heart in 2013, subject to authorization from the competent regulatory authorities, and to prepare for sales in Europe in 2014, subject to obtaining CE Marking.

5.1.1 Registered name

The Company's registered name is: "CARMAT"

5.1.2 Place and number of the Company's registration

The Company is registered in the Versailles Trade and Companies Register under number 504 937 905.

5.1.3 Date of incorporation and term

The Company was incorporated on June 25, 2008 and registered on June 30, 2008 for a term of 99 years, subject to any extension or early dissolution.

5.1.4 Registered address, legal form and applicable law

The Company's registered office is located at 36, avenue de l'Europe – Immeuble l'Etendard-Energy III – 78140 Vélizy Villacoublay. The Company is a corporation (*société anonyme*) under French law with a Board of Directors, and it is governed by the provisions of Book II of the French Commercial Code.

5.1.5 Important events in the development of the Company's activities

1988	First patent on the total artificial heart filed by Professor Carpentier
1993	Collaborative partnership with Jean-Luc Lagardère, Chief Executive of Matra, to create the total artificial heart
2000	Creation of the first prototype of the total artificial heart (1900 grams) Industrial approval of concepts
2001	First successful animal transplantation Creation of dedicated full time project team within the EADS Group
2004	Creation of the second prototype of the total artificial heart (1200 grams)
2004-2008	Optimization of the volume, weight and energy consumption of the total artificial heart
2008	Creation of CARMAT SAS by Matra Défense (EADS Group) and Prof. Alain Carpentier Contribution in kind (patents, licenses, software, equipment, etc.) to CARMAT SAS by the Carpentier Foundation ("Association Recherche Scientifique de la Fondation Alain Carpentier") and the EADS Group (via its subsidiary Matra Défense) Grant to CARMAT SAS and its partners of €33 million in subsidies and repayable advances by OSEO Innovation under the Strategic Industrial Innovation scheme, the largest amount ever granted to a young innovative enterprise by OSEO Innovation Capital increase of €7.25 million, including issue premium (€5 million invested by Truffle Capital and €2.25 million by Matra Défense and Professor Alain Carpentier)
2009	Grant of a subsidy of €1.5 million to CARMAT SAS by the Departmental Council of Yvelines Authorization from the European Commission for the grant of €33 million to the CARMAT SAS research and development program Appointment of Marcello Conviti as Chief Executive Officer of CARMAT SAS Opening of the CARMAT SAS clean room* by Valérie Pécresse, Minister of Higher Education and Research Completion of modeling and optimization work on the artificial heart (900 grams) in readiness for the assembly and implantation phase for the preclinical trials
2010	CARMAT SAS equity increase of €0.95 million, from funds managed by Truffle Capital Transformation of Company from an SAS into an SA (*société anonyme*) Appointment of Jean-Claude Cadudal, Marcello Conviti, Alain Carpentier, André-Michel Ballester and Truffle Capital, represented by Philippe Pouletty, to CARMAT's Board of Directors,. Issue of convertible bonds for €2 million and paid up BSA-OC from three Truffle Capital Funds, converted or exercised when CARMAT SAS was floated on the NYSE-Euronext's Alternext market in Paris CARMAT granted the status of "Innovation Enterprise" by OSEO Innovation for the Mutual Funds for

	Investment in Innovation (FCPI)
	Gross capital increase of €16 million, including issue premium, on the occasion of CARMAT's flotation on NYSE-Euronext's Alternext market
	Conclusion of an agreement with Edwards Lifesciences, the world leader in the cardiac valves sector and hemodynamic monitoring, for the use of Carpentier-Edwards biological cardiac valves in the CARMAT total artificial heart
	Industrial assembly of the first two CARMAT total artificial heart prostheses in the clean room
	Henri Lachmann joins the CARMAT Board of Directors
2011	Payment of €3.8 million in state aid, comprising €3.5m for the completion of milestone no. 2 of the OSEO ISI program and the receipt of €300,000 from the total balance of €1.5 million in aid granted under the R&D program set up by the Yvelines local government.
	CARMAT is listed on the NYSE Alternext OSEO Innovation index
	Appointment of Valérie Leroy as Director of Marketing and Investor Relations
	Presentation of promising test results regarding physiological compatibility
	CARMAT submits its preliminary application to the AFSSAPS
	CARMAT and BULL announce the development of a device for users of the CARMAT artificial heart.
	CARMAT receives ISO 13485:2003 and ISO 9001:2008 certification (Quality system certification).
	Launch of a €25.5m rights issue.
	Great success of the rights issue with €29.3m subscribed, extension clause included
	CARMAT presents preclinical hemocompatibility data to the 25th Annual Congress of the European Association for Cardio-Thoracic Surgery
	Approval from the CPP (Patient Protection Committee)
2012	CARMAT publishes its first twice-yearly Shareholder Newsletter
	Significant shareholder participation at the General Assembly, Q&A session for which minutes are published on the Company's website.
	CARMAT laureate of the European Mediscience Awards in the Best Technology category.
	Further elements added to the ANSM file, notably the results of the implants on animals and the intermediate results on the durability tests. Confirmation of a shift in the test calendar and, consequently, in the calendar concerning the first implantations; due mostly to delays related to the industrial validation procedures with our contractors.
	Participation in the Franco-American Biotechnology Symposium (FABS 2012) at Nice and in the Techno-College of the 26th Annual Congress of the European Association for Cardio-Thoracic Surgery (EACTS) at Barcelona.
2013	CARMAT has received €5m in Research Tax Credits (CIR) in respect of 2012, in line with the Company's 2013 financing plan.
	CARMAT has obtained approval to begin human implantations at four world-renowned cardiac surgery centers in four countries.

5.2 INVESTMENTS

5.2.1 Principal investments made in the last two financial periods

In the 12-month financial period ended December 31, 2011, the Company incurred capital expenditure of €902,961, relating to:

- Tangible fixed assets (€100,363), mainly comprising work related to office premises and the acquisition of computer equipment and furniture;
- Assets under construction (€802,598), comprising the acquisition of test benches for subsets and the prosthesis, approved but not yet in service at the year end;

In the 12-month financial period ended December 31, 2012, the Company incurred capital expenditure of €310,773, relating to:

- Tangible fixed assets (€220,809) mainly comprising the acquisition of test benches for the prosthesis and software validation, work related to the office premises, and the purchases of measuring equipment and furniture;
- Assets under construction (€89,964), relating to the acquisition of test benches and laboratory equipment, approved but not yet in service at the year end.

5.2.2 Principal capital expenditure underway and method of financing

Assets under construction at the end of 2012 relate to the acquisition of test benches for subset wear and laboratory equipment for assembling subsets at CARMAT and its subcontractors. These purchases amounted

to €89,964, approved as at December 31, 2012.

These investments are financed from the Company's own funds, deriving primarily from the Company's flotation on the NYSE/Euronext Paris Alternext market on July 12, 2010 and the rights issue on the NYSE/Euronext Alternext exchange in Paris on August 10, 2011, and from subsidies and reimbursable advances from OSEO Innovation.

5.2.3 Principle future capital expenditure

Principal capital expenditure anticipated in the short term comprises €250,000 for enterprise resource planning software, €90,000 for the improvement of the prosthesis test benches and €420,000 for a pressure sensor calibration bench.

6 OVERVIEW OF THE COMPANY'S ACTIVITIES

6.1 GENERAL OVERVIEW

Founded in 2008, and after more than 15 years of research, CARMAT has developed a total artificial heart, orthotopic*, bioprosthetic*, self-regulating and implantable, together with its electrical energy supply system and its control and remote diagnostic systems.

Until now, the company has devoted its entire activity to the research and development of the bioprosthetic total artificial heart project and has therefore not yet generated any sales. The fundraising performed, the existing treasury and expected financial resources, in particular from the Oseo or the research tax credit, should allow the funding of the artificial heart project until 2014.

However, some important scientific and regulatory steps described in the calendar below, on the one hand, as well as in paragraph 6.4.7, and in paragraphs 22.1.6, 22.1.7 and 21.1.8, on the other hand, still need to be successfully completed. If required, new fundraising, likely to represent an accumulated amount of approximately €50 million, will be necessary to finance the clinical trials and the scale up to industrialization, as well as the commercialization planned for, at the earliest, 2014.

As of the day of registration of the current document, the provisional calendar for the project is the following:

Period	*1st semester 2013*	*2nd semester 2013*	*2014*	*2015*
Activities	▪ Preclinical activities ▪ Implantation of an international clinical trials plan ▪ Obtainment of clinical trial authorization in France or in other countries ▪ Training of centers	▪ Feasibility study ▪ Activities required for the obtainment of the necessary authorization for the pivot study in France or in other countries. ▪ Introduction of new external systems	▪ Submission of the file for CE marking ▪ Recruitment of the sales force ▪ Commercial launch in Europe	▪ Upscaling of the industrial tool ▪ Initiation of regulatory activities in the USA

It must be noted that the Company can obtain the CE marking without obtaining the agreement of the ANSM to proceed with clinical trials in humans in France, as the Company will have conducted conclusive clinical tests in humans in other countries.

Nevertheless, obtaining the ANSM's agreement to proceed with the clinical trials in France is necessary for the possible collection of OSEO payments, and in particular milestone no.4, corresponding to a grant of €2.9m, and a repayable advance of €3.8m, representing a maximum receipt of €6.7m (refer to paragraph 22.1.3 Milestones of the project, associated deliverables and special conditions for the continuation of the project - and subsequent projects).

Consequently the Company continues the preclinical activities required and aims for formal submission of a request for clinical trial authorization from ANSM by the end of the 1st semester 2013. The continuation of animal experimentation required by ANSM in the 1st trimester 2013 (refer to paragraph 6.3.3.1 on page 59 and after) explains the necessary gap between the calendar presented above and the one published in the previous reference document, recorded by the French Autorité des Marchés Financiers on September 12, 2012 under the number R.12-044.

The reader is also encouraged to refer in particular to chapters 4.3.1 (History of operational losses - Risks linked to projected losses), 4.3.2 (Uncertain capital resources and uncertain complementary finances), 4.3.3 (Dilution risk linked to the issuing of securities, immediate or over time, of the Company's capital) and 6.3.3 (Process and developmental stages of CARMAT's bioprosthetic artificial heart project), as well as Company press releases.

The name CARMAT came from a meeting at the beginning of the 1990s, between Professor Alain Carpentier and Jean-Luc Lagardère, who was then Chairman of Matra. The resulting merger gave rise to a very active cooperation from 1993 with the aim of designing a bioprosthetic total artificial heart. This unique partnership combines:

- Over 30 years experience of Professor Alain Carpentier[4], father of modern cardiac valve surgery. Professor Carpentier developed the treatment of biological animal tissues that allowed him to design the world's most widely used biological valves (Carpentier-Edwards valves®). He also developed the surgical techniques for mitral valve repair used today throughout the world, on the principle that a device must always be associated with a reproducible procedure.

[4] Carpentier A. Cardiac valve surgery - the "French correction". J Thorac Cardiovasc Surg. 1983 Sep;86(3):323-37.

- Matra's expertise in onboard systems and their restrictions (reliability, severe environments, mass and volume) allows their engineers to work on the concept using simulations, modeling and test benches.

The Company's objective is to meet a world-wide public health care need, which is the treatment of advanced heart failure. It is a severe disease, progressive, and often fatal, in constant progression in developed countries.

CARMAT's total artificial heart project aims to provide a long-term therapeutic solution to patients suffering from advanced biventricular heart failure, not eligible for a transplant, having exhausted all medicinal possibilities and to whom no satisfactory solution has actually been proposed.

6.2 HEART FAILURE

6.2.1 Pathology and Etiologies*

Heart failure occurs when the myocardium (cardiac muscle) can no longer carry out its essential function as a blood "pump" and provide a sufficient cardiac output to satisfy the metabolic needs of the organism. When the failure reaches the left ventricle, we talk of left ventricular failure; when it reaches the right ventricle, we talk of right ventricular failure; when the failure reaches both ventricles, the left and the right, we talk of congestive or biventricular heart failure.

The two principal causes of heart failure are coronary disease* (myocardial infarction*) in around 40% of cases, and high blood pressure* in approximately 44% of cases.

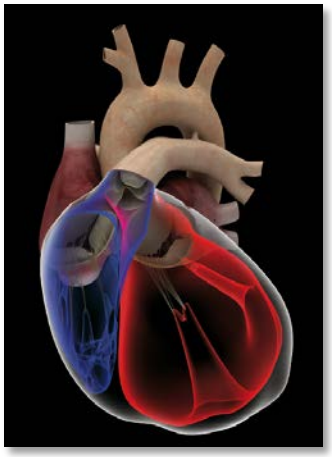
- In a heart attack, a plaque of lipids or a blood clot forms in one of the arteries of the heart, which are called coronary arteries, and the flow is interrupted. The part of the cardiac muscle that does not receive any blood is no longer oxygenated (ischemia*). It dies and is replaced by scar tissue.
- If this part is important, the cardiac muscle weakens and the heart tends to expand; this secondary expansion, due to the increase in pressure within the heart, will in turn deteriorate the healthy part of the heart and the heart failure will worsen over time.
- In high blood pressure (HBP), the resistance to blood flow increases in the arteries. The heart must fight against this resistance. As with all muscle subjected to an increased effort, it will first of all increase in size (hypertrophy*).
- If HBP is not correctly treated, the heart can dilate; its contractile force will progressively weaken and heart failure will develop. This heart failure is frequently aggravated by the tendency of hypertensive hearts to have cardiac arrests.

The left ventricle is the most frequently affected ventricle. Right ventricular failure is most often a consequence of a pressure overload in the right ventricle, i.e. a pulmonary hypertension. But the principal cause of pulmonary hypertension is, in fact, left heart failure[5]. That is why heart failure frequently progresses from the left ventricle to the right ventricle.

Up to 30% of patients whose left heart failure is treated by a left ventricular assist device develop a right heart failure[6,7].

The most frequent complications are the following:

- irregular heart beat: the heart must pump faster to ensure the same flow rate despite its expansion; a serious ventricular arrhythmia can then develop which may go so far as a cardiac arrest;
- thromboembolic accidents (formation of clots): when a clot reaches the brain, it leads to a stroke*, with dramatic and often crippling consequences.
- and renal failure, the kidney being an organ very sensitive to variations in pressure caused by an inadequate cardiac pump.



Ventricular dilatation

Being a progressive disease, the prognosis is poor: less than 50% survival 5 years after the diagnosis,[8] more than 40% of deaths within a year following initial hospitalization[9].

Doctors distinguish the severity of heart failure or the extent of the handicap with the aid of the NYHA (*New York Heart Association*) classification system based on symptoms and consisting of 4 categories.

---

5 Voelkel NF et al. Right Ventricular Function and Failure: Report of a National Heart, Lung, and Blood Institute Working Group on Cellular and Molecular Mechanisms of Right Heart Failure. Circulation. 2006;114:1883-1891

6 Dang NC, et al. Right heart failure after left ventricular assist device implantation in patients with chronic congestive heart failure. J Heart Lung Transplant 2006;25:1-6.

7 Boyle AJ, et al. Predictors of poor RV function following LVAD implantation. J Heart Lung Transplant 2003;22:S205

8 Blackledge HM et al. Prognosis for patients newly admitted to hospital with heart failure: survival trends in 12 220 index admissions in Leicestershire 1993–2001. Heart 2003; 89:615–620.

9 Stewart S et al. . More 'malignant' than cancer? Five-year survival following a first admission for heart failure. Eur J Heart Fail 2001;3:315-322.

NYHA	Class I	Class II	Class III	Class IV
Symptoms	No symptoms	Tiredness, palpitations, shortness of breath after a sustained effort	Symptoms and discomfort at the slightest effort	Symptomatic even at rest
Activity	No limitation	Modest limitation	Marked reduction	Inability for all activity, permanently confined to bed.

The transition to class III constitutes a determining threshold[10]:

- for the patient: it marks the passage between a virtually normal life and a considerably reduced activity, very often involving a loss of autonomy;
- clinically this means more aggressive therapies, a dependence on drugs, and, with class IV, the start of repeated hospitalizations;
- for the society, this represents an explosion of the costs, particularly due to hospitalizations: a class IV patient costs the community up to 15 times more than a class II patient[11].

Class III and class IV patients represent between 20 and 35% of the total, with class IV reaching up to 5% of heart failures[12].

CARMAT's total artificial heart project is initially directed at patients suffering from terminal heart failure - the most advanced form of the disease, for which the mortality at one year is estimated as being between 60 and 94%[13]. Depending on the benefits shown by the clinical studies, it could then be offered to the patients with the best prognosis.

6.2.2 Epidemiology, prevalence and incidence

The prevalence* of heart failure is rising sharply in developed countries, affecting around 2% of the general population[14][15] i.e. about 15 million Europeans[16][17]. The prevalence increases greatly with age. A French epidemiological study has shown that it can affect nearly 12% of patients aged over 60 years[18].

More than 5.8 million people will suffer from heart failure in the United States, with an annual incidence* higher than 550,000 new patients per year. According to a study published by the *American Heart Association* in February 2001, the prevalence rate of heart failure in the United States should rise by 25% between 2010 and 2030[19].

This progression of the epidemiology is linked to the aging of the population, but also, in the case of advanced heart failure, to the improved survival after a myocardial infarction and to the progress made in the medicinal treatments, such as betablockers* and diuretics*[20].

Paradoxically, this progress contributes to the increased prevalence of heart failure and reduces the possibility for heart transplants since they postpone the age of iterative decompensation and therefore the one at which the patients reach the advanced, chronic, and irreversible stage that affects both ventricles and which interests CARMAT – in addition to the numerous indications of emergency transplants following a massive myocardial infarction in the absence of a compatible cardiac graft.

---

10 Launois R et al. Coût de la sévérité de la maladie; le cas de l'insuffisance cardiaque. Journal d'Économie Médicale, 1990, T. 8, n° 7-8, p. 395-412.

11 Kulbertus HE et al. What has long-term medical treatment to offer and what does it cost. Eur Heart J 1987 (suppl F) 26-28

12 Agence Nationale d'Accréditation et d'Évaluation en Santé – Évaluation de l'assistance ventriculaire en attente ou en alternative à la transplantation cardiaque – April 2001.

13 Gorodeski, Chu, Reese, et al. Prognosis on chronic dobutamine or milrinone infusions for stage D heart failure.Circ Heart Fail. 2:320-24, 2009.

14 Cowie MR, et al. *The epidemiology of heart failure.* Eur Heart J 1997;18:208–225.

15 Davies MK et al. *Prevalence of left ventricular systolic dysfunction and heart failure in the Echographic Heart of England Screening Study: a population based study*. Lancet 2001;358:439–444.

16 Remme WJ et al. *Public awareness of heart failure in Europe: first results from SHAPE.* Eur Heart J 2005; 26:2413–2421.

17 McMurray JJ et al. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012. Eur Heart J 2012;33:1787–1847 (nombre incluant les 51 pays adhérents de la Société Européenne de Cardiologie).

18 Saudubray T et al. Prévalence et prise en charge de l'insuffisance cardiaque en France : enquête nationale auprès des médecins généralistes du réseau Sentinelles La revue de médecine interne 26 (2005) 845–850

19 Heidenreich PA et al. Forecasting the future of cardiovascular disease in the United States: a policy statement from the American Heart Association. Circulation. 2011 Mar 1;123(8):933-44

20 *Évaluation de l'assistance ventriculaire en attente ou en alternative à la transplantation cardiaque.* Rapport de l'ANAES (Agence Nationale d'Accréditation et d'Évaluation de Santé) – April 2001 – E.

6.2.3 Economic challenge

Heart failure constitutes a real public health challenge which is set to increase in Western countries, where the cost of heart failure is now the largest of all chronic diseases.

The total cost of heart failure is estimated at 44.5 billion dollars in the United States in 2015 and 97 billion in 2030[21]. 12 to 15 million consultations per year and 6.5 million days of hospitalization are attributed to it[22]. According to a study published by the *American Heart Association* in February 2011, the direct treatment costs (medical costs) of patients are expected to rise by 215% within the US population (and even more amongst those over 65 years) and the indirect costs (lost productivity) by 80% between 2010 and 2030[23].

The direct cost of advanced chronic heart failure in France was around €1.5 billion[24] (€3.3 billion for the class of long-term illnesses regrouping serious cardiovascular pathologies - ALD 5 in 2009, solely for the general health insurance system) and concerned more than 730,000 people in 2011 (an increase of 9% compared to the previous year).

In a communiqué published on May 7, 2010 on the occasion of the European Heart Failure Awareness Day, the French Society of Cardiology and the French Federation of Cardiology recalled some figures. In France there are more than 100,000 new cases a year. 10% of these patients were hospitalized, given that the average length of hospitalization exceeds ten days and that the rate of re-admission within six months is 20%. In 2008, heart failure was the primary diagnosis in 195,800 hospital stays in France, where the daily cost of hospitalization in intensive care in cardiology was over €2,000.

Overall, heart failure represents between 2 and 2.5% of the total expenditure on health care in Western countries, with costs linked to hospitalization alone representing 70% of the total cost of the disease[25]. Due to repeated hospitalizations, class IV chronic heart failure represents between around 61% and 92% of the total cost of heart failure[26].

6.2.4 Available treatments

It should be noted that this disease in incurable in the chronic phase and that current treatments aim solely at reducing the symptoms. Treatments evolve as the disease progresses.

Drugs

In class I and II, treatment is essentially drug-based[27] and, depending on the severity and symptoms, combines:

- anticoagulants* and anti-platelet aggregation medication* to prevent the formation of blood clots;
- angiotensin-converting enzyme inhibitors* to reduce vascular resistance;
- betablockers which reduce the cardiac rhythm and output to decrease blood pressure;
- diuretics to remove excess fluids and, in this way, lighten the burden on the heart to prevent pulmonary edema;
- vasodilators* which relax the blood vessels to increase the flow of blood and oxygen to the heart without increasing its work;
- etc. …

The complexity of treatment and the need for frequent adjustments leads to low patient compliance: 40% of patients do not follow their treatment in a consistent manner after 3 months.[28]

Devices

From class III, surgical options, such as the implantation of supporting medical devices, are considered:

- mono- or biventricular pacemakers to prevent arrhythmias;
- implantable defibrillators to treat ventricular tachycardia and prevent sudden death;
- left ventricular reconstruction;
- restrictive mitral annuloplasty;
- mechanical assisted circulatory support systems, implantable or not, and artificial hearts.

---

21 *Heart Disease and Stroke Statistics* – American Heart Association 2012.

22 Hunt SA et al. ACC/AHA 2005 Guideline Update for the Diagnosis and Management of Chronic Heart Failure in the Adult: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Circulation. 2005;112:e154-e235

23 *Heart Disease and Stroke Statistics* – American Heart Association 2010

24 Régime général de l'Assurance Maladie – http://www.ameli.fr/l-assurance-maladie/statistiques-et-publications/donnees-statistiques/affection-de-longue-duree-ald/prevalence/frequence-des-ald-au-31-12-2011.php - http://www.ameli.fr/l-assurance-maladie/statistiques-et-publications/donnees-statistiques/affection-de-longue-duree-ald/cout/cout-des-ald-en-2009.php

25 McMurray JJ, Stewart S. Epidemiology, aetiology, and prognosis of heart failure. Heart 2000;83:596-602.

26 Clegg AJ et al. Clinical and cost effectiveness of LVAD for end stage heart failure – Health Technology Assessment NHS – 2005.

27 American Heart Association – Heart Failure Medications - http://www.heart.org/HEARTORG/Conditions/HeartFailure/PreventionTreatmentofHeartFailure/ Heart-Failure-Medications_UCM_306342_Article.jsp

28 Benner JS, et al. Long-term persistence in use of statin therapy in elderly patients. JAMA. 2002;288:455-61.

For the most part, these options continue the objective of recovering the heart's natural function. For example, biventricular pacemakers aim to reeducate the ventricles by synchronizing their contractions. Restrictive mitral annuloplasty aims to reeducate the left ventricle by affecting its geometry. However, if these approaches temporarily relieve some patients, they face important difficulties in selecting patients[29] or technical implementation[30], which restrict their adoption and do not prevent the progression of the disease.

The mechanical circulatory support systems are the devices which could be considered as the closest, in function and indication, to the CARMAT artificial heart project. Their characteristics and evolution are detailed in paragraph 6.4.2. Technologies and market players.

Positive inotropes* are generally introduced at the most advanced stage of the disease. These are drugs, administered intravenously in a hospital, which increase the contractility of the cardiac muscle and that allow, at least temporarily, critical situations of low cardiac output in episodes of acute decompensated heart failure* or cardiogenic shock* to be resolved. Dependence on inotropes marks the terminal phase of heart failure with a mean survival of 3 and a half months.[31]

Transplantation

Indeed, in the terminal form of the disease, the only treatment possible is the replacement of the diseased ventricles by the transplantation* of a healthy heart*, i.e. the heart of a donor.

Professor Christian Barnard preformed the first heart transplant in South Africa on December 3, 1967. The first transplant patients, with few exceptions, did not survive more than a few weeks after the operation, mainly due to rejection (reaction of the host against the transplant which it considered as a foreign biological body). Several important advancements had allowed the improvement of patient survival:

- the preservation of donor hearts thanks to refrigeration, allowing the removal at a distance from the place of transplantation;
- endomyocardial biopsy allowing the early diagnosis of rejection: a probe is introduced, under X-ray control and under local anesthesia, into a large vein and pushed until it is in the right ventricle, permitting a small piece to be sampled which is then analyzed under a microscope;
- last but not least, the advent of cyclosporin, an immunosuppressant*, whose therapeutic use has allowed, since the beginning of the 1980s, considerable development in the field of organ transplants, by preventing acute rejection.

Today, heart transplant survival is slightly higher than 50% at 10 years[32]. Nevertheless, survival after 1 year has progressed very little over the past 20 years.

The hopes founded on this treatment continue to face major problems that limit its mainstreaming. Indeed, if we compare a very conservative estimation of approximately 400,000 class IV terminal heart failure patients (barely 2% of the total number of patients with heart failure of all classes in Europe and the US, i.e, more than 20 million) to an optimistic estimation of around 4000 heart transplants performed in the same geographical regions in 2010 (see paragraph 6.4.1 Market numbers), we observe a considerable difference.

The first reason can be found in the very strict eligibility criteria both for the removal of the organ and for the transplant. Notably, the donor[33] must, in principle, be under the age of 61 years, brain dead, not a carrier of certain viruses such as HIV or hepatitis B and C, not a drug addict or have a cancer and, of course, not be suffering from heart disease. This therefore limits the possibility of donation mainly to trauma deaths (in particular road accidents, which are constantly decreasing). So, in France in 2010, only 376 hearts could be harvested and 356 implanted.[34]

Considering this shortage of organs, the eligibility criteria of the recipient are even stricter[35] in order to ensure the greatest chance of success with each transplant. Blood groups must be identical, weight and size equivalent. Irreversible pulmonary hypertension, an active infection or a cancer are formal contraindications. Other relative contraindications are also taken into account such as diabetes, advanced pulmonary or hepatic diseases, renal failure, morbid obesity... A psychological assessment is taken into account to ensure that the patient agrees to comply with lifelong complex medicinal treatment.

---

29 Strickberger SA et al. Patient Selection for Cardiac Resynchronization Therapy, Circulation. 2005; 111: 2146-2150

30 Marwick TH. Restrictive Annuloplasty for Ischemic Mitral Regurgitation Too Little or Too Much. J Am Coll Cardiol. 2008;51(17):1702-1703.

31 Hershberger RE et al. Care processes and clinical outcomes of continuous outpatient support with inotropes (COSI) in patients with refractory end stage heart failure. J Card Fail. 2003;9(3):180-7.

32 Stehlik J et al. The Registry of the International Society for Heart and Lung Transplantation: Twenty-eighth Adult Heart Transplant Report. J Heart Lung Transplant 2011;30:1078-1094.

33 Latrémouille C., Jouan J. Transplantation cardiaque. EMC - ©Elsevier, Techniques chirurgicales - Thorax, 42-748, 2006.

34 Agence de Biomédecine - Synthèse nationale de prélèvement et de greffe 2010 et annexe au bilan 2010.

35 Mehra MR et al. Listing Criteria for Heart Transplantation: International Society for Heart and Lung Transplantation Guidelines for the Care of Cardiac Transplant Candidates. J Heart Lung Transplant 2006;25:1024 – 42

Patients with psychiatric disorders, or addicted to alcohol or drugs are not considered.

Age, which must be below 65 years, is a particularly discriminating criterion. The organs are therefore reserved for the youngest patients, while the vast majority of chronic heart failure patients are over 60 years or suffering from comorbidities making them ineligible.

In this way, the number of transplants is stable or declining in all developed countries for over 10 years, while the prevalence of heart failure has considerably increased.

Heart transplant waiting lists therefore do not reflect treatment needs, but simply the number of patients satisfying all the eligibility criteria, particularly age. The low diffusion of heart transplants as treatment of choice for terminal heart failure is shown in the following table.

	France (1)	United States (2)	Germany (3)	United Kingdom (4)
Transplantations	398	1853	341	92
Patients on waiting list	284	2668	992	130
Population (5)	65,436,552	311,591,900	81,726,000	62,641,000
Patients with terminal HF (6)	26,000	124,000	32,000	25,000

(1) 2011 – French Biomedicine Agency - Annual report 2011
(2) 2009 - Organ Procurement and Transplantation Network – Scientific Registry of Transplant Recipients
(3) 2011 – Eurotransplant statistics
(4) April 2010 / March 2011 – NHS Organ Donation Annual Report
(5) Banque Mondiale 2011
(6) In the absence of epidemiological reference data, cautious estimation based on a prevalence of heart failure of 2% in the general population, 2% of this 2% have terminal heart failure (see paragraph 6.4.1 Market numbers).

Transplant limits also appear in the difficulties of the caring for transplant patients and the complications either of the graft itself or caused by immunosuppression. So, 5 years after a heart transplant, 95% of patients suffer from hypertension, 81% from hyperlipidemia, and 32% from diabetes. Furthermore, 25% to 50% develop coronary disease of the graft, and 33% suffer from chronic renal failure.[36]

A heart transplant is a heavy treatment at a very high price. Every three years, the Milliman institute publishes a detailed report[37] on the estimated cost of organ transplants in the United States. With regards to heart transplants, their findings for 2011 show a cost of 997,700 dollars, including 30 days pre-transplant and 180 days post-transplant and distributed as follows (in US dollars):

30 days pre-transplant	Removal	Admission	Procedure	180 days post-transplant	Immuno-suppressors and other treatments	**Total**
42,200	80,400	634,300	67,700	137,800	30,300	997,700

It is difficult to make an international comparison given the very different health care finance systems and the figures available cover heterogeneous periods before and after transplant.

For example, today France uses, – since the transition to T2A in 2008 -, a flat-rate system covering cross-cutting activities to the removal and transplant, in addition to reimbursement by various procedures from simple to quadruple depending on the severity and complexity, but there does not exist an annual national summary of the cost. As an illustration, the flat rates and maximum reimbursements are as follows (in Euros)[38]:

2011	**Flat rate**	**per patient**
Annual flat rate for coordination of removal (at least 10 removals)	404,377	
Annual flat rate transplant (for 10 transplants)	32,088	
Removal		10,304
Procedure		58,626
Rejection		29,913

36 Lindenfeld JA et al. Drug Therapy in the Heart Transplant Recipient. Circulation.2005; 111: 113-117
37 Milliman Report 2011 - Table 2: Estimated U.S Average 2011 Billed Charges Per Transplant
38 Agence de Biomédecine Rapport Annuel 2011 – Modalités de financement des activités de procréation, embryologie et génétique humaine, et de prélèvement et greffe d'organes.

These amounts do not cover the expenses normally covered by the Health Insurance, such as the hospital fee and the daily rate, up to €2,000 per day in a cardiology intensive care unit, or the drugs, nor the post-operation costs such as functional rehabilitation, examinations, the immunosuppressor treatments or non-acute complications.

The objective of CARMAT is to propose an immediately available alternative to transplantation, at a lower overall pre- and post-operation cost, with an equivalent survival rate and reduced complications.

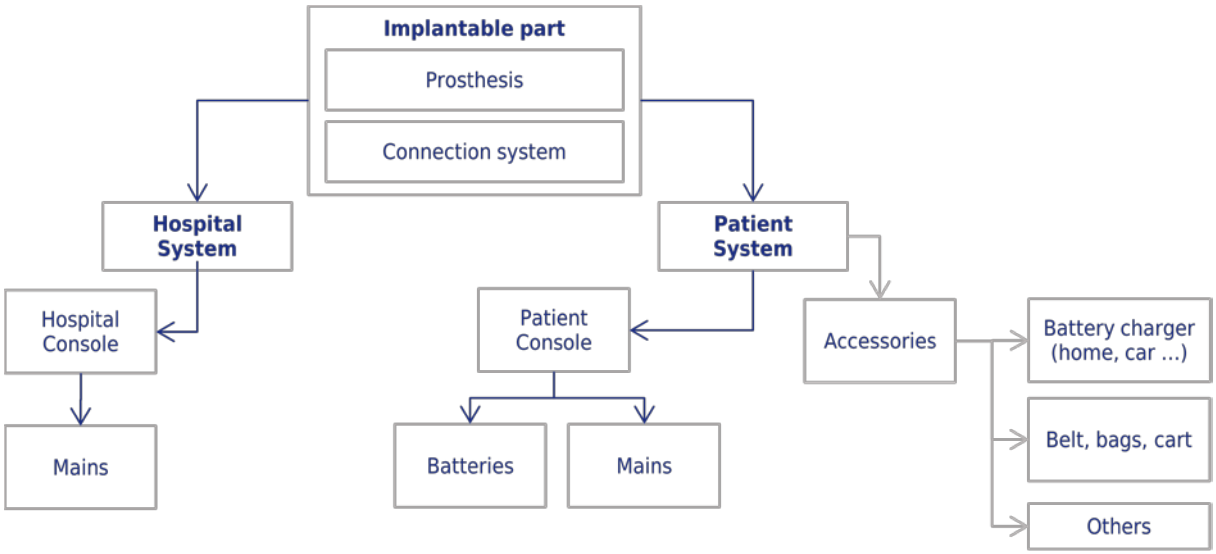
The projected price of the CARMAT system is between €140,000 and €180,000 and should allow an attractive economic alternative to be offered, since certain very significant costs, such as those of repeated hospitalizations while waiting for the transplant or immunosuppressor treatments, will be avoided.

6.3 CARMAT: THE FIRST BIOPROSTHETIC ARTIFICIAL HEART PROJECT

6.3.1 Description of the CARMAT bioprosthetic artificial heart project

The system will be composed of:

- an implantable part, the total artificial heart, as such,
- Patient systems allowing the return home,
- a Hospital system allowing complete configuration of the prosthesis and patient monitoring.



Source CARMAT – The complete CARMAT system project

6.3.1.1 The prosthesis

The implantable parts include the prosthetic heart and the electrical connection to the power supply, either by battery or by the mains.

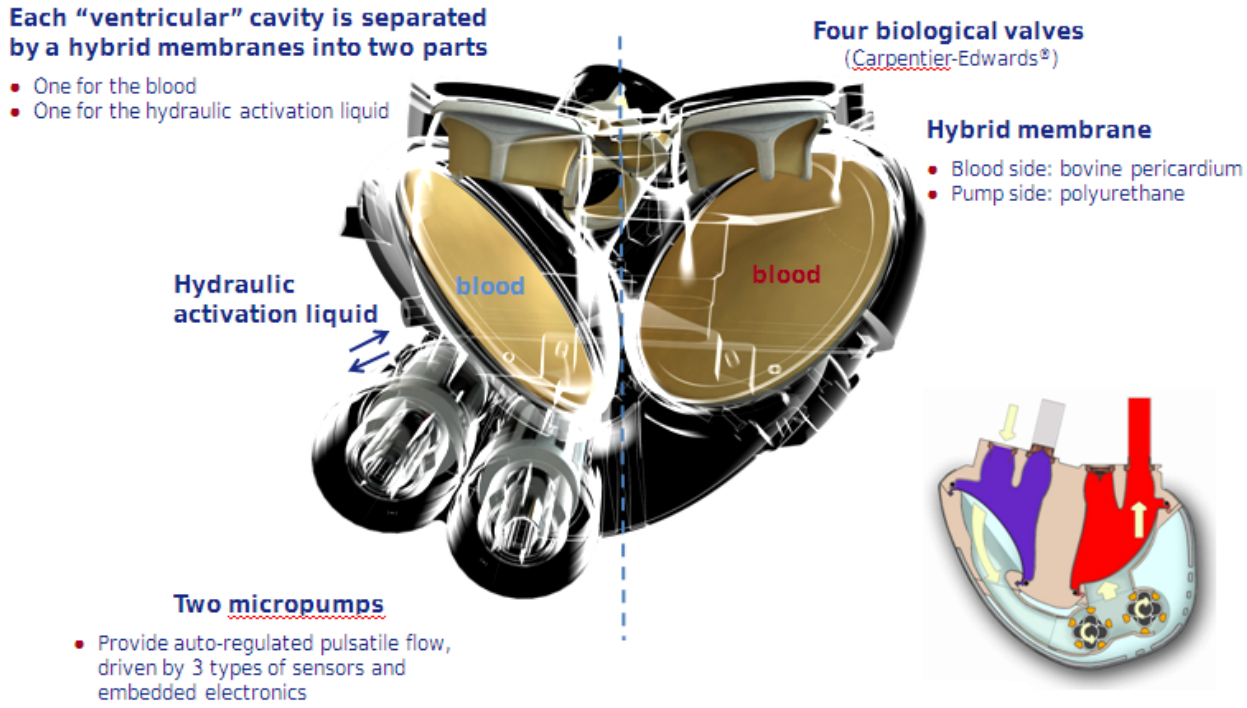
The prosthesis will reproduce the operation of the natural heart by using hydraulic actuation, a liquid serving as an intermediary to push the blood. The cardiac rhythm is broken down into two periods, diastole* when the ventricles fill up with blood, and systole* when the blood is pumped into the great vessels and organs.

The prosthesis comprises 2 ventricular cavities, one on the right and one on the left, with each separated into 2 volumes, one for blood, one for the actuation liquid, by a flexible hybrid membrane. This membrane reproduces the viscoelastic nature of the cardiac muscle and acts in the same way on the blood, pumping it when it contracts.

A motor-pump group - consisting of two miniature pumps - moves the actuation liquid to the ventricles thus generating systole or by reversing the direction of rotation towards the external pouch during diastole.

An electronic device regulates how the prosthesis operates according to patients' needs using information given by sensors and processed by a microprocessor. A flexible external pouch contains the actuation liquid and beats at cardiac rhythm.

The internal layout of the artificial heart project has been the subject of continuous optimization over the past few years. Engineers endeavored to position the various sub-assemblies of the prosthesis in the best possible place so as to keep the largest ventricular volume, thus ensuring a good blood flow without artificially increasing the operating frequency (see section 6.3.2. "Innovations and competitive advantages of the CARMAT total artificial heart project").



Source CARMAT - Functioning of the bioprosthetic artificial heart project

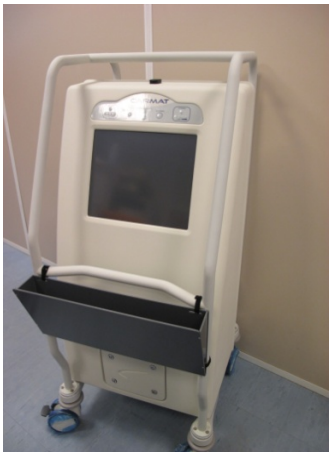
The prosthesis is connected to the patient's atria thanks to an interface device which allows easy suture onto which the prosthesis is then clicked. (See the animation available on the company website www.carmatsa.com). In addition, numerous dedicated implant tools have been developed in collaboration with surgeons to make the procedure easier, reduce the operational ischemia time and in this way minimize the inherent complications of a prolonged extracorporeal circulation.

6.3.1.2 The electrical connection

The transfer of electrical energy from the monitoring console or batteries to the prosthesis will be percutaneously for the early clinical trials. This solution has the merit of being proven as it is used by the majority of implantable ventricular assistance systems currently available. Nevertheless, the percutaneous cable represents a major cause of infections and the Company is currently studying several innovative alternative technologies to provide a further point of differentiation.

In 2011, feasibility studies on the power supply system by way of a retro-auricular plug (behind the ear) did not give the desired results. This technology has therefore been put on hold for the moment and other promising avenues are being explored permitting their clinical trials to be considered from the end of 2013.

6.3.1.3 Hospital monitoring console



The Hospital Monitoring Console (HMC) – already available – is used solely in the implantation centers by certified medical personnel.

It allows the starting of the prosthesis during implantation, the power supply during the hospital stay; the monitoring and configuration of the prosthesis during periodic control visits, and the downloading while functioning of new functions or versions, like for example the software allowing the automatic adaptation to the patient's metabolic needs on the basis of information provided by the sensors, which is downloaded when the patient leaves the hospital[39].

It can import the monitoring data from the patient's systems and, in the long run, it could interface with the doctor's computer to receive and analyze data transmitted by remote transmission. It offers surgeons detailed functions for the analysis of the prosthesis' functioning and of the physiological parameters measured.

Source CARMAT - Hospital Monitoring Console (HMC)

[39] Shareholders Newsletter n°3 – January 2013 http://www.carmatsa.com/images/stories/pdf/LAA/03/Lettre_aux_actionnaires_FR_VF_N3.pdf

6.3.1.4 Patient System

The systems that the patient takes home contribute significantly to their quality of life as they give them the mobility and autonomy essential for a life close to normal.

The Company is actually developing two generations of systems:

- A system transportable on a trolley, comfortable and silent, providing
- 4 to 6 hours of battery life; this first system is available and can be used as soon as the patients leave hospital after the first clinical phase, to allow the return home in good conditions.
- A portable system, much lighter, allows greater mobility. The Company has fully specified this system and identified partners for its development which can be started from the end of the feasibility study.

6.3.1.5 Batteries

- first-generation batteries (Lithium-Ion) will offer 4-6 hours' autonomy;
- the second generation, which is subject to fuel cell research with the company PaxiTech, will mean that patients no longer have to worry about charging their batteries, since autonomy is now greater than 12 hours, with a weight of less than 3 kg.

The use of a fuel cell should be a first in the medical field. It should offer an original solution integrating the production of hydrogen on demand and optimizing patient security while being ergonomic (useful width: 2 mm). The first operational prototype of this fuel cell could be tested in connection with the portable unit mentioned above.

Other external accessories such as a battery charger, a means to connect to a home mains network or to the power supply of a car via the cigarette lighter, bags or belts for transport or to ensure the protection of the system during a shower are also planned. All the elements of the system intended for the patients aim to allow them to feel safe, to have a good quality of life at home and to ensure their mobility for the requirements of everyday life.

Systems destined for patients - such as the batteries - today make up an important part of the developmental effort of the Company. Indeed, they are critical for the quality of life of the patient and therefore for the adoption of the CARMAT heart by the market. Furthermore, they allow a reduction of direct and indirect costs for the health care systems by promoting a rapid return home, thus creating a favorable cost/benefit ratio for reimbursement.

6.3.2 Innovations and competitive advantages of the CARMAT total artificial heart project

Historically, research into the total artificial heart began in the United States in 1963 under the impetus of the American Congress. However, all research on implantable artificial hearts soon hit the snags of hemocompatibility, auto-adjustment of operation to the patient's physiological needs, miniaturization, autonomy and reliability in the long run.

Consequently, the challenges posed by Pr. Carpentier to the Matra team were many:

- design a prosthesis minimizing the risks of thrombosis* (formation of clots), a problem which all the other projects encountered. (see paragraph 6.4.2 Technologies and market players);
- develop an automaton allowing the prosthesis to operate independently, and as such to mimic as closely as possible the operation of the natural heart without the patient or the doctor having to take any action;
- integrate all components necessary for the physiological operation of the artificial heart in a weight and a volume compatible with the thoracic space available in the majority of patients;
- optimize the reliability and the lifetime of the prosthesis, essential characteristics of a life supporting implantable device, to obtain a patient survival equivalent to that of a transplant;
- provide the patient with an autonomy and a mobility as close as possible to a normal life;
- finally, ensure that the implantation procedure for the heart can be performed without difficulties by all cardiac surgery teams.

Numerous innovations and multiple competitive advantages have emerged from the CARMAT team's answers to the Professor's challenges.

6.3.2.1 Hemocompatibility

The only artificial heart project where all the surfaces in contact with blood will be made from compatible biological material to reduce the thromboembolic risk.

All the implants and assist devices or organ substitutions in contact with blood pose the major problem of their hemocompatibility: they must not cause the destructions of red blood cells* (hemolysis*) or activate the coagulation cascade*, thus favoring the formation of a clot blocking a blood vessel which can cause a pulmonary embolism or a stroke.

The causes of these problems are based around two points:

- hemodynamic, respect the blood flow, which should prevent stasis (abnormal stagnation and accumulation of blood) or "shearing" of red blood cells (shear stress);
- the surface condition and toxicity of the materials in direct contact with the blood. These materials may be of a varied chemical nature, but their surface condition must be either perfectly smooth and water-repellent so as not to cause any adherence, or else of a microporous structure so as to guarantee satisfactory adherence of proteinic biological tissues.

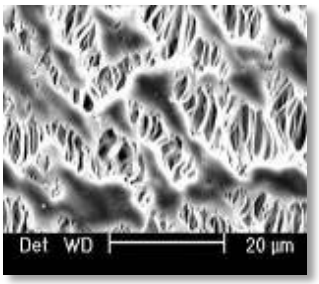
The CARMAT total artificial heart project contributes original solutions to this major obstacle by developing a type of blood flow actuation which is compatible with physiological blood pressure, thanks to the optimized design of ventricular cavities and the use of microporous biological and synthetic biomaterials which allow continuous proteinic* coverage, adhering to all surfaces in direct contact with the blood. The search for non-thrombogenic materials, essential for the system's ultimate performance, is a quest which has been led by several industrial players without success, in particular in the field of ventricular assistance.

The CARMAT total artificial heart project followed the novel pathway opened by the principles of hemocompatibility as shown by research carried out on Carpentier-Edwards biological valves, designed by Professor Alain Carpentier, and which have been tried and tested over 30 years, with implants on over a million patients, and for implant times of over 25 years[40,41]. These biological valves, unlike mechanical valves, allow the considerable reduction, or even elimination in certain cases, of the anticoagulant treatment, which is especially restrictive for the patient.

An agreement with an initial term of one year, automatically renewable for one year at a time, was entered into on November 5, 2010 between CARMAT and EDWARDS LIFESCIENCES, the world leader in the heart valves sector and in hemodynamic monitoring, for the use and supply of Carpentier-Edwards biological heart valves® for the CARMAT total artificial heart project.

Biosynthetic membrane

Carpentier-Edwards pericardial valve®



Ventricle in microporous PTFE

Interface with atria

Source: CARMAT – Hemocompatible materials

Four Carpentier-Edwards pericardial valves will be incorporated into each CARMAT total artificial heart. The atrial connection interfaces are also made from treated bovine pericardium on the blood side. Only the side of the hybrid ventricular biomembranes covered with pericardium is also in contact with the blood. This will mean that all the components coming into contact with the blood will be in hemocompatible biological materials, setting them apart from other artificial heart projects in which mechanical valves are used.

The development and characterization of innovative microporous materials are based on the significant experience of some of the Company's key partners, such as the Bio-surgical Research Laboratory of Professor Carpentier (Broussais Hospital and Georges Pompidou European Hospital) which developed the biological valves, and their treatments, and the FRK (Foundation of Cardiac Surgery Development in Poland), experts in the manufacture of polyurethane implantable elements. Based on this principle, the development of large dimensioned biosynthetic material, such as the biosynthetic membranes and the atrial interface covers, already represents a significant development in the history of implantable material.

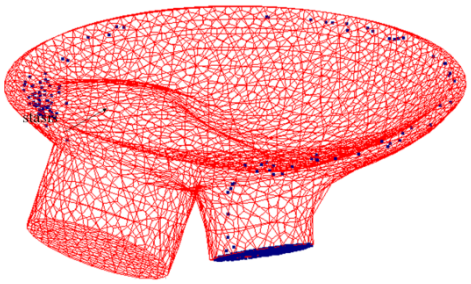
---

40 Ayegnon KG, et la. A 25-year experience with Carpentier-Edwards Perimount in the mitral position. Asian Cardiovasc Thorac Ann. 2011 Feb;19(1):14-9

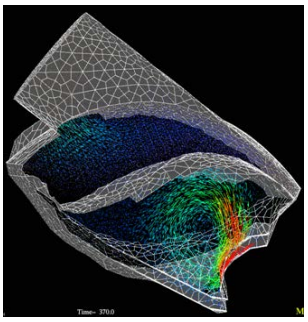
41 Aupart MR et al. Perimount pericardial bioprosthesis for aortic calcified stenosis: 18-year experience with 1133 patients. J Heart Valve Dis. 2006 Nov;15(6):768-75; discussion 775-6.

In connection with the preparations for clinical trials and prior to the filing of the technical file with the ANSM with a view to obtaining authorization to set up and run the initial clinical trials in France, tests for resistance to calcification and for hemocompatibility aiming to demonstrate the suitability for implantation of the CARMAT bioprosthetic heart have been performed and published[42]. The conclusions of these studies are presented in paragraph 6.3.3 "Process and developmental stages of the total artificial heart project".

The hemodynamics, studied through various models, were validated through digital simulations. These studies i) avoided shearing and stasis, ii) ensured "washing" of the entire ventricle at every cycle and iii) assessed the membrane's optimal movement.



Stasis detection



Hemodynamic intra-ventricular simulation

Source: CARMAT – Digital simulations

6.3.2.2 Self-regulation
The first intelligent artificial heart project that provides an immediate and automatic response to the metabolic needs of the patient.

To improve the quality of life of patients, the CARMAT bioprosthetic total artificial heart project was designed to permanently analyze the hemodynamic situation of the patient and to adapt thereto in real time.

Thus, for example, if a patient climbs some stairs, the cardiac output from the artificial heart project will increase like what would occur with a natural heart. If they lay down to sleep, the heart will slow down to ensure a comfortable sleep. Similarly, the CARMAT total artificial heart project will react to pathological situations such as a hemorrhage by reproducing, with the help of specific algorithms, the behavior that a normal heart would have in the same circumstances.

This automatic response to patients' physiological requirements comes from a bioprosthetic artificial heart design which is as faithful as possible to the physiology of the natural heart thanks to the joint work of the CARMAT teams and the medical teams led by Professor Alain Carpentier.

Thus, the output of the artificial heart project will be pulsating*, as is the natural heart, and its hemodynamic operation is based on Starling's law which governs the operation of the human heart. In line with this law, any modifications to the cardiac flow that occur are mainly based on variations in venous flow back (pre-charge) but are also sensitive to the influence of arterial pressure (post-charge).

The artificial heart project will also simulate the reactions of the natural heart to stimuli from the nervous system, in particular when maintaining aortic pressure in such a way as to permanently ensure satisfactory organ perfusion, in particular the cerebral areas.

Unlike other research projects on total artificial hearts that offer little or no adaptation to the needs of the patient, the medical self-regulating regulation of the CARMAT bioprosthesis aims to reproduce the physiological functioning by implementing:

- an original algorithm allowing replication of the visco-elastic characteristics of the cardiac muscle which changes shape under the effect of pressure depending on its initial elongation, respecting Starling's law;
- an algorithm simulating cardiac function in response to peripheral resistance modifications, which themselves are dependent on the nervous system. The analysis of aortic pressure allows the heart rate to be corrected;
- an algorithm using information provided by a 3D inclinometer allowing changes to the patient's posture to be identified, and to manage these transitions while respecting physiology for the patient's comfort.

The regulation system was developed over two time frames:

---

[42] Jansen P, van Oeveren W, Capel A, Carpentier A. In vitro hemocompatibility of a novel bioprosthetic total artificial heart. Eur J Cardiothorac Surg. 2012 Jun;41(6):e166-72.

- first of all, on the basis of computerized simulations allowing modeling of the artificial heart, its environment – that is to say the patient's bloodstream, posture and activity. These simulations were designed so as to be as representative as possible and allow the generation of test scenarios;
- then in the laboratory by placing the prosthesis on a hydraulic test bench specially designed for this purpose to recreate the bloodstream (hemodynamic) and simulate human activity (cycles of rest, activity, sleep).

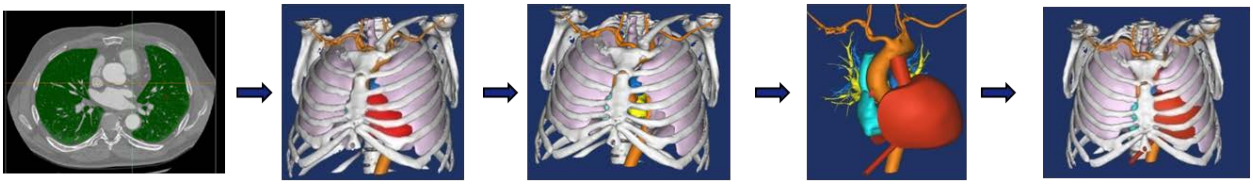
6.3.2.3 *Miniaturization*
A bioprosthetic cardiac project optimized and anatomically compatible with the majority of patients

In the absence of embedded self-regulation, the other artificial heart projects bypass the problem of adjustment by the use of external control consoles, or by the use of portable extracorporeal devices. These bulky devices, often reserved for hospital doctors, do not allow an acceptable quality of life for the patient. Taking advantage of progress made in the miniaturization of electronics, the trend among research projects today is to design hearts which integrate the command and adaptation systems as much as possible. But the intrathoracic space is limited. This integration is often realized at the expense of the ejection volume, which requires the artificial acceleration of the cardiac frequency to provide a physiological blood flow.

The shape of the CARMAT total artificial heart project, similar to that of the human heart, has been fully optimized for the anatomy of the thorax so as to satisfy the maximum number of patients while conserving a physiological ejection volume, by using all the space available around the volumes reserved for blood.This anatomical shape has been studied taking several criteria into account, such as its total volume, its ventricular volume, its interfaces with the aorta*, the pulmonary artery* and the atria. A reduction in size to the detriment of ventricular volume would have been an anti-physiological choice, since the operating frequency would have been increased, for the same level of flow.

Respecting the obligation of as large a ventricular volume as possible, while conserving a very significant reliability of onboard elements, has required significant miniaturization efforts for all the sub-assemblies involved in its activation: motor-pump unit, control electronics and sensors.The optimization of the final form was conducted by using a means of CT imaging associated with three-dimensional image fusion mechanisms, which were used to verify the anatomical compatibility of the CARMAT total artificial heart project, on the one hand, and by performing ex vivo* implantations, on the other hand.

An advanced virtual pre-implantation system has therefore been developed, based on a sophisticated three-dimensional simulation, which allows, in a virtual and completely non-invasive manner, removal of the natural heart and grafting of the prosthesis to check its anatomical compatibility with a given patient. A validation of this model has been performed in silico* by a study based on more than 100 thoracic CT images of patients suffering from cardiac disease, and confirmed by ex-vivo tests on 15 thoraxes. This study aimed to validate the conformity of the prosthesis to average thoracic dimensions, the feasibility of connecting to the large vessels, and the absence of contact with the diaphragm. According to this study, performed in collaboration with the University Hospital (CHU) of Nantes, the CARMAT total artificial heart project would be compatible with 86% of the chests of the men and 14% of those of the women studied[43].



Source CARMAT - 3D virtual implantation simulator

6.3.2.4 *Power and autonomy*
The first medical use of a fuel cell

Experiences of ventricular assistance have been revelatory in terms of showing the current limits of portable electrical energy technology. These systems use rechargeable batteries with various technologies (Nickel metal hydride, Lithium-ion, etc.). The autonomy on offer is in the region of just 4 to 6 hours, thus forcing the patient's life into a rhythm that is both restrictive and often stressful.

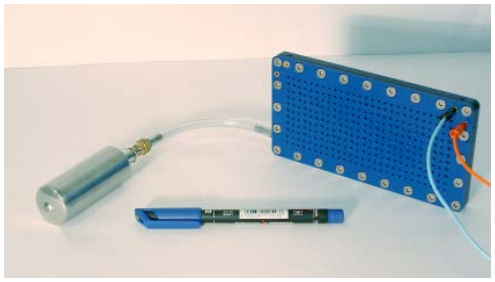
Moreover, a number of difficulties stand in the way of immediate use of such devices (levels and types of supply voltage, obsolescence of the technologies used, excessive weight, etc.). Progress is made every year, but this does not allow any major improvements to be seen in the short term.

---

[43] Information presented at the 64th convention of the French Society of Thoracic and Cardiovascular Surgery (SFCTCV) in Lyon, the 26 and 27 May 2011.

For this reason, this mode of power will only be adopted for the first versions of the system intended for patients.

That is why, in order to provide a technology suitable for large-scale manufacturing, and starting from obtaining the CE mark, CARMAT is developing for its total artificial heart project, through its partnership with the company PaxiTech, a high-technology company from the CEA, a portable fuel cell which does not have the problems of storage and refueling of hydrogen traditionally faced by fuel cells. Such a cell could offer patients autonomy of 12 hours, at a maximum weight of 3 kg, thus significantly improving their quality of life.



Source: PaxiTech – portable fuel cell

Moreover, the percutaneous transfer of energy using a wire link poses problems of asepsis in long-term use outside of the hospital environment. The rate of infection from the percutaneous cable is greater than 20% in long-term ventricular assist use[44] (see paragraph 6.4.2 Technologies and market players). Since September 2011, the Company has accelerated its research in two fields to improve the quality of life and reduce the risk of infection for the patients.

6.3.2.5 Reliability
The first artificial heart project tested to the standards of the space industry of the 21st century

The CARMAT bioprosthetic total artificial heart project is an extremely high-technology system incorporating very varied materials and components, implanted into the human body. The lifespan of such a system represents an essential performance element if this heart is to become a real alternative to transplants. In the long term, the CARMAT total artificial heart project should provide a lifespan comparable to that given by cardiac transplant, that is to say a 50% survival rate over a ten-year period. Few devices have such comparable lifespans during continuous operation without some form of maintenance being necessary. An artificial satellite in orbit several tens of thousands of kilometers from Earth must offer this type of performance. That is why the same test methodology has been applied to the CARMAT artificial heart project.

The goal for the lifespan tests of the bioprosthetic is 5 years, which represents around 230 million beats. This lifespan is assessed with mathematical models used in aeronautics for the electronic parts and endurance tests for mobile electromechanical or mechanical parts.

However, a distinction should be made between the duration of the endurance tests on the bench and the real durability of the device. The duration of the tests corresponds to the minimum regulatory requirements (CE marking or FDA guidance) which are generally 5 years, in real time or with an acceleration factor.

The real durability can be much longer (refer to the durability of cardiac valves which can exceed 25 years) and can only be established by clinical experience.

The real performance of the CARMAT heart project can only be established after the accumulation of clinical data in real time. Moreover, the durability of a device does not predict the survival of the patient, for example, if it leads directly or indirectly to complications.

Source CARMAT – Endurance test room for complete systems,
can accommodate up to 12 systems in a controlled environment.

[44] Zierer A. Late-onset driveline infections: the Achilles' heel of prolonged left ventricular assist device support. Ann Thorac Surg. 2007 Aug;84(2):515-20.

Endurance bench tests reproduce the conditions in which the tested device will operate during its use in the patient's body.For some of these tests, it is possible to use an acceleration factor by increasing the frequency of requests, subject to remaining compliant with the future usage profile. For example, a heart can be tested up to an accelerated frequency that remains in the physiological limits of a natural heart.

Iterative tests conducted for several years have allowed the product's design to be optimized by highlighting the possible failure modes and by implementing solutions which rectify these weaknesses. With regards to the hydraulic pump, the results show a continuous improvement in its design with no wear visible after 4 years of tests on the latest generation, while the first generation showed signs of wear after 3 months. Additionally, 22 pumps have been tested over periods ranging from 2 years to 6.7 years, with an average of 4.3 years, without any measurable loss of performance. What's more, 5 new motor-pump units are currently being tested, accumulating to date over 6 months of endurance without significant wear.

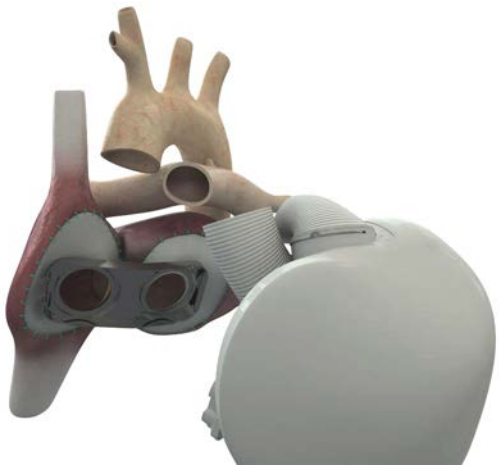
Moreover, the biosynthetic membrane and the polyurethane pouches have been tested over a period of 5 years without any alteration of their expected mechanical characteristics.

As part of the preparation of the clinical trials and prior to the filing of the technical file with the ANSM with a view to obtaining authorization to set up and run the initial clinical trials in France, all these results have been included, in 2012, in the technical file open at the ANSM (refer to paragraph 6.3.3 Process and developmental stages of the total artificial heart project).

6.3.2.6 Implantability
A simple procedure reproducible by all surgical teams

An implantable device can only be a valid therapeutic solution if the implantation is simple and reproducible. Under the supervision of Professor Carpentier, the CARMAT teams have therefore worked in tight collaboration with several surgeons, anesthesiologists, perfusionists and nursing personnel of the operating theater to design and develop a procedure that all cardiac surgery teams can perform in good conditions, even in cases of emergency.

Notably an original interface with the patient's atria was developed, which allows the surgeon to have much more room to work, and a better subsequent alignment of the prosthesis. Consequently, the procedure is considerably easier and faster. Indeed, the implantation time must be as short as possible to limit the neurological risks of a prolonged extracorporeal circulation.



Source CARMAT – Rapid connection interface to the atria

Once this interface is sutured to the atria, the prosthesis can simply be clicked into place. The cover of this interface consists of a hybrid material of which the side in contact with the blood is made of bovine pericardia to respect the hemocompatibility philosophy of the prosthesis.

Many ancillary implantation tools have also been developed in collaboration with medical teams.

6.3.3 Process and developmental stages of the CARMAT total artificial heart project

The development plan for the total artificial heart is broken down into three phases:

1. a preparation phase of the clinical investigations which consists of studying, designing and manufacturing the systems of the CARMAT total artificial heart implantable in humans, and of performing all the validation tests necessary to obtain a Clinical Trial Authorization from the ANSM or from the regulatory authorities in other countries;

2. a clinical validation phase consisting of a feasibility study and a pivot study;

3. a development phase which aims to complete the definition of the system and its clinical and in vitro

validation file in anticipation of the submission of the file for CE marking. This third phase will take place at the same time as the clinical trials.

This breakdown aims to obtain clinical validation data as quickly as possible and thus to validate “in real time” the distinctive technical choices on the project (hemocompatibility, physiology, automatic adaptation, anatomy, miniaturization, reliability) or to relate back with the same reactivity in terms of design.

This development plan was accepted by OSEO Innovation in the contract signed in 2009, and modified by amendment in 2011 (see paragraph 22 Important contracts). The milestones of OSEO development therefore correspond to the stages of this development plan (see paragraph 22 Important Contracts). This plan was also presented to AFSSAPS in 2004 and its principle developed when the presubmission file was filed in 2011 (see paragraph 6.4.5 Regulatory strategy).

6.3.3.1 Preparation

The preparation phase is based on a first definition of the CARMAT system. For reasons of robustness, this definition comprises:

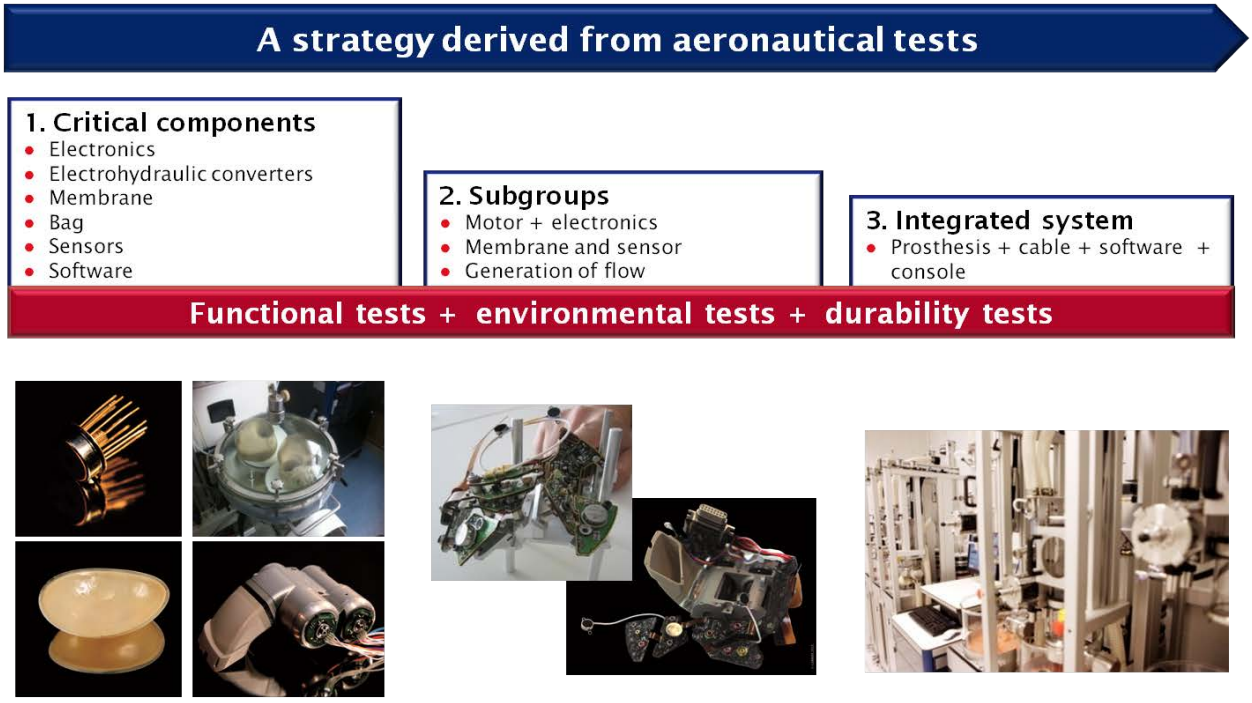
- A long-term human-implantable biologized prosthesis;
- Intra-extracorporeal wire connection;
- Redundant power supply system;
- Alarm module;
- External wire connection to the power supply and telemetry data storage device (console).

The first step consisted of carrying out a study and detailed design of the system and its sub-assemblies. This step was essential for enabling the design team to transition from the prototype stage needed for the feasibility studies to defining an implantable system. On this occasion, research was conducted on the following points, among others:

- study of the system architecture and drawing up of the specifications;
- technological studies relating to methods of obtaining hemocompatible surfaces (membrane, ventricular lining, atrial interface and connection device, ventricular shape);
- mechanical studies of assembly strength: study of how to attach the motor-pump units to the body, study of the system for attaching the bezel to the body, study of the adhesives that can be used for gluing the external pouch to the body;
- integration study: study of the means for purging and sterilizing the prosthesis.

The second stage has allowed the development of the various sub-assemblies, as well as their qualification, and system integration. Twenty or so systems have thus been manufactured in order to be able to carry out in vitro tests with a view to conducting endurance tests and qualification tests on benches recreating the bloodstream and mimicking human activity (rest/activity/sleep cycle).

The last step concerns the manufacturing of the systems for the clinical trials. For the purposes of this phase of preparation for clinical investigations, the Company has built an integration clean room and conducted a Bayesian strategy of intensive preclinical tests illustrated and detailed below.



Source CARMAT – Preclinical test strategy

A. Biocompatibility tests

The prosthesis uses hybrid materials forming the ventricular cavity and suture flanges. These materials constitute one of the original features of the CARMAT system. As well as proving their long-term in vitro physicochemical stability, the Company has chosen to demonstrate their good long-term implantation properties on the basis of their calcification resistance and excellent hemocompatibility.

a. Calcification tests

Benefiting from the expertise of Prof. Alain Carpentier, CARMAT has carried out several feasibility trials with a view to identifying the level of calcium fixed in the tissue after 1 month's implantation in 12-day-old Wistar rats[45]. Over 500 rats were dorsally implanted with four 8 mm diameter disks (i.e. more than 2000 disks in all) and explanted after 1 month.

A blood calcium determination was performed. The results obtained for the disks of a polyurethane/pericardium hybrid material, corresponding to CARMAT's hybrid membrane, were comparable to those obtained with bovine pericardium on its own, the material used in bioprosthetic valves. The Company's hybrid material does not therefore present any greater calcification than that encountered with materials already on the market.

b. Hemocompatibility

The impervious microtextured linings of hybrid pericardium membrane and expanded waterproof PTFE were placed in direct contact with human whole blood* in order to characterize their blood activation. All blood characterizations are based on the recommendations contained in ISO Standard 10993-4: 2009[46]. A negative control (heparin-coated PVC) and a positive control (silicone) acted as reference.

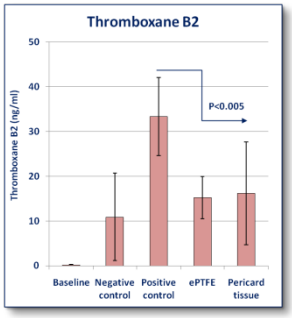
Initial results show that the materials used by the Company have no effect on the blood cell count and do not cause hemolysis. Slight platelet activation as well as very mild inflammation were, however, observed which is still in accordance with the Company's expectations as regards the bioactivity of the materials.

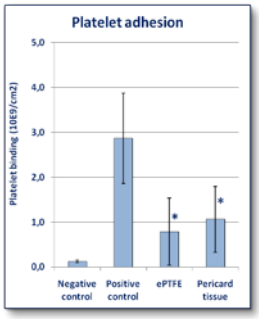
This could allow passivation of the surfaces and thus reduce the anticoagulant treatments in the long term. Analyses of the scanning electron microscopy images show the non-thrombogenic effect of the materials.

The demonstration of the biocompatibility of the material used by CARMAT in direct contact with biological tissue is now concluded and has been published in a scientific journal[47]. The Company now has high confidence vis à vis the hemocompatibility of its materials.

Atrial connection interface

Hybrid biomembrane





Coagulation factors*

Source CARMAT – Results of the hemocompatibility of the hybrid biological interfaces

c. Hemodynamic biocompatibility

The aim of this test was to verify that the risk of hemolysis and thrombosis inside the device is as low as possible. Studies have shown that medical devices that cause an unnatural blood flow give rise to a platelet activation favoring thrombus formation[48]. Hemolysis and thrombosis are two phenomena that are caused by excessively high blood cell shear rates.

CARMAT has limited the materials interfacing with blood to bovine pericardium and expanded PTFE, which are

---

45 Golomb et al. American Journal of Pathology, 1987, vol 127, no. 1, p. 122-130.

46 Seyfert et al. Biomolecular Engineering, 2002, no. 19, p. 91-96.

47 Jansen P, van Oeveren W, Capel A, Carpentier A. In vitro hemocompatibility of a novel bioprosthetic total artificial heart. Eur J Cardiothorac Surg. 2012 Jun;41(6):e166-72.

48 Bluestein D. Research approaches for studying flow-induced thromboembolic complications in blood recirculating devices, Department of Biomedical Engineering, New York University at Stony Brook, 2004 Sep;1(1):65-80.

known for their biocompatibility. As the inlets and outlets, the ventricles have been designed to optimize the blood flow through the device and so minimize contacts and the risks of thrombosis. The pericardium, which covers in particular the bezel trim – the interface between the prosthesis and the auricles – ensures continuity as far as the inlet valves.

B. Verification of the technical requirements – test-bench testing

All of the test-bench experiments were conducted with a constant view to ensuring that every constraint of every component of the system is taken into account with the view of improving the overall quality of the device. Thus the manufacturing constraints were taken into account right at the prosthesis design stage.

CARMAT's testing strategy was to specify the critical components of its device in order to study them separately and then to bring these components together and to test the overall system to obtain a sufficiently high level of confidence for its device. Thus, the Company set up a general test program for its device and specified the sub-components: motor-pump units, hybrid membrane and pouch, sensors, electronics and software according to four major test categories:

a. Functional tests

They are based on the demonstration of the product's performance.

- **Motor-pump unit**

The pumps are composed of a motor and two concentric gears.

An initial test bench is a pneumatic bench which allows the turning part of the motor to be rotated by inducing a coupling offering negligible friction to carry out some very accurate performance measurements. This test bench has two main functions: (i) to drive the CARMAT motor in order to measure the electrical performances and (ii) to power a precise friction coupling in order, this time, to measure the motor's mechanical performance.

Another test bench devoted to measuring pump performance has also been set up. This consists of a fish-tank filled with silicone oil kept at a temperature of 40°C, which reproduces the environment in which the equipment operates normally and a collector equipped with a flow area limiter connected to the pump outlet to simulate the hydraulic head.

- **Hybrid membrane and compliance pouch***

The main performance of these two components relies on their compliance and on their imperviousness to silicone oil and physiological fluids. Measurements have been done on a special test bench and with the aid of a contactless control system based on video localization in order to verify the compliance of the components as well as their deployment. The compliance of the hybrid membrane exactly matches expected performance. The deployed volume of the pouch also conforms to requirements.

To assess the permeability of the pouch and of the membrane, samples taken from manufactured products were interfaced with media representative of the clinical trial configuration, silicone oil and a saline liquid at 40°C. After 1 month and after 3 months, the samples were analyzed under a Raman microscope to measure the penetration of the silicone oil into the thickness of the material. The results confirmed the imperviousness of the two constituents.

- **Electronics**

The aim of the simulations conducted was to verify the design margins of the functions performed by the electronics and to confirm that the components are correctly proportioned to protect them from being subjected to stresses that could reduce their life expectancy. A thermal study has also been carried out to check that the electronic components are working within the temperature operating limits compatible with their specifications. All of the electronic components have been assessed in this way.

Tests have been performed on prototype electronics to check that all of the functions were operational at ambient temperature. These tests were performed by downloading software suitable for testing the function of the electronics microprocessor. This performs measurements, stimulates electronic functions and communicates with a man/machine interface which indicates the result of the test or measurements.

The pressure measurement was calibrated and tested with the aid of a test bench that reproduced the pressure ranges to which the cards will be subjected. This test is performed at temperature.

- **Prosthesis tests**

The major functions of the prosthesis, assessed by connecting the various components, are:

- *Control of the pumps*: an essential function that controls the flow of the actuator liquid in order to move the loaded membrane and to set the blood in motion.

  This function is verified by connecting a motor pump unit, an electronic device and the software modules

responsible for controlling the motors. The software transmits to the motor, via the electronics, a command representative of the flow in the prosthesis.

The measurements performed verify the precision with which the pumps are being controlled, as well as the electrical consumption of the electronics and any disturbances generated by the motors that may be affecting the electronics. The results are also compared with the performances obtained with previous versions of the prosthesis.

The results are in conformity with the specification requirements. The improvement brought, firstly, by the new sensors designed to keep track of the position of the rotating component of the motor and, secondly, by servo-controlling the current passing through the motors, has reduced consumption but also rendered the control of the pumps better able to cope with variations in the supply voltage.

- *Detection of the membrane by ultrasound*: function contributing to the precise determination of the volume of blood contained in the ventricles.

  This function is verified by connecting a motor-pump unit, a membrane, an electronic device equipped with an ultrasonic sensor and the software modules responsible for controlling the motors and for emitting and detecting ultrasound signals.

  The initial tests carried out in static mode make it possible to check that the membrane is detected by the electronics even when it is inclined at the maximum angle relative to the axis of the sensor. These tests are reproduced in dynamic mode until reaching a membrane displacement speed equivalent to the maximum flow rate in the prosthesis.

  The software transmits to the motor-pump unit, via the electronics, a command representative of the flow in the prosthesis. The membrane then moves in the same way it will in the prosthesis. The information received from the ultrasonic electronic module makes it possible to check that the position of the membrane remains detectable while in operation.

  The final stage consists in verifying that membrane detection is functional when all the components are integrated into the prosthesis, and in particular that there is no interaction between the membrane detection in the two ventricles. These tests were performed on the complete prosthesis.

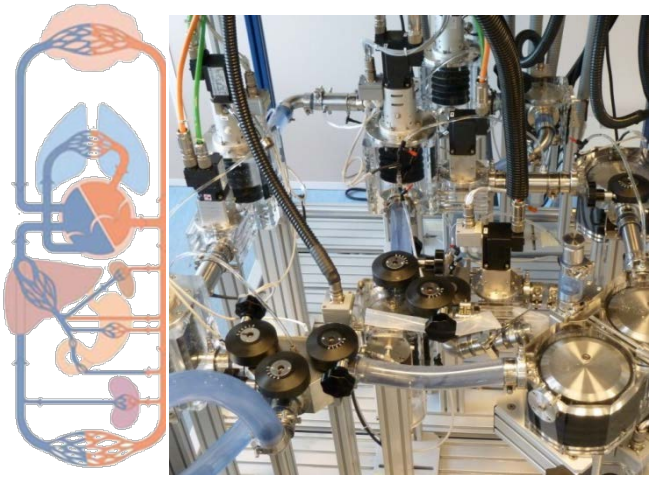
- *Medical self-regulation*: function allowing the flow to be adjusted to the patient's needs.

  The first version of this algorithm, which automatically adjusts the flow through the prosthesis, has been tested on a hydraulic test bench. To do this, a previous generation of prosthesis integrating the new pump principle with which the current prototypes are fitted was used.

  Testing software that integrates medical regulation has been developed to actuate this prototype. The prosthesis is connected to the test bench which is regulated in such a way as to obtain a mean flow rate of 6 l/min. The variations in the flow rate of the prosthesis and the evolution of arterial and pulmonary pressures as a function of the filling of the test bench as characterized by the systemic pressure are then observed.

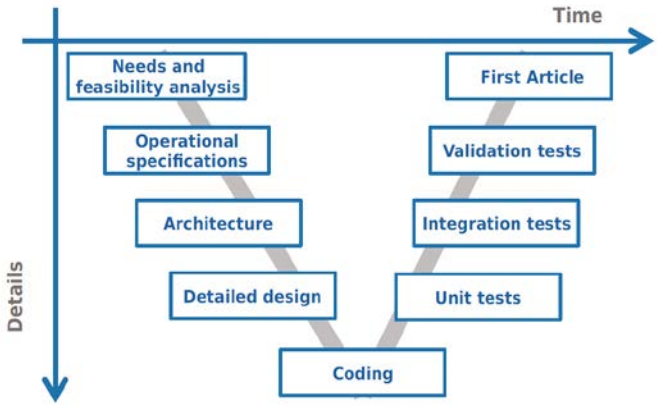
  These preliminary static tests have shown the capacity of the prosthesis to automatically adapt its flow rate from 4 to over 9 l/min. They also show that the prosthesis can cope with situations of pulmonary hypertension by maintaining the flow rate despite very high pulmonary pressures. An adjustment of the algorithm to the architecture of the prostheses destined for clinical trials has been performed.

  After a digital simulation assessment, the algorithm has been tested on a new test bench. This test bench allows more complex dynamic scenarios to be introduced, such as the transition from decubitus to orthostatic, which permits the validation of all the performance parameters of the CARMAT system.



Source CARMAT - Advanced hemodynamic test bench

b. Software tests



Source CARMAT
V-shaped development cycle of the IEC 62304 standard

A software intended for use in humans for the diagnostic, control or treatment of a disease is considered as a medical device in its own right and must be developed according to the IEC 62304 standard for class C. This is the highest level of requirement intended for softwares that could cause the death of the patient.

Each software for the CARMAT system, onboard or external, i.e. more than about ten, has been developed and tested following this standard in a formal manner. It describes the regulatory requirements for each stage of the development cycle as well as each activity and task to be performed to produce a reliable and safe software. In particular, the development and verification activities are clearly separated. The teams who design do not develop and those that develop are different from those that test. Each software is executed on onboard electronic components, so of a very small size to limit their bulk and their consumption. They must therefore be optimized to respect the operational restrictions. Furthermore, the responses of the physiological regulation algorithms must happen in real time, less than a millisecond. The software verification process found in the life cycle of the software aims to detect and report errors that could have been introduced during the development of the softwares for the prosthesis.

Such verification processes have two additional objectives: (i) to demonstrate that the prosthesis software meets the requirements set out in the specification and design documentation, and (ii) to eliminate errors that could lead to unacceptable failures and to demonstrate with a high degree of confidence that these errors have been eliminated. Three principal verification phases exist: unit tests, design verification, as well as specification verification. According to Standard EN 62304, all the requirements contained in the specifications and designs must be tested or verified. All these tests and verifications have been successfully passed.

c. Environmental tests

They are based on the verification that the products can withstand and do not have an abnormal effect on the ranges of temperature, pressure and vibration, as well as the magnetic and electrical fields in which they are liable to develop. Performances specifically involving certain equipment are verified as soon as possible, as is the correct operation of equipment according to the ambient temperature, variations in the temperature and in the electrical fields generated by the equipment itself. These tests are complete. Following these unit checks, it was possible to check the conformity of the complete system.

- **Motor -pump unit:**

On a chemical level, all the adhesives and coatings used in the manufacture of the pumps have been evaluated by aging in the actuation liquid kept at temperature. On a mechanical level, all the vibration tests on the motor-pump unit have been performed. The test bench intended for this test is connected to the pump and reproduces the head represented by the actuation liquid.

- **Hybrid membrane and pouch:**

Aging tests on the materials used for the pouch and the hybrid membrane have been passed with success. The anticipated durability of the biological materials should be equivalent to that of the biological valves.

- **Electronics**

The entire electronic assembly is covered with a coating. Aging tests on this coating, which is immersed in silicone oil at temperature, have demonstrated the product's stability. The requirements relating to the complete life cycle have been verified.

- **Prosthesis**

The prosthesis underwent several environmental trials: thermal tests, electromagnetic tests and vibration tests. The electromagnetic tests were performed on prototypes of the latest definition, irradiation and susceptibility. These have made it possible to fulfill the manufacturing requirements for the electronic cards.

- **System:**

Tests on the system environment essentially consisted of verifying that requirements were respected with regards to electromagnetic environments and electrical safety. These tests were successfully passed.

d. Integration process validation and verification testing

The integration process of the prosthesis is itself an innovation, no biocompatible self-regulated implantable prosthesis and no associated industrial sector currently existing.

The Company therefore must, for each component, part and sub-assemblies, step by step and supplier by supplier, establish a detailed description of each manufacturing step, the validation procedure for each stage, the control procedures for the component, piece or final sub-assembly, the acceptance testing procedure at CARMAT, the process and instruction manuals for integration into the clean rooms, etc., as well as all the documentation required by the Quality Assurance system of the Company and the requirements of the ISO certification, at CARMAT as well as at its suppliers.

In the development and pre-series phase, the volumes are not sufficient to justify setting up the automation or robotization of certain tasks. Many operations therefore remain manual, with the variability that this entails. In its level of requirements for these tests, the Company has adopted a very strict approach: each component must conform fully.

Today, the Company considers that all the procedures put in place respond to this requirement. The setting up of this process has required considerable effort, in the analytical approach allowing the correction of errors or imperfections as they appear, even at the expense of extending the duration of these tests.

e. Endurance tests

These are based on the verification of the reliability requirements of the products. CARMAT has performed initial verification of the reliability of the various components of the system, the central element being the prosthesis.

The mobile elements (pumps, membrane, pouch) have been the subjects of specific tests, like the sensors which are subject to mechanical restrictions: the pressure sensors equipped with a silicon membrane and ultrasound sensors made of piezoelectric components.

They are tested on test benches reproducing the environment in which the components normally have to work, but reproducing also the actual interface with the parts of the prosthesis with which they are related.

It is possible to speed up the tests for these constituents to obtain endurance results more speedily and thus reinforce the reliability of the prosthesis itself.

13 new test benches have been set up for the purposes, among other things, of conducting the endurance tests and of simulating the patient’s entire life cycle with typical daily scenarios. There are 12 endurance test benches for complete systems (prosthesis, cable, software, console) and an advanced hemodynamic test bench for the performance tests of the self-regulation algorithm.

These sophisticated digital benches are entirely specific to the CARMAT prosthesis and represented a "project within a project". Much proprietary know-how has been acquired during their development.

Taking into account the demonstrated inadequacies of the animal model for the type of prostheses designed for human physiology that the CARMAT bioprosthetic heart represents (see the following paragraph, *Ex-vivo and in-vivo tests*), the development of these means of tests inspired by the aeronautics and space industries is an additional first to the credit of CARMAT for the medical device industry.

These very sophisticated test benches also allow an acceleration, in the limits of physiological conditions. For example, up to 150 beats per minute can be tested, which corresponds to a sustained effort, but not continuously, and of course not up to 300 beats per minute, which corresponds to a potentially lethal ventricular arrhythmia.

In December 2012 the ANSM received a final supplement to the file related to the endurance tests and bringing to a close all the preclinical in-vitro tests prior to feasibility clinical trials in France.

In 2012, all the preclinical tests and the validation tests represented significant effort for the Company, its partners and its suppliers, in a total innovation context, not only technologically but also regulatory (no precedent in France) and industrially (processes and new integration methods, no existing associated industry).

Certain tests proved to be consumers of prostheses. In certain cases it was not possible to run some tests in parallel, or to reuse the same prosthesis for successive tests, as had been initially planned. This need for a greater number of test prostheses resulted in the production of double the number of prostheses initially planned for the preclinical trials. This significant increase in workload, in the context of the setting up of a pioneering integration process, caused shifts in CARMAT's planning as well as for its partners and suppliers. Consequently, a certain number of tests could not be performed for the dates specified in the initial schedule due to a lack of available prosthesis.

A strict test sequence must be respected, particularly to ensure that all prostheses are tested at the same product definition and at the same level of validation, respecting the ISO standards and the CE marking requirements. The endurance tests of the complete system are the last of this sequence and their start has consequently incurred the accumulated delays of the delivery of the elements and sub-assemblies, the manufacturing of additional prostheses and the completion of the previous tests.

At the date of publication of this document, the preclinical in-vitro validations have been finished. The Company

has transferred the results of the endurance tests to the file submitted to the ANSM prior to the first phase of clinical trials in France.

The progress of the preclinical tests to date is as follows:

	Progress status *
Components and sub-assemblies	
In-vivo hemocompatibility of biomembrane & ePTFE	✓
In-vitro biostability of bag	✓
In-vivo biostability of biomembrane and atrial interface	✓
Biomembrane accelerated wear testing	✓
Bag accelerated wear testing	✓
Ultrasound sensors accelerated wear testing	✓
Pressure sensors accelerated wear testing	✓
Hydroelectric converters accelerated wear testing	✓
Prosthesis and system	
Production environment (clean room)	✓
Anatomic compatibility (in-silico)	✓
Biocompatibility of the integration process	✓
Software (feasibility trial version)	✓
Complete system endurance testing	✓
Animal implants	

**End of April 2013*

Source: CARMAT – Overview of the progress of the preclinical trials

Between the publication of the previous reference document (September 12, 2012) and the date of the registration of the current document, the following progress has notably been completed:

Prosthesis production: 10 prostheses of clinical quality and 2 prostheses intended solely for software validations have been produced or have been the subject of multiple reconditionings to the benefit of different tests, in vitro and in vivo.

Development of softwares for the prosthesis following the standard 62304: the software development plan envisages two softwares for the prosthesis: a software for patient support at the hospital and a software for the return home. The first was successfully validated in the prosthesis in parallel with the completion of the test cycle and software-only verifications. It constitutes the software base of the prosthesis in which the monitoring of correct functioning is managed. The "home" software will be downloadable onto the functioning prosthesis.

Finalization of the system qualification tests: a new environmental, thermal, vibrational and electromagnetic test campaign has been completed. It confirms the good performance of the system to these demands.

Endurance test: The end of the endurance tests on 5 systems and transmission of the data thus collected to the file open with the ANSM.

Validation of the industrial processes at the subcontractors' and partners': since the reliability of the system depends principally on the quality of the components of this system, the Company has intensified its involvement in the manufacturing process followed by these suppliers. Thus during the period more than 18 audits have been performed to verify that the suppliers' practices are in agreement with CARMAT's specifications and the requirements of its Quality Management System.

Extension of the CPP's authorization: The CPP renewed its authorization in November 2012 and approved the new protocol submitted by CARMAT on January 8, 2013. The inclusion criteria were specified in this protocol.

Presentation of the complete technical file of the preclinical trials to AFSSAPS/ANSM: the file has been the subject of questions from the AFSSAPS/ANSM experts to which CARMAT has supplied the written replies. To date, only the animal experiments continue. (Refer to sub-section Ex-vivo and in-vivo tests below).

Animal Experimentation: A first test campaign was conducted in calves to train surgical teams (3 teams) to the surgical procedure and the mechanism for initiating the prosthesis. A second campaign continued at the ONIRIS (National Veterinary School in Nantes) and the Bio-surgical Research Laboratory in Paris. (Refer to sub-section C. Ex-vivo and in-vivo tests below).

Obtaining the agreement to proceed with the first implantations in humans with 4 world renowned cardiac surgery centers in Belgium, Poland, Slovenia and Saudi Arabia.

C. Ex-vivo and in-vivo tests

Between 2010 and 2011, the Company conducted 15 ex-vivo implantations, in order to assess the anatomical compatibility, the development of ancillary implantation tools, the adjustment of the surgical procedure and the training of the teams. In 2012 and 2013, at the time of the registration of the current document, it had also conducted twenty or so implantations in animals.

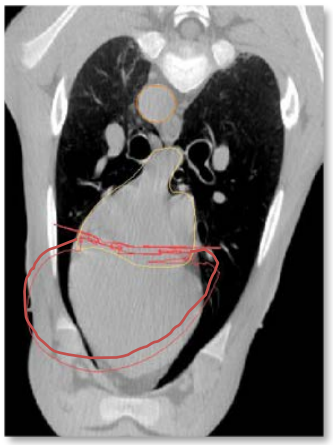
Limitations of the animal model

The animal model, largely used in evaluations of medical devices, does not lend itself well to a total artificial heart project designed for a human thorax and self-regulated on the physiological needs of humans.

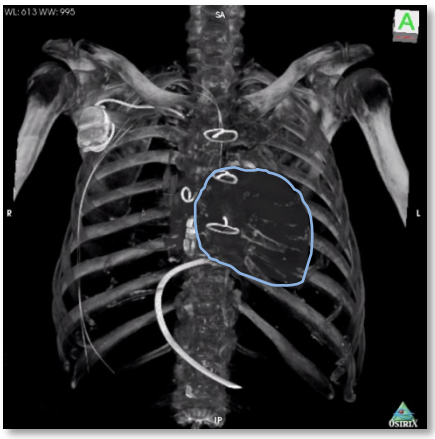
Indeed, the only usable model for its size, weight and thoracic capacity is the calf, if large primates are excluded for ethical reasons. However, it is not possible to test the variations in flow rate linked to a standing position, and therefore the perfusion of organs such as the human brain, on a calf. So, the evaluation of the functioning of the sensor of the CARMAT artificial heart project and the associated algorithms was not possible.

What's more, a calf weighs 40 kg at birth but 300 kg at 6 months and up to 500 kg at 10 months. It is therefore not possible to test - over a long term - a prosthesis designed for human physiology. The output of the CARMAT artificial heart project is not sufficient to perfuse a bovine organism of 150 kg or more.

The thorax of a calf is concave (V-shaped), unlike the human thorax which is ovoid. It is therefore necessary to use an animal of around 100 to 120 kg to have the thoracic space necessary to implant the prosthesis. The position of the large vessels is also different, which complicates the implantation and can negatively influence the results, without the prosthesis being involved.



Calf thorax, in red the position that the prosthesis must occupy in the human thorax



Human thorax, in blue the anatomical position of the prosthesis

Source CARMAT – In-vivo et ex-vivo implantations

It has been shown that the results of the animal model do not predict the results in humans owing to too many differences (physiology, anatomy, and especially blood factors). For example, an American artificial heart project had successfully performed 14 animal implantations at 1 month before proceeding to the human clinical validation. This success transformed into failure in humans with 9 strokes in the first 14 patients[49].

A publication of December 2012[50] summarizes the conclusions of six of the most prestigious international learned societies in the field (Society of Thoracic Surgeons, American Association for Thoracic Surgery, American Heart

[49] FDA Panel review Summary of Safety and Probable Benefit - H040006 - AbioCor® Implantable Replacement Heart. http://www.accessdata.fda.gov/cdrh_docs/pdf4/H040006b.pdf

[50] Acker MA et al . Statement regarding the pre and post market assessment of durable, implantable ventricular assist devices in the United States J Heart Lung Transplant 2012; 31: 1241-52

Association, Heart Failure Society of America, International Society for Heart and Lung Transplantation, and Interagency Registry of Mechanically Assisted Circulatory Support) on the pre- and post-commercialization of the cardiac assist devices.

The scientific community also declared in this publication that "Today, animal models have not answered [many] questions, and different responses between species have been observed that often do not exhaustively reflect the human response. ".

Their conclusion was that "New test methods allowing the assessment of the biological reliability of devices before their clinical introduction must be developed. The improvement in reliability, due to the development of new implantable biomaterials, is a necessary field of research".

It is the strategy CARMAT chose from the start of the project, building, on the one hand, on the extensive biomaterial experience of Professor Carpentier, and, on the other hand, on that of the bench tests performed in the aeronautics industry, thanks to EADS.

That is why the preclinical tests are essentially in-vitro (on test benches) to test, in particular, the endurance and hemocompatibility.

Use of animal models

Despite these limitations in the animal models for the CARMAT artificial heart project, animal implantation is an indispensable procedural training tool. Between the end of 2011 and the end of 2012, CARMAT conducted prosthesis implantations in several animals.

An initial series of short-term animal implants (≤ 48 hours, extubated but not woken) was performed between the end of 2011 and the end of 2012 with the following objectives:

- on the one hand, to validate the surgical procedure, the surgical technique and the ancillary implantation tools;
- on the other hand, to check the start-up process of the prosthesis and re-establish the physiological parameters in the period immediately after the surgery.

These implantations were performed as part of a rigorous protocol on 2 to 4 month old Charolaise calves, of a size and weight compatible with the prosthesis, and respecting ethical rules governing animal experimentation.

Indeed, all animal experiments are subject to approval by an ethics committee who ensure that the animal model used is likely to provide relevant information for the security of the device, and who can stop the experiments if the animal suffers.

The preliminary results of the first 5 animals were presented at the 33rd convention of the International Society for Heart and Lung Transplantation (ISHLT) held in Montreal, Canada on April 24, 2013.[51]

They correspond to the protocol objectives: start-up and correct functioning of the prosthesis, maintenance of a continuous blood flow rate of 7 to 9 liters/minute, etc.

However, the limitations of the model appear already: the observed blood flow rate of these animals, weighing approximately 100 to 120 kg, before the operation was between 11 and 15 liters per minute, while the maximum flow rate of the prosthesis, designed for an adult man or woman, is 9 liters per minute.

During these tests the prosthesis has therefore demonstrated its ability to operate at its maximum output.

On the other hand, the maximum output only just covers the metabolic needs of a calf of 2 months weighing 120 kg which gains another 15 to 20 kg each week: the stopping of the experiment is quickly inevitable at short notice in order to avoid any suffering by the animal.

Numerous regulatory agencies, in particular the ANSM or the FDA, continue nevertheless to demand chronic animal experimentation before authorizing a clinical trial in humans.

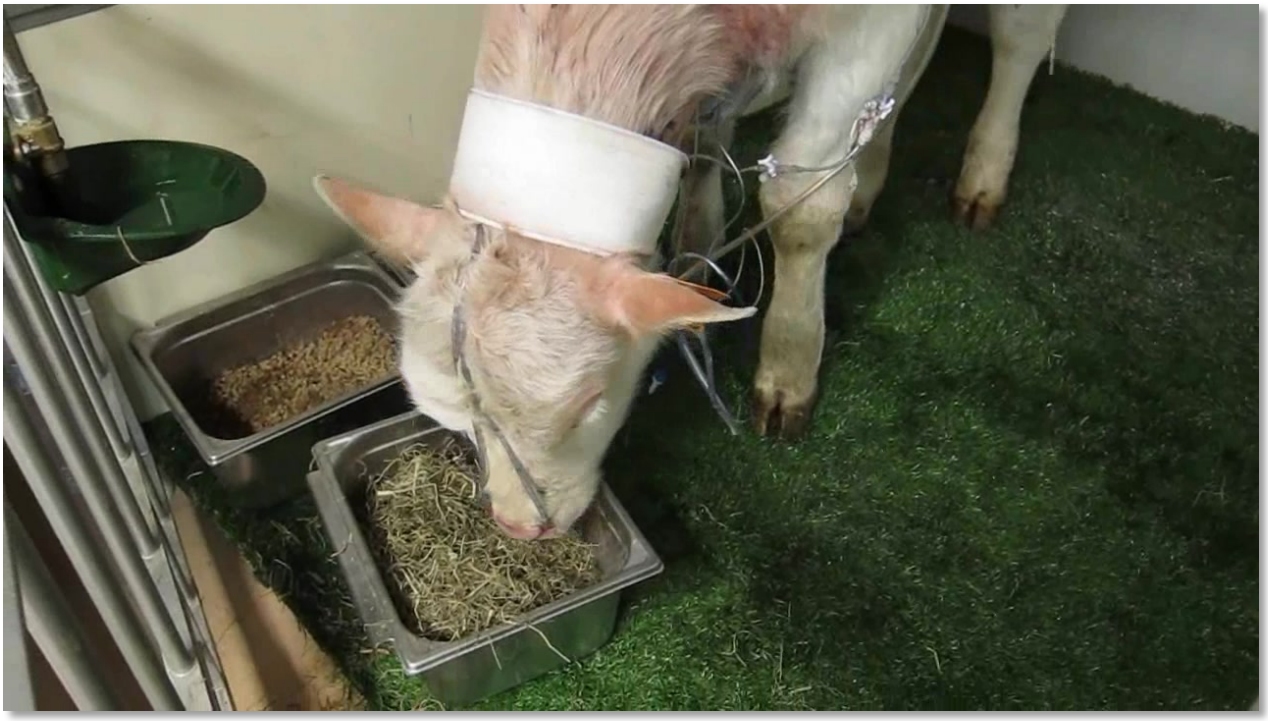
Animal experimentation thus continues in France over longer periods of time since the beginning of the 1st quarter 2013. The new protocol aims to confirm the return to normal of the clinical indicators (standing, spontaneous feeding, normal diuresis, bowel movement) and the hemodynamic and biological indicators, in particular the absence of hemolysis, over as long a time as possible without the animal suffering.

The postmortem examination must show the absence of thrombosis in the device and in the organs of the animal.

This test is currently in progress as of the day of registration of this document and is proceeding in accordance with the Company's expectations.

---

[51] Sub-Acute Animal Implantation of a Novel Bioprosthethic Artificial Heart. Latremouille C. et al, The Journal of Heart and Lung Transplantation Vol. 32, Issue 4, Supplement, Pages S174-S175.



Source: CARMAT- Calf implantation in the 1st quarter of 2013, in a standing position and feeding normally

Each of the 3 medical surgical teams selected for the first clinical phase of the project in France (George Pompidou European Hospital, Paris (Pr Latrémouille) - Marie Lannelongue Hospital, Le Plessis Robinson (Pr Dartevelle and Dr Nottin) and the Laënnec Hospital, Nantes (Pr Duveau)) participated in the implantations, accompanied by specialized veterinary teams.

D. Human clinical validation

a. Required authorizations

In France

Two authorizations are required to commence a clinical trial in France.

- the favorable opinion of the Comité de Protection des Personnes (CPP)
- the Clinical Trial Authorization (CTA) of the ANSM

The favorable opinion of the Comité de Protection des Personnes (Île-de-France III, opinion n° 2925) was received on November 28, 2011 and relates to the ethical aspect of the study protocol and the patient's consent. The favorable opinion of the Comité de Protection des Personnes is valid nationally for all the French centers that participate in the biomedical research on the CARMAT artificial heart project. The favorable opinion obtained in November 2011 was renewed in November 2012.

The human clinical validation will start in France as soon as the Clinical Trial Authorization (CTA) is obtained from the ANSM. It is based on the analysis of the file of preclinical test data, in particular the current animal tests, and an evaluation of a favorable risk/benefits ratio for the patients considered, by ANSM experts independent of the industries concerned.

The Company can obtain the CE marking without obtaining the agreement of the ANSM to proceed with clinical trials in humans in France, as the Company will have conducted conclusive clinical tests in humans in other countries (refer to the following paragraph).

Nevertheless, obtaining this agreement from the ANSM to proceed with the clinical trials in France is necessary for the possible collection of OSEO payments, and in particular milestone no.4, corresponding to a grant of €2.9m, and a repayable advance of €3.8m, representing a maximum receipt of €6.7m (refer to paragraph 22.1.3 Milestones of the project, associated deliverables and special conditions for the continuation of the project - and subsequent projects).

Consequently the Company continues the preclinical tests required and aims for formal submission of a request for clinical trial authorization from ANSM by the end of the 1st semester 2013. CARMAT hopes to receive this authorization in the 1st semester 2013 at the conclusion of the animal experimentation.

Abroad

The regulatory processes are different in each country. When there is no centralized national organization, a

request for authorization must be made to each individual hospital, and, in certain cases, patient by patient.

In parallel to the French activities, CARMAT has therefore put in place a clinical trial plan in other countries and has thus obtained the agreement to proceed with implantations in humans in four world renowned cardiac surgery centers in Belgium, Poland, Slovenia and Saudi Arabia (refer to the press release from May 14, 2013). Negotiations are in progress in other European countries.

b. Training of clinical investigation centers

At the end of 2011, CARMAT initiated an intensive training and certification program with 3 cardiac transplant centers in France with the aim of conducting the first clinical trials. These three centers are:

- George Pompidou European Hospital in Paris (Pr Latrémouille)

The Marie Lannelongue Surgical center in Plessis-Robinson (Pr Dartevelle and Dr Nottin)
The Laënnec Hospital of the University teaching hospital in Nantes (Pr Duveau)

These three teams, as well as members of the Scientific Committee, are already longstanding contributers to the development effort, notably in material development and the validation of ancillary implantation tools, development of anatomical compatibility models and medical self-regulation, active participation in animal experimentation and the review of protocols and patient profiles.

Under the supervision of Pr Carpentier, this continual collaboration ensures the transfer and dissemination of knowledge to promote the adoption of this technology and to build a large body of shared know-how.

The training not only concerns the surgeons but also all the personnel involved in the selection of patients, in the operation, and in the post-operation monitoring. Therefore training must be given, not only to the individuals, but also to teams, including cardiologists, cardiac surgeons, anesthesiologists, perfusionists, biomedical engineers, and the nursing staff, in theater as well as in the intensive care units, ...

This very complete and very interactive training consists of:

- Theoretical training:
  - Presentation of the CARMAT system in a demonstration room.
  - The operation of the CARMAT prosthesis.
  - Visual and theoretical training on the Hospital Monitoring Console (HMC).
  - Training in the use of the 3D virtual implantation system for pre-operation planning.
  - Training in the implantation procedure: conditions and selection of the patient, preparation of the material, surgical procedure, accessories.
  - Training in patient management and their follow-up.
- Practical training:
  - HMC training and control of the prosthesis on a training bench and delivery of explanatory documentation.
  - Ex-vivo, followed by in-vivo, training on animals: performance of full implantations involving all the members of the teams.
  - Training on the HMC and the patient management.
  - Training in the explanation of the device.

The members of the French medical surgical teams already trained provide the training for the international centers. As of the date of registration of the current document, this training is in progress.

c. Clinical investigation plan

The clinical trials will be in two stages:

- a feasibility study (First-In-Man), whose aim is to verify the safety and to look at the examination of the main performance variables (4 patients).

As an illustration, the protocol approved by the CPP notably includes the following principal criteria for patient selection (refer to paragraph 6.2 Heart failure, for a proper understanding of the terms and issues).

- Age ≥18 years
- Functional status of the patient as evaluated by the NYHA of class IV and an INTERMACS® classification of 1 or 2
- Left ventricular ejection fraction ≤ 30%
- Medical treatment optimized and reliant on the administration of injectable inotropes for at least 7 days
- No strokes < 6 weeks, bleeding disorders or septicemia
- No cancer leading to a life expectancy of < 6 months;
- No psychiatric disorders that prevent compliance with the protocol or the proper management of the CARMAT system.

This compassionate indication concerns patients in critical cardiac shock whose condition is life-threatening in the very short term, from a few hours to a few days. The protocol plans an extensive daily monitoring while at the

hospital during the first month then monthly afterwards. The success criteria notably include the survival of the patient at one month or their eventual orientation towards the transplant.

As of the date of the registration of the current document, the finalization of the patient profile and training are in progress in the four international centers that have accepted to participate in the study.

- a pivot study for the purpose of validating the safety, the efficiency and the performance of the system and to obtain CE marking (up to 22 patients envisaged).

Subject to satisfactory results from the feasibility study, the protocol of the pivot study could include patients with a better prognosis.

The setting up of an international multicenter study is part of good clinical practices and ensures a global basis for a product which is not intended to be limited to the domestic market. The agreement of the four international centers to participate in the feasibility study reinforces the ability of CARMAT to put in place a multicenter pivot study and to establish an international cardiac surgeon base formed upstream of the commercialization.

CARMAT wishes to extend the participation in its pivot study to other European centers, especially in Germany, where the number of patients is large on account of a cardiovascular disease prevalence 1.5 times higher than in France and where there are established procedures for reimbursing innovation. The Company has already identified the centers in Europe that are interested in the CARMAT implantable artificial heart in the context of clinical investigations.

The extension of the clinical investigation plan to these international centers requires effort from the Company in terms of locating all the documentation intended for the doctors and the patients and the establishment of local clinical resources and has required, from the first semester 2013, the obtaining of legal authorization to conduct the clinical trials in each of the centers, in particular the authorization of the local ethics committees.

In total, a minimum of 22 patients should be implanted with the CARMAT artificial heart for the clinical validation required for the submission of the file for the CE marking. In the event of successful clinical trials, and subject to the absence of delays, in particular in the rhythm of patient recruitment, the file for the CE marking of the total artificial heart could be submitted in 2014.

The Company consequently intends to perform clinical trials in the United States in order to obtain the commercial authorization from the FDA for the CARMAT total artificial heart in the American territory. These clinical trials could start from 2015 with a view to receiving the marketing authorization as early as the fourth quarter of 2016. (Refer to paragraph 6.4.5.2 Regulatory Strategy - American Regulation)

d. Communication on the results of the clinical trials.

The CARMAT scientific committee will proceed with the analysis prior to any communication of clinical trial results and will decide on the appropriateness and the eventual communication of intermediary results, respecting the ethical considerations owed to the patients and their families.

It is customary that the communication of the results is done through the intermediary of a report by the principal investigator on all the subjects of the study, published in the journal of a scientific society after being reviewed by a peer review committee (peer-reviewed publication).

6.3.3.2 Development

This phase follows immediately after the feasibility clinical trial. It aims to complete the definition of the system and its clinical and in vitro validation file in anticipation of the submission of the dossier for CE marking.

This third phase will take place in parallel to the pivot study and consists notably of:

- The continuation of the aforementioned pivot study;
- The continuation of the endurance tests on a total of 10 systems, which will be continuously tested until their failure;
- Eventual modifications of the system of the CARMAT artificial heart project resulting from the experience gained from the feasibility study, in particular with regards to the procedure, implantation tools, software, packaging, ergonomics or the manuals intended for the physicians and the patients;
- A study for localization of the documents - regulatory as well as those intended for users - in view of the extension of the clinical trials outside of France, the CE marking and eventually the commercialization;
- The study of potential improvements of the production tools in order to increase production, particularly with regards to the continuation of securing supplies by the development of secondary sources and the rationalization of the integration process;
- Finally, the design and development of new equipment or new functions allowing the acquisition of new points of competitive differentiation such as an innovative connection to the prosthesis allowing the limitation of infection, a portable system integrating the fuel cell technology and a remote diagnostic

system. Certain of these developments are already in progress or achieved, notably their design and specification phase.

6.4 MARKET AND STRATEGIES

6.4.1 Market numbers

CARMAT seeks to commercialize a bioprosthetic total artificial heart for patients with terminal heart failure in class IV of the NYHA classification system, either chronic or following an acute myocardial infarction, in a definitive treatment or "*Destination Therapy*" indication, in contrast to a "*Bridge To Transplant*" indication, i.e. waiting for a transplant (refer to paragraph 6.4.2 Technologies and market players).

Chronic heart failure affects around 15 million patients in Europe[52] and 5.8 million patients in the United States[53], giving a total of approximately 20.8 million patients in this geographical area.

Referring to the indications obtained by similar devices, as well as the inclusion and exclusion criteria actually planned in CARMAT's clinical trial protocols by the regulatory authorities (refer to paragraph 6.3.3.2 Human clinical validation), the bioprosthetic total artificial heart would be recommended, at least, to patients suffering with chronic or acute terminal heart failure, aged less than 70 years, who cannot be transplanted, not suffering from cancer reducing their life expectancy to less than 6 months, dependent on inotropes, and suffering from biventricular attack or mono-ventricular attack with risk of contamination of the other ventricle.

Considering that:

- each year, 2.3% of these patients reach the terminal stage of the disease - marked by the first hospitalization -, giving a population of around 475,000 patients[54].
- 38% of this population is aged less than 70 years, giving an addressable population of approximately 180,000 patients[51];
- around 12,000 eligible patients are transplanted or on the waiting list[55];
- 67%[56] of patients have no risk of right ventricular contamination; and
- the anatomical compatibility of the CARMAT heart for men and women is 86% and 14% respectively (refer to paragraph 6.3.2.3 Miniaturization);

So, the number of potential patients for the class IV chronic terminal heart failure would be around 24,000 patients in Europe and the United States.

Moreover, *acute myocardial infarction*[57] constitutes an important source in need of cardiac substitutes.

In France, around 100,000 patients suffer from a myocardial infarction each year. Of those patients hospitalized, 7% die in the first month[58]. Myocardial infarction affects 935,000 patients in the United States[59]. Its incidence varies according to gender (less in women) and according to geographical area, notably on account of differences in diet. The incidence can range from 8% in Finland to 0.75% in Japan.

In total, considering the average incidence of 2% in Europe and the United States[60] whose population represented a total of 1070 billion inhabitants in 2007, the annual number of myocardial infarctions can be cautiously estimated at 2.14 million[61].
From 7.0%[55] to 18%[62] of patients, who are victims of acute myocardial infarction, die within 30 days. At this stage, the practitioner's only option is emergency heart transplantation, as the native heart is no longer capable of supplying the pumping function.

Considering an average hypothesis of 12% (which corresponds to the mortality rate at 30 days in the United

---

52 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2008. European Heart Journal (2008) 29, 2388–2442 (sur les 900 millions d'habitants des 51 pays adhérents de la Société Européenne de Cardiologie)
53 Heart Disease and Stroke Statistics – 2010 Update at a glance – American Heart Association and American Stroke Association
54 Jhund PS et al. Long-term trends in first hospitalization for heart failure and subsequent survival between 1986 and 2003: a population study of 5.1 million people. Circulation 2009;119:515–523.
55 Purshouse K et al. Is There a Crisis in Heart Transplantation? Reflection over 10 Years. Open Journal of Organ Transplant Surgery, 2012, 2, 1-4
56 Baumwol J. Right heart failure and "failure to thrive" after left ventricular assist device: clinical predictors and outcomes. J Heart Lung Transplant. 2011 Aug;30(8):888-95. Epub 2011 Apr 29.
57 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012 - European Heart Journal (2012) 33, 1787–1847
58 Haute Autorité de la Santé – La HAS s'attaque à l'infarctus du myocarde – May 2007.
59 Heart Disease and Stroke Statistics – 2010 Update at a glance – American Heart Association and American Stroke Association.
60 Yeh RW et al. Population Trends in the Incidence and Outcomes of Acute Myocardial Infarction. N Engl J Med 2010; 362:2155-2165
61 Perspectives de la population mondiale - Révision de 2006, Organisation des Nations unies - Département des affaires économiques et sociales, 2007,
62 Roger VL. Epidemiology of myocardial infarction. Med Clin North Am. 2007 July; 91(4): 537–ix

States[63]), there are more than 250,000 people each year who are subject to a very short-term fatal myocardial infarction.

This sub-population of critically-ill patients constitutes the second target market for the total artificial heart.

Hence, considering that:

- the average incidence is 2%, giving 2.14 million patients in Europe and in the United States[64];
- 12% of these patients die within 30 days for lack of an emergency transplant[65];
- 65% of these patients are less than 70 years old[66];
- more than two thirds of these patients are men[67,68];
- the anatomical compatibility of the CARMAT heart for men and women is 86% and 14% respectively (refer to paragraph 6.3.2.3 Miniaturization);

So, the number of potential patients with life-threatening acute myocardial infarction indication would exceed 100,000.

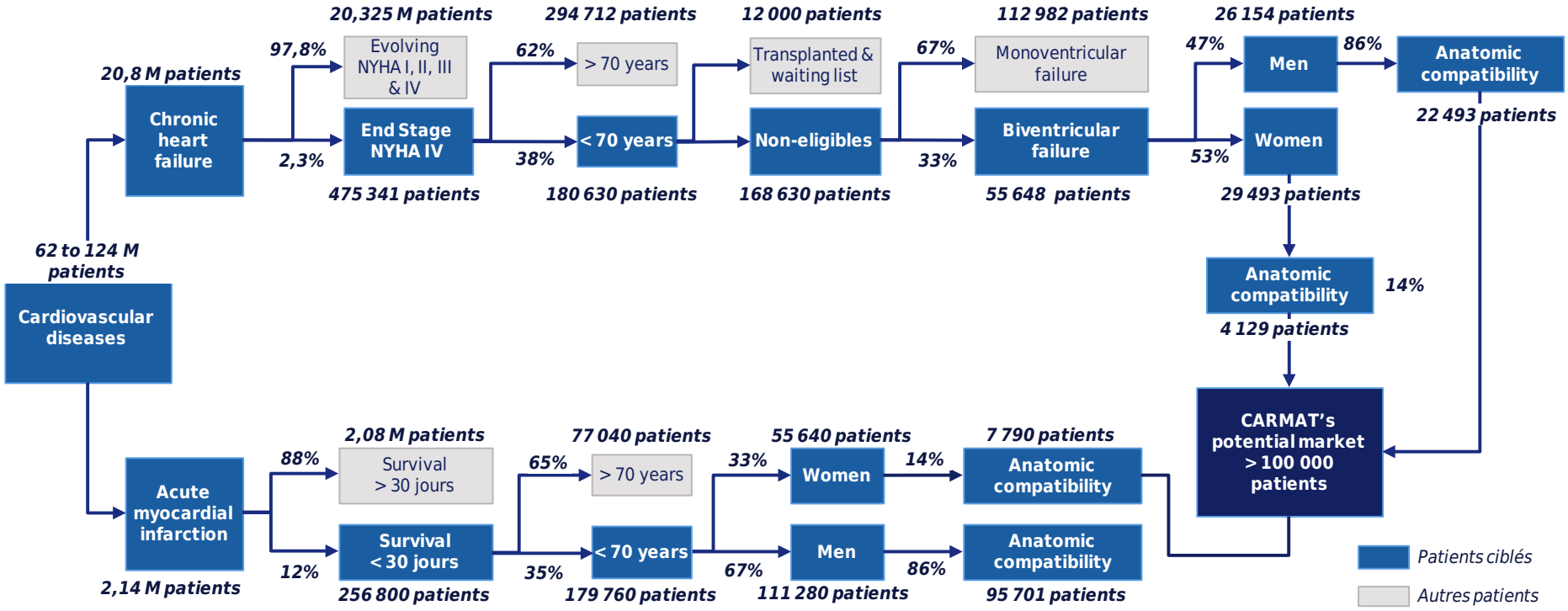
Estimates for the total artificial heart market could therefore stand at around 125,000 prostheses in cases of class IV end stage chronic heart failure and irreversible acute heart failure following a myocardial infarction for men and women, taking into consideration their respective anatomical structures, in Europe and the United States (refer to the methodological note on the following page).

On a purely prospective basis, it can be expected that, in the years to come, the incidence of acute myocardial infarction decreases, while chronic heart failure increases, as mentioned in paragraph 6.2.1 Pathologies and Etiologies of Heart Failure.

These estimations are summarized in the following illustration.

63 http://www.cdc.gov/dhdsp/atlas/2010_heart_atlas/docs/Executive_Summary.pdf - page 16
64 Yeh RW et al. Population Trends in the Incidence and Outcomes of Acute Myocardial Infarction. N Engl J Med 2010; 362:2155-2165
65 http://www.cdc.gov/dhdsp/atlas/2010_heart_atlas/docs/Executive_Summary.pdf - page 16
66 Roger VL. Epidemiology of myocardial infarction. Med Clin North Am. 2007 July; 91(4): 537–ix- Table 1
67 Lundblad D et al. Gender differences in trends of acute myocardial infarction events: The Northern Sweden MONICA study 1985 – 2004. BMC Cardiovascular Disorders 2008, 8:17
68 Vaccarino V et al. Sex Differences in Mortality After Acute Myocardial Infarction Changes From 1994 to 2006. Arch Intern Med. 2009;169(19):1767-1774.

NUMBER OF PATIENTS TARGETED FOR THE CARMAT TOTAL ARTIFICIAL HEART IN EUROPE[69] AND THE UNITED STATES



Source CARMAT – Potential market for the total artificial heart

METHODOLOGICAL NOTE

Estimation established based on the hypotheses detailed and referenced in the previous pages. The Company strives to update this information based on the most recent pertinent scientific publications, and to reduce the number of references so as to avoid the bias incurred by the aggregation of populations or different methodologies. Nevertheless, no official epidemiological reference data exists for these indications and the geographical area considered. Consequently the populations studied can differ from those defined for the indications targeted by the CARMAT artificial heart. For example, the available data is most often split by age at around 65 then 75 years old. The Company has, in this case, cautiously estimated the population of less than 70 years based on the demographic data of the considered population. Likewise, it has not been possible to find references on the proportion of patients suffering from terminal phase cancer (life expectancy <6 months) in the population with terminal heart failure. This exclusion criterion could not therefore be taken into account. However, The Company estimated that this situation has little influence on the estimation. This data is provided solely as an indication and does not constitute, in any way, a commitment by the company on the size of the market at the time of the commercialization of the CARMAT heart or a sales forecast.

[69] 51 member countries of the European Society of Cardiology, notably including Eastern Europe, Russia and the Gulf countries.

6.4.2 Technologies and market players

Heart transplantation, especially in light of the lack of organs, can only cover the needs of patients with class IV terminal heart failure (refer to paragraph 6.2.4 Available treatments). Alternative medical devices exist, – often grouped under the term mechanical assisted circulatory support.

The principal market players are Thoratec® and Heartware® in the field of ventricular assistance, and Syncardia in the field of artificial hearts.

These devices are indicated in two cases:

- While **waiting for a transplant** (*Bridge to Transplant: BTT*)

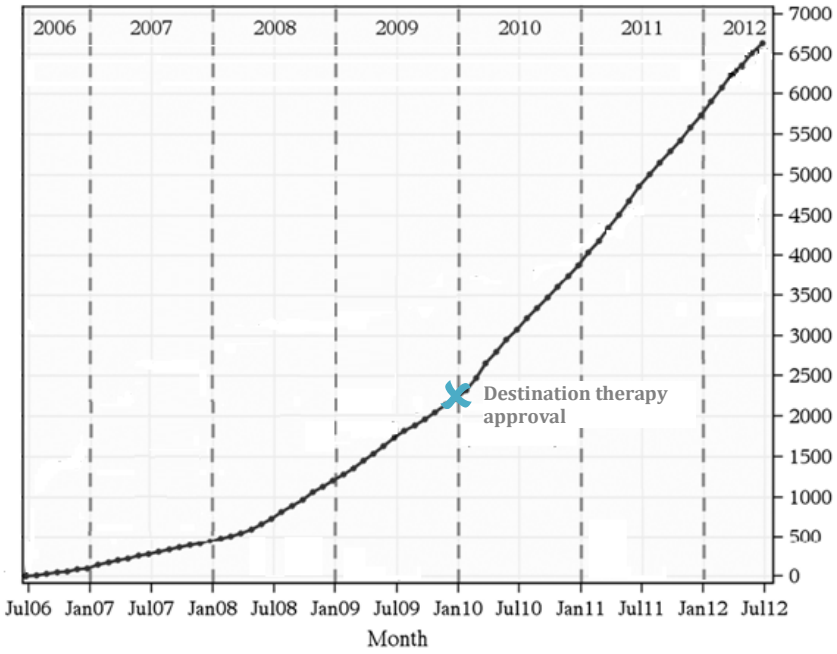
  The device is implanted temporarily until an organ is available or until the patient's condition improves sufficiently to tolerate the operation. Considering the thromboembolic or infectious complications of the available devices, they were, until recently, used mostly for this short-term indication. It was also limited by the cost – the cost of the implantation of the device adding to the cost of the transplant.

- As a **definitive treatment** (*Destination Therapy: DT*)

  This indication was, until recently, reserved for a very small number of patients who were ineligible for a transplant – or who did not wish to have a transplant. However, under the pressure of an exploding prevalence and the shortage of organs, numerous patients temporarily implanted actually become destination therapy patients.

  Furthermore, since the first authorization by the FDA in 2010 for this indication for the HeartMate® II, it has considerably developed in North America as well as in other European countries such as Germany. Since then, HeartWare has started a clinical trial in the United States to obtain this indication and in March 2012 Syncardia obtained the designation of Humanitarian device as first-line treatment to Destination therapy (refer to paragraph 6.4.2.2 Orthotopic total artificial heart).

Number of patients - Accumulated prospective enrollment



Source – Adapted from the Interagency Register for Mechanical Assisted Circulatory Systems (INTERMACS)[70]

NB: The devices indicated as waiting for recovery (*Bridge to Recovery : BTR*) are not mentioned here. Indeed, their indications and their technologies are very different. They can provide only a limited assistance (around 2 l/min vs 9 l for the CARMAT heart) for a very limited time (from a few hours to a few days) and are intended for patients without permanent ventricular deterioration, who have need of temporary hemodynamic support, for example after a surgical intervention or a post-traumatic hemorrhage.

[70] Kirklin JK et al. The Fifth INTERMACS Annual Report. J Heart Lung Transplant 2012;32:141–56 - February 2013
www.intermacs.org : 9472 patients by 29 April 2013 (Essentially a North American Register, a EUROMACS register is being created).

Considering the expected advantages of the numerous innovations of the CARMAT bioprosthetic artificial heart project, and notably those aiming at a long-term use with reduced complications, CARMAT wishes to target this rapidly growing indication, which in 2012 represented 44% of the indications for mechanical assisted circulatory support in the North American Register[67].

The aim of *Destination Therapy* is to offer a system providing a real quality of life to the patient, i.e. a reasonable autonomy and a return home, and even a professional or social life, which is accompanied by an increase of at least 2 NYHA classes, without major complications.

The devices can then be distinguished into two categories:

6.4.2.1 Ventricular Assist Device (VAD – Dispositifs d'Assistance Ventriculaire: DAV)

These devices are often and incorrectly referred to by the media as artificial hearts.

However, as their name suggests, these devices work in parallel with the natural heart to help it, supplement its flow rate to satisfy the metabolic needs but not to replace it. The historical leader of this category is the company Thoratec®, with the HeartMate II®, - and with the company HeartWare® as the prominent challenger. Thoratec® announced having passed the 13,000 mark for HeartMate II® implants in 2012.

In theory these devices can assist the left ventricle *(Left Ventricular Assist Device – LVAD)* or the right ventricle *(Right Ventricular Assist Device – RVAD)* or both. In the latter case they are called biventricular assist devices *(BiVAD)*. To date, however, there are no implantable devices approved for the right ventricle or a biventricular application, all the devices having been designed for the left side of the heart.

Nevertheless, the wider diffusion of these left ventricular assist devices has led to an increase in the need for biventricular assistance. Indeed, the development of a right heart failure is a major complication of left ventricular assist devices. The additional indication for a right ventricular assist device (following the implantation of a left ventricular assist device) represents up to 37% of cases[71].

Methods for evaluating this risk are being developed to identify patients who would benefit from a biventricular assist device at an early stage, as it has been demonstrated that an early implantation results in a very significant improvement in survival rates compared to a late implantation[72]. This could contribute to an increase in the use of biventricular devices, such as the one from CARMAT, as a first-line treatment.

"Miniature" devices, such as the rotating centrifugal pumps fixed on the ventricles, are conceptually attractive. Nevertheless, there remains numerous obstacles to their definitive use in the biventricular indication.

These non-pulsating miniature devices, such as the HVAD® by HeartWare® are designed to supplement, to assist the cardiac function and not as a substitute for it. They consequently have limitations in terms of their flow rate. The flow rate of the centrifugal pumps of these left ventricular assist devices is determined by the specific geometry of each device, the speed of rotation of the pumps in turns per minute, and the difference in pressure between the entry into the pump (ventricular pressure) and the ejection from the pump (aortic pressure).

The blood pressures are very different in the right side of the heart. On the left side, the blood needs to reach all the organs, the brain at the highest point, the extremities of the limbs, at the furthest. On the right side, it is "sufficient" to send the blood to the neighboring lungs for reoxygenation. The actual design of a left ventricular assist device with a centrifugal pump and the constant flow rate would have to be significantly modified to adapt it to a right ventricular assist device.

To our knowledge, no manufacturer of implantable left ventricular assist devices with centrifugal or axial pumps has submitted a file for approval as a right ventricular assist device[73].

Some left ventricular assist devices with centrifugal pumps and a constant flow rate have been experimentally

---

71 Potapov EV, et al. Tricuspid incompetence and geometry of the right ventricle as predictors of right ventricular function after implantation of a left ventricular assist device. J Heart Lung Transplant 2008;27:1275-81.
Dang NC, et al. Right heart failure after left ventricular assist device implantation in patients with chronic congestive heart failure. J Heart Lung Transplant 2006;25:1-6.
Klotz S, et al. Pre-operative prediction of post–VAD implant mortality using easily accessible clinical parameters. J Heart Lung Transplant 2010;29:45-52.
Boyle AJ, et al. Predictors of poor RV function following LVAD implantation. J Heart Lung Transplant 2003;22:S205

72 Fitzpatrick JR, et al. Risk score derived from pre-operative data analysis predicts the need for biventricular mechanical circulatory support. J Heart Lung Transplant 2008;27:1286-92.
Fitzpatrick JR, et al. Early planned institution of biventricular mechanical circulatory support results in improved outcomes compared with delayed conversion of a left ventricular assist device to a biventricular assist device. J Thorac Cardiovasc Surg 2009;137:971-977.

73 HeartWare® Stockholder update – January 2010: http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MjYyMjF8Q2hpbGRJRD0tMXxUeXBlPTM=&t= 1

tested as biventricular assist devices[74]. Very few publications exist on the subject. All indicate that the design for the left side of the heart is a major flaw: currently "the right pump, in a circuit of normal pulmonary pressure, would pump more volume than the left and would result in pulmonary edema."[71]

The options for avoiding this major complication are:

- The reduction of the pump speed below the recommended values, which would cause a thrombosis of the pump or rotor instability[71]. This option must therefore be dismissed as it goes against the actual design of the pump.
- The narrowing of the ejection duct, which would cause the increase in the total resistance of the pump and would allow the necessary volume to be pumped, while staying in the rotation speed limits of the pump.

However, in patients with high pulmonary vascular resistance, and in particular when it is irreversible, the narrowing should be less. [...] A system of adjustable narrowing of the ejection duct would therefore be desirable.[71]

A recently presented animal study concluded that "in the case of biventricular support, the adjustment of flow rate of the right ventricular assist device by adjusting the rotational speed of the pump is limited, even when using an ejection duct with a reduced diameter".[75]

How can these adjustments be achieved, how can they be made dynamic and automatic, in short self-regulated? No answer has yet been found to these questions. It is nevertheless vital for the patients at high risk whose long-term hemodynamic stability can, in no way, be guaranteed. It is this self-regulation that the CARMAT artificial heart project proposes.

In the case of biventricular support, each device is controlled independently by two separate portable controllers. The absence of communication between the two controllers severely limits the synchronization between the left ventricular assist device and the right ventricular assist device, as well as the response to the physiological demands. The necessity to wear two controllers and two battery packs obviously limits the quality of life.

To date, the majority of ventricular assist devices with rotatory pumps have fixed rotation speeds that can only be altered by the doctor possessing the access codes. The absence of synchronization therefore weighs heavily on patient recovery as well as on device management (use of medical resources for the adjustment).

Moreover, fixed flow pumps are generally set on the slow rotation speeds allowing the native left ventricle to create a left ventricular pressure, and consequently a pulsatile flow. However, in very ill patients for whom biventricular support is indicated, the native ventricle is no longer capable of generating a left ventricular pressure. In this case, the higher rotation speeds required of the centrifugal pump lead to a non-pulsatile flow. In these patients, the renal and hepatic functions are most often already compromised and the long-term effects of a non-pulsatile flow on the organs have not been studied.

Also, in the context of the use of two systems, one on the left and one on the right, the presence of 2 percutaneous cables also noticeably increases the risk of infection, already high with only one system[76].

The limitations are therefore inherent to the design of these left ventricular assist devices. They remain an attractive solution for temporary left ventricular assist devices, a population of patients completely different from those targeted by CARMAT.

The physiological self-regulation of the CARMAT device answers the need of synchronization between the pulmonary and the systemic circulation. The instantaneous response to physiological changes is a critical element for the rehabilitation of the high risk group of patients with biventricular heart failure.

While assistance is provided in parallel to the native heart, the latter continues to deteriorate progressively. Notably, with accumulated experience of long-term support, it is found that the phenomena of native aortic valve regurgitation[77] (up to 38% of patients) and serious ventricular arrhythmia[78] (up to 31% of patients) present rapidly in the medium term. These complications can require other expensive and risky procedures such as the implantation of a valve or a defibrillator. They obviously do not exist in the case of a replacement. On the other hand, they can lead patients suffering from such complications to need an emergency transplant or the implantation of a biventricular replacement device such as the one by CARMAT.

---

74 Hetzer R et al. Long-term biventricular support with the HeartWare implantable continuous flow pump. J Heart Lung Transplant 2010;29:822-4.
Loforte A et al. Biventricular support with the HeartWare implantable continuous flow pump: An additional contribution. J Heart Lung Transplant 2010;29:1443-4.

75 Meyer AL et al. Biventricular Implantation of the HeartWare HVAD in an Animal Study. 2011 Annual Meeting and Scientific Sessions, The International Society for Heart and Lung Transplantation http://www.abstracts2view.com/ishlt/

76 Zierer A. Late-onset driveline infections: the Achilles' heel of prolonged left ventricular assist device support. Ann Thorac Surg. 2007 Aug;84(2):515-20.

77 Toda K et al. Late aortic insufficiency related to poor prognosis during left ventricular assist device support Ann Thorac Surg. 2011 Sep;92(3):929-34.

78 Brenyo A et al. Risk of mortality for ventricular arrhythmia in ambulatory LVAD patients. J Cardiovasc Electrophysiol. 2012 May;23(5):515-20.

None of the devices actually approved, and originally designed for short-term implantation while waiting for a transplant, have developed effective solutions to prevent complications from the implantation of thrombogenic materials.

Metals and polymers, except if their design or their nature leads to surface proteinization, such as ePTFE and the bovine pericardium used exclusively by CARMAT for all the surfaces in contact with blood, are thrombogenic: they activate the coagulation cascade and therefore create blood clots, which can potentially migrate into dangerous areas such as the brain – with a risk of stroke (up to 20% of patients[79]) - or the lungs at the risk of pulmonary embolisms.

To limit these complications, these devices require a heavy anticoagulant treatment for life (blood-thinners). This treatment is restrictive, complicated and unstable, and itself leads to complications[80]: too much risks severe hemorrhage, not enough risks a thrombosis or a stroke.

The CARMAT bioprosthetic artificial heart project is also the only device designed to limit thromboembolic risk by using biological, hybrid or synthetic materials with a proven long-term clinical hemocompatibility. Even if an anticoagulation treatment is needed, it will be limited in intensity and restrictions, and could more easily be temporarily interrupted if necessary.

It can be seen that these devices are intended for different patients from those targeted by CARMAT and are barely substitutable. Nevertheless, ventricular assist devices allow many patients to benefit from a temporary or long-term alternative to transplantation. Their growth is strong and has allowed the development of a medical and scientific community dedicated to the problems of circulatory support – which will be a conducive environment for the first clinical, then environmental steps of the CARMAT bioprosthetic artificial heart project. Their success or difficulties have also drawn the attention of the financial community - notably North America, which constitutes another point of interest for CARMAT. Certain listed companies have known a successful and interesting stock market.

6.4.2.2 Orthotopic "total" artificial heart (Total Artificial Heart: TAH)

Much like a heart transplant procedure, these devices replace both failing ventricles, by implanting in their place (orthotopic replacement) two ventricular volumes and a system that ensures a blood flow. The CARMAT bioprosthetic artificial heart project belongs to this category.

The only total artificial heart currently on the market in Europe and the United States belongs to the eponymous private equity company Syncardia[81].

This device was designed in the 1970s and implanted for the first time in 1982 - under the name of Jarvik 7. The patient survived 112 days. In 1985, a patient for the first time reached the transplantation stage after having survived 9 days with an artificial heart. In 1990, the FDA closed the company Symbion Inc., which held the rights for the Jarvik 7 and stopped the clinical study in progress (IDE*) – due to the violation of their regulations. The technology was recovered by a university center in Arizona under the name CardioWest™. A new clinical study started in 1992 in the United States, lasted 10 years and resulted in FDA approval in 2004 for a bridge to transplant indication and CE marking in 2005. In the meantime, a new privately funded company, Syncardia Systems Inc., was created in 2001 to prepare and then ensure the commercialization. Syncardia announced the 1000th implantation of its artificial heart in February 2012, which is 19 years after the first implant in December 1982. The North American Register INTERMACS records 136 commercialized implants (not counting studies) between 2006 and 2012[82].

There is also an artificial heart whose design dates back more than 40 years. Its functioning is based on a pneumatic actuation. The internal polyurethane diaphragms are activated by the compressed air, generated by a compressor, which is itself powered electrically. Two percutaneous plastic tubes of around 2 meters long (7 feet) join the device to the external compressor.

Until the CE marking of the first portable compressor on a trolley in 2006, all patients had to stay in hospital connected to a compressor/controller of several cubic meters - familiarly known as "Big Blue" by the health care teams - until their transplantation. In the FDA study (referenced on the company website), the average waiting time was 79 days, with a maximum of 411 days and a survival of 50% at 48 weeks. This first generation of portable compressors was approved in the 2nd semester 2012 in the United States, and a second generation - the Freedom™ portable driver – is currently in clinical trials (CE marked in 2010). The possibility of a return home while

---

79 Backes D et al. Cerebrovascular complications of left ventricular assist devices. Eur J Cardiothorac Surg (2012). doi: 10.1093/ejcts/ezs320.

80 Rossi M et al. What is the optimal anticoagulation in patients with a left ventricular assist device? Interact CardioVasc Thorac Surg(2012)doi: 10.1093/icvts/ivs297.

81 www.syncardia.com – all the information concerning Syncardia are taken from their internet site, except where specifically mentioned.

82 Kirklin JK et al. The Fifth INTERMACS Annual Report. J Heart Lung Transplant 2012;32:141–56 - February 2013 (Essentially the North American Register, a EUROMACS register is being created).

waiting for an organ has had a snowball effect on Syncardia sales (400% from 2010 to 2012). This of course contributes to the quality of life but also substantial savings to the health care system.

Despite being relatively short-term implantations (on average 79 days), the rate of complications[83] – particularly infectious (69.5% for 95 patients), hemorrhagic (44%) and thromboembolic (22%) is high – probably for the same reasons as those described in the previous paragraph concerning the assist systems (design and materials).

Moreover, in 2012 and 2013 Syncardia obtained the designation *Humanitarian Use Device* (*HUD*: device for compassionate use) for its 70cc and 50cc models as first-line treatment to destination therapy, as well as a pediatric indication for the latter. This could allow the company to commercialize, after requesting then obtaining the corresponding exemption (*HDE: Humanitarian Device Exemption*), a maximum of 4000 devices per year in the United States for each model in these indications.

CARMAT can only welcome the regulatory or commercial success of the market players. Indeed, they maintain the attention of the scientific and financial communities, highlighting the expected advantages of CARMAT's innovations and preparing the route.

Compared to a transplant, the respective advantages and disadvantages of current systems are summarized in the following table:[84]

	Transplantation	**Assist systems and artificial heart**
Advantages	State of the art destination therapy Normal physical activity possible Long-term prognosis favorable	Immediately available Planned intervention Good level of physical activity
Disadvantages	Lack of donors and organs Risk of rejection The transplanted organ is exposed to diseases Risk of coronary disease of the transplanted organ Risks linked to immunosuppression Renal failure Neoplasia (cancer) Susceptibility to infections Diabetes Hypertension	Complete dependence on the device Autonomy dependent on a continuous electrical power supply Infection of the percutaneous cable(s) Risk linked to anticoagulation Severe hemorrhage Stroke *Regarding assist devices:* Serious cardiac arrhythmias Aortic regurgitation.

Thanks to the use of breakthrough technologies, such as biological or hemocompatible materials to limit the risks linked to anticoagulation, or fuel cells to increase patient's autonomy and quality of life, CARMAT aims to appreciably reduce the majority of these disadvantages and to offer a real alternative to transplantation.

NB: The AbioCor artificial heart® from the company Abiomed® is no longer detailed in this document. Indeed, despite the device having obtained a compassionate authorization (HDE) from the FDA in 2006, no implants seem to have been performed since 2009 and the company has since totally reorientated its strategy towards the waiting for recovery (Bridge to Recovery: BTR) indication with a system called Impella®. The recent presentations to investors available on the company's website[85] no longer mention either the product AbioCor®, or its market. CARMAT therefore considers that Abiomed® is no longer part of the market players for the artificial heart or long-term assist devices. Likewise, the other projects – essentially universities driven – do not seem to have evolved since the previous edition of this present document. The reader is invited to refer to the Company's previous source or reference documents for this historical information, as well as to paragraph 4.1.3 Risks linked to the competition.

6.4.3 Marketing strategy

The company will be able to market its product all over Europe once it has been granted the CE marking. To date, the Company plans to proceed with this commercialization by the intermediary of a direct sales force in the principal European countries, at least during the first phase.

This choice stems from two factors:

- The need for technical and clinical support provided principally by the Company in the training and launch phases;
- A concentric marketing strategy, which consists of focusing first of all on the core targets, i.e. the active cardiac transplant centers (at least 20 cardiac transplants per year), then on the centers less active, and

83 FDA (2004) – Summary of Safety and Effectiveness Data – PO30011 – available on the company website or that of the FDA.

84 Adapted from Strüber M et al. The Current Status of Heart Transplantation and the Development of "Artificial Heart Systems". Dtsch Arztebl Int 2009; 106(28–29): 471-7

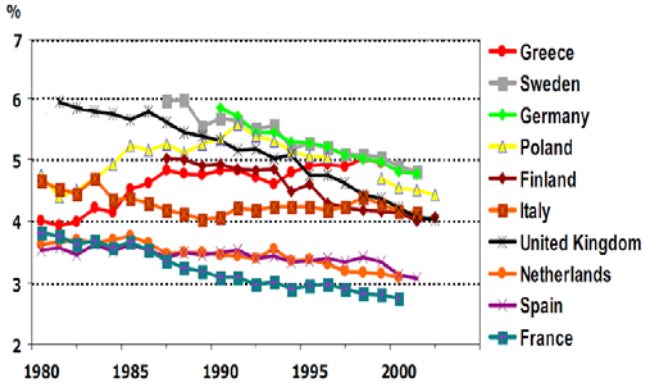
85 www.abiomed.com – all the information concerning Abiomed® are taken from their internet site, except where specifically mentioned.

then on the centers that have dedicated heart failure teams (surgery and cardiology) but that do not have transplant approval, then finally all cardiac surgery centers.

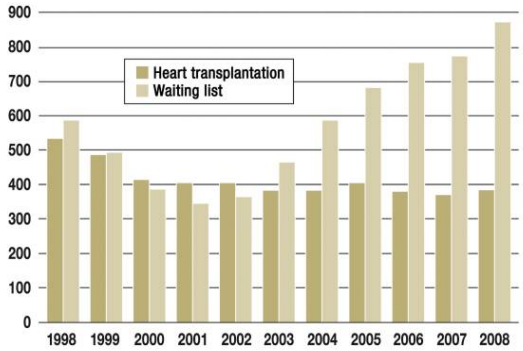
This approach should allow incremental investment. Indeed, considering the very limited number of organs, the number of truly active cardiac transplant centers - i.e. who make use of their approval and perform a sufficient volume of transplants to maintain available and trained teams - is very low, less than around ten in each of the major countries. For example, only 8 centers in Germany (out of 79 cardiac surgery centers), 7 in France (out of 64 centers) and 2 in the United Kingdom, perform more than 20 transplants a year.

The Company therefore considers that, to cover this target consisting only of centers of excellence, a direct sales force is the most appropriate response.

With regards to the order in which the different European countries will be tackled, it will depend on the prevalence of cardiovascular diseases, on the size of the centers, and on the reimbursement procedures available for innovation. Germany comes first in these three criteria.



Cardiovascular disease mortality (Europe)[86]



Transplantation and waiting list - Germany[87]

In 2012, for a population 25% larger than that of France and a prevalence of cardiovascular diseases of almost double, Germany[88] performed less heart transplants than France[89] (324 vs. 398) and had a waiting list of more than triple the size (972 vs. 284).

Consequently, it is the country with the most experience of circulatory assist systems (even ahead of the United States where innovative devices are generally approved much later than in Europe), it has the largest European centers in terms of volume and has procedures for early reimbursement for innovation.

In Germany, a patient needing a transplant is immediately offered a choice between a transplant and a device, fully aware that the choice of a device will remove them from the priority list for a transplant. Nevertheless, it has been shown that the choice of a device, when it is not a last minute choice when the situation is very deteriorated, gives the patient the same life expectancy as with a transplant[90,91].

Italy is also an attractive market for these three criteria, despite the lack of centralized decisions (approval at the regional level).

Establishing centers of excellence with high volume in selected countries as early as the clinical phase would allow the rationalization of clinical and commercial resources, the development of "advocates" and training centers, and eventually the consideration of the indirect distribution platforms for other countries.

The development of a commercial approach to the American market is premature at this stage, but will probably require a collaboration.

With regards to the pricing strategy, the price objective of the CARMAT bioprosthetic artificial heart project is between €140,000 and €180,000. This price range is in line with current practices of reimbursement for available devices. For example, a left mono-ventricular implantable assist device is, today, reimbursed between €60,000 and

---

86 Adapted from: European Heart Network – Cardiovascular statistics 2008 - http://www.ehnheart.org/cvd-statistics.html.

87 Translated by Strüber M et al. The current status of heart transplantation and the development of "artificial heart systems". Dtsch Arztebl Int. 2009;106(28-29):471–477.

88 Eurotransplant (Register of organ donations and transplantations for Germany, Belgium, the Netherlands, Austria, Croatia and Slovenia). http://www.eurotransplant.org/cms/mediaobject.php?file=Year-Statistics-20113.pdf

89 Removal and transplant activity: organs, tissue and cells. National summary 2010 - October edition 2011 - Data extraction march 2011 - French Biomedicine Agency website.

90 Komoda T et al. Influence of new Eurotransplant heart allocation policy on outcome of heart transplant J Heart Lung Transplant. 2008 Oct;27(10):1108-14.

91 Beyersdorf F. Heart Transplant and Artificial Heart Systems. Dtsch Arztebl Int. 2009 July; 106(28-29): 469–470.

€110,000 in Europe. Being a system that consists of an implantable part, but also external parts and associated pre- and post-operational services, the adjustment variables are many and would allow the adaptation to volume and reimbursement conditions specific to each center or each market.

It must be noted that the absence of reimbursement is not synonymous to the absence of sales or revenue. Indeed, hospitals possessing specific budgets to finance innovation and pre-reimbursement funding arrangements exist in many countries.

The reimbursement procedures are many and different for each country. Therefore, the sales force will initially consist, on the one hand, of very clinical profiles to ensure the training and adoption of the device by the medical-surgical community, and, on the other hand, of specialists in reimbursement and negotiations with hospital groups or public and private insurers.

6.4.4 Industrial strategy

The industrialization phase, which will commence as soon as the conclusions from the first wave of clinical trials are known, will consist in setting up production facilities at CARMAT and its subcontractors.

6.4.4.1 The choice of a model of integration

Supported by an experienced research department, the Company designs or specifies all of the elements making up the CARMAT artificial heart project, including its external elements as well as all the ancillary tools, packaging, systems and methods intended for the validation (test benches) and production of components, of the sub-assemblies and of the system (clean room). It has also acquired strong intellectual property rights concerning all of these elements. Nevertheless, considering the very high number of specialties and expertise involved in each component and sub-assembly of the system, it was impossible to develop and even less so to produce them all internally.

For example, the Company did not develop and produce the pressure sensors but used a new and precise miniature model used in aeronautics. It did, on the other hand, develop all the characterization procedures for these sensors, as well as specifying the electronics and the software code that allows them to be used in the prosthesis. These electronics are also subcontracted, the manufacturing of the printed circuit boards requiring very high manufacturing volumes to make the installation and the equipment profitable, volumes that the Company would not achieve on the production of the artificial heart alone.

The Company has therefore adopted a model of integration: it designs and specifies, but entrusts the manufacturing of most of the elements to specialized subcontractors, recognized in their domain of activity and selected following rigorous consultation - elements that are then integrated into the Company's clean room.

CARMAT integrates the components and sub-assemblies provided by manufacturers of very different sizes, methods and areas of expertise. Thus the Company has more than 80 manufacturers of elements or services linked to the implantable part of the CARMAT system.

The challenge for a young company like CARMAT is to unite these companies of diverse origins and methods – some being large industrial subcontractors for the space domain, others small businesses, almost cottage industries – around common and strict methods and processes, such as is required in the universe of medical technologies and the regulatory authorities. This coordination relates to technical aspects, logistics and in particular, quality. Great efforts have been made by the Company to validate and qualify these suppliers, so that each one of them conforms to the very high level of quality standards required by the active implantable medical device domain.

CARMATS's mode of operation, its methods, and its integration process are therefore identical to those of a large group in the management of a project as complex as that of the bioprosthetic total heart. The creation of this network constitutes an accomplishment in its own right, and creates value for CARMAT as well as for all French industry.

In parallel, and as announced at the time of the capital increase in July 2011, the Company actively continues a strategy of secondary source development, in particular the transformation of critical raw materials or the supply of key components. To initiate a second source involves the selection of a new supplier, help in producing the first parts, then qualifying them while ensuring that each part comes from a source that is strictly identical to those coming from another source, including the documentation which comes with them to satisfy traceability. It is important work but vital to reduce the dependency of the Company with regards to their suppliers and to anticipate the industrialization phase.

6.4.4.2 Internalized production and production capacities

In contrast, the Company has kept and retained internally the production of the biosynthetic elements of the prosthesis (ventricular biomembrane, ventricular coverings and atrial connection interfaces), protected by numerous patents and by industrial secrets.

The clean room available to CARMAT is fully completed. It has two distinct areas, one is ISO class 5 used for the manufacturing and sterilization of biosynthetic and ventricular internal elements, the other is ISO class 7 where other elements, essentially outsourced, are assembled around the sterile "heart of the heart". The manufacturing, integration and sterilization of the prosthesis are also performed in this controlled environment by specialized and highly qualified personnel.

More than thirty prostheses have been produced or reconditioned for the needs of preclinical tests, around ten additional prostheses are being manufactured for the clinical trials. It must be noted that the implantation of each patient requires that two prostheses be present in the implantation center for one procedure, in case a problem – for example accidental unsterilization – occurs.

The Company has the objective to produce around 25 systems in 2013, and to reach a production rhythm of approximately 40 systems per month in 2017. The maximum production capacity inside CARMAT's clean room is 200 prostheses a year. Additional production capacities will have to be considered for larger volumes.

6.4.4.3 The main partners

In connection with the OSEO Innovation financing (refer to paragraph 22 Important contracts), the total artificial heart project is based around CARMAT as leader, with four other partners in complementary research and development areas, thereby allowing it to participate in the development of a high-technology sector in the area of medical devices:

- DEDIENNE SANTE is an SME specializing in the design, manufacture, market introduction and distribution of surgical implants, mainly in the orthopedic domain. In connection with the total artificial heart project, DEDIENNE SANTE is developing assemblies in biocompatible PEEK which make up the structural parts of the prosthesis. This development is being undertaken in a dedicated environment at CARMAT, thus preventing any contamination resulting from non-implantable materials.
- IREIS (formally known as HEF R&D) is a subsidiary of the HEF group, specializing in surface engineering and is behind the invention of several tribological and anti-corrosion surface treatments and coatings. In connection with the total artificial heart project, IREIS performs the qualification of the motor-pump unit, which is a sensitive part of the prosthesis.
- PAXITECH is a technological spin-off of the CEA created in September 2003, whose objective is to produce and market portable fuel cells and fuel cell components, regardless of their power range. In connection with the total artificial heart project, PAXITECH is developing a fuel cell which would be used in the long term as a source of portable external energy which will give the patient over twelve hours' autonomy. PAXITECH also carries out integration of the fuel cell with the hydrogen tank so as to obtain an alternative solution to portable batteries.
- Benefiting from almost 50 years' experience (company created in 1959), VIGNAL ARTRU INDUSTRIES ("VAI - Pack'Aero group") is an SME which specialized in the creation of high precision mechanical microsystems. In connection with the total artificial heart project, VAI produces the "motor-pump unit" (MPU) assemblies, made up of two micro-pumps and a duct. VAI is in charge of integrating these units, the various characterization and honing tests, and the acceptance testing for motor-pump unit assemblies.

6.4.5 Regulatory strategy

6.4.5.1 European background

The CARMAT heart is an active implantable medical device (AIMD) and must, in particular, satisfy the Safety Requirements of directives 90/385/ EEC and 93/42/EEC to obtain the CE marking. It is a very rigorous process of which CARMAT has already successfully passed the first step thanks to the ISO 13485-9001 certification in July 2011. The annual audit of re-certification has also been successfully passed in May 2012.

The Safety Regulations mentioned in various directives applicable to medical devices are as follows. The medical device must not compromise the clinical state nor patient security. Additionally, they must not present risks for the people who implant them, nor for third parties. These devices are required to meet the performances determined by the manufacturer. They must be designed such that they can resist storage and transportation conditions.

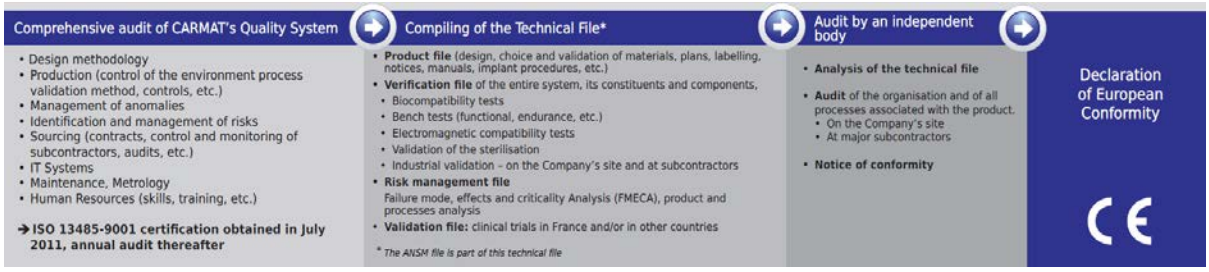
These requirements are also written in more general terms in order to cover a large range of technologies. The manufacturer must review each Safety Regulation in order to determine if it applies to the device, then identify the harmonized European standard that allows the conformity to that Safety Regulation to be shown. The obligation to be in conformity with the Safety Regulations must be the priority for the manufacturer in order to ensure that all the necessary measures have been taken so that the device does not compromise the security and health of the patients, of the user and, if required, of other people once installed, maintained and used correctly, according to the planned use, it being understood that the eventual risks linked to its use constitute acceptable risks with regard to the benefit brought to the patient and compatible with a high level of protection of health and safety.

Conformity to the Safety Regulations must be considered both as an objective (respect for safety and health), and as a means of obtaining the objective. According to the European directives, each stage of the CE marking process must take into account, in addition to the considerations of security and planned usage of the device, other aspects such as the design or properties related to the construction, protection against radiation, mechanical,

thermal or electrical risks, or function measurements or even labeling.

The CE marking by declaration of CE conformity is based on a complete audit of the quality assurance system with an assessment of all the Company's processes and focusing on activities linked to the product. An exhaustive technical file must then be prepared, consisting of, apart from the design elements, the risk management file and all the verification and validation data – in particular the clinical trials results. Then, the Company will have to submit to an audit by an independent notified body which will verify the technical file and all the processes linked to the product and the organization, at CARMAT, and if necessary at the subcontractors. Once this audit has been successfully passed, CARMAT will be able to obtain the CE marking, which authorizes the commercialization of the product throughout the European community. Certain member states have put in place additional conditions concerning, for example, the registration or notification of market introduction.

In the event of successful clinical trials, and subject to the absence of difficulties, in particular in the rhythm of patient recruitment, the file for CE marking of the total artificial heart project could be submitted in 2014. So, the validation process takes, in general, from six weeks to three months. This process is summarized in the illustration below.



Source CARMAT – CE marking procedure (adapted from the CARMAT Shareholders Letter n°1 – January 2012)

6.4.5.2 American Regulations

The market introduction of the CARMAT heart in the United States of America is subject to obtaining a PMA ("Pre-Market Approval") delivered by the FDA ("Food & Drug Administration"). Before submitting a PMA application to the FDA, CARMAT will have to complete the existing clinical file with the data from the new clinical study being performed on a larger population.

The realization of this study in the United States is itself subject to obtaining an IDE ("Investigational Device Exemption") authorization from the FDA, based, among other things, on all the preclinical data (technical trials, animal tests, etc.) and clinical data collected in other countries.

With a view to prudence and to avoid spreading itself too thinly during the commercial launch in Europe, the Company has, for the moment, planned to wait a year after the European commercial launch before starting its regulatory activities in the United States.

This cautious strategy could allow, on the one hand, the integration of certain clinical data acquired in Europe into the FDA file (all the European centers selected for the studies have indeed agreed) and on the other hand the self-financing – at least in part – of this new regulatory effort.

6.4.6 Innovation strategy - application of know-how

CARMAT is a young enterprise, that has existed for barely five years, but it already enjoys – thanks to its involvement with the bioprosthetic total artificial heart project and thanks to its teams – an exceptional and unique dual expertise accumulated over 15 years of development and collaboration with the medical world and the world of space and aeronautics, in the application of biomaterials and advanced technologies in the field of the total artificial heart.

The way it works, its methods, procedures and development process are like those of any large group in managing a project as complex as that of the bioprosthetic total artificial heart.

The medical contribution, especially from Prof. Alain Carpentier, has enabled the Company to establish an experience and an expertise in the fields of human physiology, development of a complex bioprosthesis, simulation of human cardiovascular circulation, and the development of hemocompatible materials.

The contribution in the areas of aeronautics and space provided by the EADS group and its accumulated experience in satellites in particular has been realized by the application of a high tech expertise acquired in onboard electronics and computing. Miniaturized control and data processing systems enabled the Company to put in place reliable tools for measuring and detecting anomalies and ensure the proper functioning of the CARMAT bioprosthesis.

Over and above the contributions of the world of medicine and the world of space and aeronautics, the Company

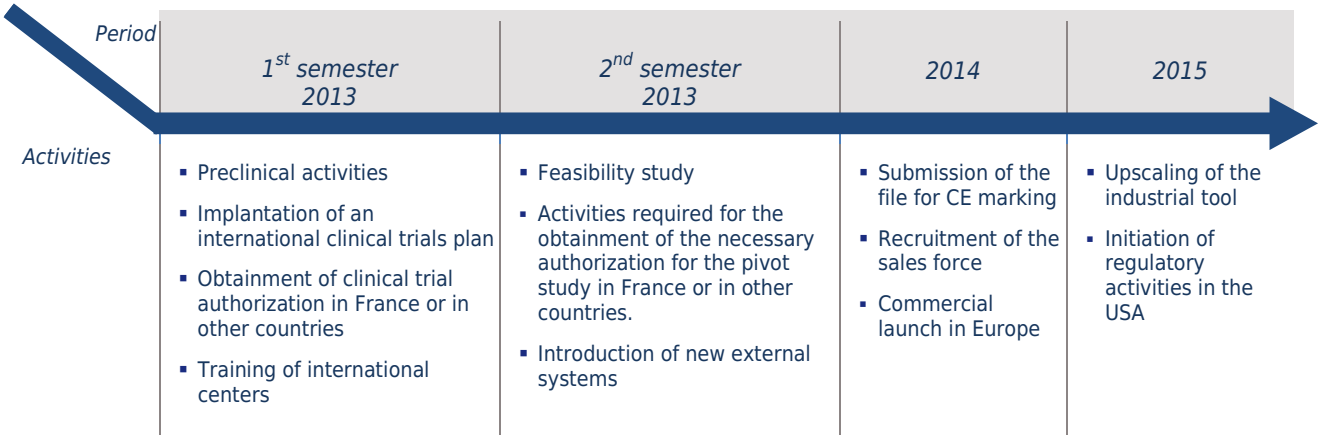
has also found ways of bringing together skills in areas that have never been in the habit of working together on so complex a project, each acquiring expertise belonging to these fields.

That is why, emboldened by this unique capacity for creating synergies between skills from industry and from the medical world, CARMAT thus intends in the future, further to the field of the total artificial heart, to tackle the development of new physiologically self-regulating, implantable, complex bioprostheses for other organs of the human body. Original simple devices derived from research already carried out by CARMAT and the patents that it holds, in particular with regard to hemocompatible materials, could also be developed. These products, derived from patents already submitted – in particular in the field of digital simulation and ancillary implantation tools – could also lead to commercial ventures or to transfer of rights. Original services could also be commercialized.

However, the Company does not foresee devoting resources to these potential applications while the artificial heart project is not successfully completed. On the other hand, it continues an aggressive protection policy of its intellectual property (refer to paragraph 11 Research and development, patents and licenses) and ensures a permanent technological watch of technologies and methods corresponding to its areas of activity.

6.4.7 Provisional project calendar

As of the day of registration of the current document, the provisional calendar for the project is the following:



The Company can obtain the CE marking without obtaining the agreement of the ANSM to proceed with clinical trials in humans in France, as the Company will have conducted conclusive clinical tests in humans in other countries.

Nevertheless, obtaining this agreement from the ANSM to proceed with the clinical trials in France is necessary for the possible collection of OSEO payments, and in particular milestone no.4, corresponding to a grant of €2.9m, and a repayable advance of €3.8m, representing a maximum receipt of €6.7m (refer to paragraph 22.1.3 Milestones of the project, associated deliverables and special conditions for the continuation of the project - and subsequent projects).

Consequently the Company continues the preclinical tests required and aims for formal submission of a request for clinical trial authorization from ANSM by the end of the 1st semester 2013. The continuation of animal experimentation required by ANSM to the 1st trimester 2013 (refer to paragraph 6.3.3.1 on page 59 and after) explains the necessary gap between the calendar presented above and the one published in the previous reference document, recorded by the French Autorité des Marchés Financiers on September 12, 2012 under the number R.12-044.

This calendar is based on all the data of which the Company has knowledge to date. However, in an innovative technological, industrial and regulatory context, data can be revealed after the publication of this document, which could positively or negatively influence this calendar. The reader is invited to refer to paragraph 4. Risk factors, for an informed appreciation of this calendar, as well as regular Company press releases on the progress of the project.

7 ORGANIZATION CHART

7.1 ORGANIZATION OF THE GROUP

The Company is not part of a group.

7.2 SUBSIDIARIES AND SHAREHOLDINGS

The Company has no subsidiaries or shareholdings.

8 PROPERTY, PLANT AND EQUIPMENT

8.1 SIGNIFICANT EXISTING OR PLANNED TANGIBLE FIXED ASSETS

The Company performs its activities in premises that it leases on the basis of a lease agreement concluded in accordance with market prices and conditions with companies which have no direct or indirect ties to Company directors. CARMAT does not own any real estate.

Lessee Company	Address	Nature of premises	Surface area	Lease start date	Lease expiry date	Rent 2011 (including charges)
CARMAT	36, avenue de l'Europe Immeuble l'Étendard Energy III 78140 Vélizy Villacoublay France	Business premises	1053 m²	2/1/2009	1/31/2018	€266 655.35
CARMAT	36, avenue de l'Europe Immeuble l'Étendard Energy III 78140 Vélizy Villacoublay France	Business premises	595 m²	10/1/2010	9/30/2019	€135 614.84
CARMAT	36, avenue de l'Europe Immeuble l'Étendard Energy III 78140 Vélizy Villacoublay France	Business premises	595 m²	07/01/2011	03/31/2013[1]	€103 102.33

[1] The Company has signed a new lease for these premises, taking effect on April 1, 2013 and expiring on March 31, 2022

The Company considers that it has dedicated premises which should allow it to meet the envisaged growth of the Company and its staff in the short and medium-term.

8.2 ENVIRONMENTAL ISSUES

In developing the bioprosthetic total artificial heart, the Company is subject to chemical and biological risks (particularly due to the use of chemically treated animal pericardium), which obliges it to implement preventive and protection measures for its operators and for waste management in accordance with the regulations in force with regard to safety and the environment governing the use, storage, handling and disposal of hazardous materials. The Company complies with these regulations.

9 REVIEW OF THE COMPANY'S FINANCIAL SITUATION AND PERFORMANCE

This chapter is devoted to the presentation of CARMAT's earnings and financial situation for its first four financial periods. The financial periods, respectively 19 months, 12 months, 12 months and 12 months in length, ended on December 31, 2009, December 31, 2010, December 31, 2011 and December 31, 2012. The Company has no subsidiaries and therefore does not prepare consolidated accounts. Its company accounts are prepared in accordance with French standards.

It is suggested that you read this chapter in the context of the whole of this Document de Référence.

In particular, it is suggested that you read the description of the Company's business activity as presented in Chapter 6, "Business Overview" of this Document de Référence. Similarly, it is suggested that you consult the financial statements for the period ended December 31, 2012, of which the annex forms an integral part, which are presented in Chapter 20 "Financial information concerning the Company's assets and liabilities, financial position and earnings" of this Document de Référence.

9.1 CARMAT'S MAIN REVENUES AND EXPENSES

Established in June 2008, CARMAT is a research and development company which aims to develop a fully implantable orthotopic and bioprosthetic artificial heart equipped with an electrical power supply system and a remote diagnostic system.

Through its objective to treat an illness which has a fatal outcome, the Company could also provide a solution to a public health need with major socio-economic implications for which no treatment exists to date.

The activity of the Company, which has enjoyed the status of 'Jeune Entreprise Innovante' (Young Innovative Enterprise) since 2008, has focused uniquely on the development of the total artificial heart to date, which can be divided into three phases:

- a preparation phase comprising the research, design and manufacture of CARMAT total artificial heart systems;
- a fine-tuning, approval and validation phase;
- a human clinical validation phase, in parallel with the validation activities necessary to obtain CE Marking.

Whilst the Company was established in June 2008, its operating activity only concretely started from the fourth quarter of 2008 following:

- the contribution in kind of intangible (patents) and tangible assets by Matra Défense (EADS Group) and the Association Recherche Scientifique de la Fondation Alain Carpentier (Alain Carpentier Foundation Scientific Research Association), with respect to which a contributions auditor (Commissaire aux Apports) has prepared a report, concluding that "the value of contributions in kind, which amounts to €960,000, has not been overvalued and that consequently, the value of the contribution in kind is at least equal to the capital increase of the company receiving the contribution, CARMAT SAS, plus the contribution premium"; and
- of the arrival of the first employees, formerly employees of the EADS Group where they were working on the total artificial heart project.

The CARMAT financial statements have been prepared in accordance with the provisions of the Commercial Code (Articles L123-12 to L123-28) and the general rules for preparation and presentation of annual accounts (PCG 99-03 as modified by the regulations subsequently issued by the Accounting Rules Committee).

9.1.1 Operating income

Since its creation, the company has been in a research and development phase and has not had any sales. No sales are anticipated for 2013. The program has been financed by its own equity, deriving from funds secured from the main shareholders (Matra Défense (EADS Group), the Scientific Research Association of the Alain Carpentier Foundation and the funds managed by Truffle Capital), by research subsidies and repayable advances granted, by funds raised at the time of the stock market listing. and by capital increases.

During the financial year ending on December 31, 2012, operating income fell by 99.7% to €17,989. This exclusively comprised:

- a €10,500 grant from the Association Nationale de la Recherche et de la Technologie for the employment of a doctoral student;
- reversals of provisions totaling €7,489;

During the financial year ended December 31, 2011, operating income grew by 20.9 % to €6,101,753. This exclusively comprised:

- operating subsidies of €6,051,177
- reversals of provisions totaling €50,576

During the financial year ending on December 31, 2010, operating income grew by 4.7% to €5,048,697. This exclusively comprised subsidies:

- a subsidy of €4 297 697 from OSEO Innovation, of which €3,090,110 covered expenditure over the period from January 1 until October 31, 2010 and €1,207,587 represented the share of the subsidy collected on January 3, 2011 relating to expenditure incurred over the period from November 1 to December 31 2010; this latter amount appeared in the balance sheet as at December 31, 2010 under accrued income;
- a subsidy of €750,000 corresponding to the balance of the subsidy granted to the company by the Yvelines Departmental Council, of which €450,000 was received in the financial year ending December 31, 2010 and €300,000 on February 4, 2011. Since all the research expenditure had been incurred by December 31, 2010, the entire subsidy was recognized in the result for the 2010 financial year.
- - sundry subsidies received of €1,000.

During its initial 19-month financial period ending on December 31, 2009, overall operating income received (€4,822,638) was broken down as follows:

- a subsidy of €4,072,638 granted by OSEO Innovation.
- a subsidy of €750,000 granted by the Yvelines Departmental Council.

9.1.2 Operating expenses

During the 2012 financial year, operating expenses amounted to €22,403,502, compared with €22,192,807 in the previous period (an increase of +0.9%). This essentially relates to the Company's spending on research, which is expensed in the period when it is incurred.

These research activities involved expenses in three main areas:

- purchases (other than raw materials) and external expenditure of €16,467,584, compared with €16,276,476 for the previous period.
- wages and salaries of €4,183,804, compared with €4,156,960 for the previous period;
- depreciation of fixed assets acquired for the research and development phase amounting to €1,473,858 compared with €1,496,234 for the previous period.

The operating result for the period ended December 31, 2012 was € -22,385,513, compared with € -16,091,054 for the previous period.

9.1.3 Financial result

The financial result mainly comprises returns on various marketable securities (certificates of deposit) and financial instruments (term deposit accounts), less interest accruing on the repayable advances made by OSEO Innovation in connection with the financing of the research activities of the company. The financial result for 2012 was positive, being a gain of €110,099. This compares to a gain of €97,271 in 2011, a loss of €20,807 in 2010 and a gain of €77,636 in 2009.

9.1.4 Result for the period

The Company opted to take the Research Tax Credit (CIR) for the calendar years 2009, 2010 and 2011. This option was retained for the 2012 financial year. The CIR system consists of granting a tax credit to companies making significant investments in research and development. Research expenditure eligible for CIR includes in particular wages and salaries, consumables, sub-contract service provision by approved research bodies (public or private) and intellectual property costs.

The income statement for the period shows a Research Tax Credit of €5,015,433, broken down as follows:

- €5,022,922 by way of CIR for for the period 1/1/2012 to 12/31/2012, compared with €2,566,103 disclosed in 2011;
- € -7,489 by way of adjustment to the CIR for 2011, arising from the difference between the amount accrued at the close of the 2011 financial year (€2,566,103) and the amount actually reimbursed by the tax authorities (€2,558,614) in July 2012.

After taking account of extraordinary income of €70,290 and a CIR of €5,015,433, the loss for the financial year ended December 31, 2012 was €17,189,691, a 27.9% increase over the loss for the 2011 period (€13,441,022) The loss for the period ended December 31, 2010 was €7,736,485. The loss for the opening period ended December 31, 2009 was €4,722,004.

9.2 MAIN ITEMS OF THE CARMAT BALANCE SHEET

9.2.1 Main asset items

As at December 31, 2012, the Company's total balance sheet assets stood at €19,696,896. This compares with €37,426,083 at December 31, 2011, €21,047,688 at December 31, 2010 and €6,051,723 as at December 31, 2009.

Fixed assets of €2,266,763 (as against €3,147,942 at December 31, 2011) comprised:

- tangible fixed assets (€1,556,204): technical plant, equipment, measurement and special tooling, clean room, gray room, office fixtures and fittings, etc., necessary for the preparation for clinical trials described above;
- intangible assets (€168,468): patents, licenses and software
- financial assets (€542,090): assets in relation to the liquidity agreement concerning the Company's shares and guarantee deposits linked to the rental contracts for the Company's premises.

The remaining €17,430,133 principally comprised:

- accounts receivable (€6,092,119) from the State, principally the 2012 CIR (€5,022,922) and recoverable input VAT (€1,028,677);
- cash and marketable securities (€11,134,438).

During the 2012 financial year, total assets reduced by a factor of 1.9 to €19,696,896.

Fixed assets reduced by 28%, primarily due to the reduction in assets under construction (€184,621 in 2012, compared with €476,583 in 2011) and the reduction in technical plant, equipment, measurement and special tooling (€725,017 in 2012, compared with €1,262,724 in 2011).

Current assets reduced by a factor of 2, standing at €17,430,133 as at December 31, 2012 (as against €34,278,141 as at the previous year end).

9.2.2 Main liability items

Of the balance sheet total of €6,051,723 as at December 31, 2009, €3, 527,996 was represented by equity, broken down as follows:

- €8 250 000 of share capital and issue premiums arising from three capital increases carried out on June 28, September 30 and October 1, 2008:
  - €40,000 arising from a capital increase by cash contribution at the time the company was set up on June 28, 2008 (€20,000 from Matra Défense (EADS Group) and €20,000 from Professor Alain Carpentier);
  - €960,000 by way of a capital increase via contribution in kind on September 30, 2008, of tangible and intangible fixed assets by Matra Défense (EADS Group) and the Scientific Research Association of the Alain Carpentier Foundation;
  - €7,250,000 by way of a capital increase by cash contribution on October 1, 2008 (€5m from the funds managed by Truffle Capital and €2.25m from Matra Défense (EADS Group) and Professor Alain Carpentier).
  - and a loss for the period ending on December 31, 2009 of €4,722,004.

In addition to the above equity, the main liability items were:

- €546,304 of repayable advances granted by OSEO Innovation, and;
- €1,960,704 of accounts payable (suppliers, tax and social security, buildings).

As at December 31, 2010, the balance sheet total of the company was €21,047,688, some 3.5 times that of 2009. This total mainly comprised:

- €25,932,563 of share capital and issue premiums following the seven capital increases carried out during the 2010 financial year, €14,187,621 of which was raised at the time of the Company's stock market flotation in July 2010 (see chapter 10 “Cash and capital”);
- € -12,458,489 of losses for 2010 and losses brought forward;
- €2,018,892 of repayable advances granted by OSEO Innovation;
- €4,186,770 of trade accounts payable and related payables.

As at December 31, 2011, the Company's liabilities totaled €37,426,083, an increase of a factor of 1.8 relative to 2010. This total mainly comprised:

- €52,790,430 of share capital and issue premiums, including €26,669,533 raised from the rights issue carried out by the Company in August 2011 on the NYSE/Euronext Alternext market in Paris (see chapter 10 "Cash and Capital");
- € -25,899,510 of losses for 2011 and losses brought forward;
- €3,743,141 of repayable advances granted by OSEO Innovation;

- €4,992,835 of trade accounts payable and related payables.

As at December 31, 2012, the Company's liabilities totaled €19,696,896, having reduced by a factor of 1.9 relative to 2011. This total mainly comprised:

- €53,030,430 of share capital and issue premiums, of which €178,400 resulted from the exercise of 892 BCE 2009-2 options and €61,600 from the exercise of 308 BCE 2009-1 options during the financial year 2012 (see chapter 10, "Cash and Capital");
- € -43,089,202 of losses for 2012 and losses brought forward;
- €3,743,141 of repayable advances granted by OSEO Innovation;
- €4,012,870 of trade accounts payable and related payables.

10 CASH AND CAPITAL

10.1 DETAILS OF THE COMPANY'S CAPITAL

In euros	December 31, 2012	December 31, 2011	December 31, 2010	December 31 2009 (1)
Equity	9,941,228	26,890,919	13,474,075	3,527,996
Other equity – Conditional advances	3,743,141	3,743,141	2,018,892	546,304
Gross financial debt	460,054	217,066	78,096	12,219
Cash and cash equivalents	11,134,438(2)	29,369,693	11,415,823	712,837
Net financial debt	- 10,674,384	- 29,152,627	-11,337,727	-700,618
Net financial debt as a proportion of equity	N/A	N/A	N/A	N/A

(1) 19-month period
(2) Cash comprises:
- cash instruments in the form of two term deposit accounts with a total value of €5,006,854;
- cash in hand or at bank, reported at face value (€6,127,584).

Since the end of the financial year to December 31, 2012, no significant event has affected the Company's equity or the low level of risk associated with the treasury instruments.

The Board of Directors has assumed that the business is a going concern, having taken the following points in particular into account:

- cash, cash instruments and liquid marketable securities totaling €11,134,438 as at December 31, 2012;
- the payment of subsidies (€3,033,000) and refundable advances (€10,764,000) still to be claimed between now and the end of the project under the OSEO aid program signed in 2009;
- the €5,022,922 reimbursement expected in July 2013 in respect of the Research Tax Credit

10.2 CASH-FLOW

Please refer to section 5.2 "Investments" and paragraph 20 "Financial information on the assets, the financial position and the results of the Company" of this Document de Référence.

10.3 BORROWING CONDITIONS AND FINANCING STRUCTURE

10.3.1 Bank debts and repayable advances

To date the company has financed its investments from equity or quasi-equity resulting from the raising of capital on successive occasions from the shareholders, from subsidies and from repayable advances granted by OSEO Innovation (see chapter 22 "Significant contracts") and the Yvelines Departmental Council, from capital increases carried out in connection with Company's flotation on the NYSE/Euronext Alternext Paris market in July 2010 (a net capital increase of €14.2 million, including exercise of the supplementary issue option) and from the rights issue on the NYSE/Euronext Alternext Paris market in August 2011, which raised €26.7 million (including net premiums)

Consequently the company has no bank debt, bearing in mind the particular nature of its activities; the loans and sundry financial debts shown in the balance sheet as at the end of 2012 mainly comprised accrued interest on repayable advances. These repayable advances, which stood at €3,743,141 as at December 31, 2012 (unchanged relative to December 31, 2011) are disclosed in the balance sheet under Other equity, in accordance with the provisions of the Commercial Code and with the General Chart of Accounts. As indicated in note 6.1.1 of the Annex to the annual financial statements for the year ended December 31, 2012, these advances must be repaid in the event that the project succeeds. Interest arising on these advances is accrued on a pro-rata basis.

Schedule of payables	Gross sum	1 year or more	1 to 5 years	More than 5 years
Sundry loans and financial debts	460,054		460,054	
Trade accounts payable and related payables	4,012,870	4,012,870		
Staff and related payables	722,240	722,240		
Social security and other social bodies	575,416	575,416		
Other taxes and related payables	16,246	16,246		
Liabilities secured to property and related liabilities	148,669	148,669		
Other debts	3,698	3,698		
Total	5,939,193	5,479,139	460,054	

10.3.2 Leasing debts

None.

10.3.3 Convertible bonds

Bonds totaling €2,000,000 were issued by resolution of the Extraordinary General Meeting of the company on May 7, 2010 and were converted automatically into new ordinary shares in the Company on the date the Company's shares were first listed on the NYSE/Euronext Alternext Paris market.

The Company has no bonds in issue as at the date of this Document de Référence.

10.3.4 Other means of financing

During the year ended December 31, 2012 and up to the date of registration of this Document de Référence, the Company was in a research phase and recorded no sales. Finance for the program was provided by:

- Increases in the Company's equity, mainly from the second issue of shares (rights issue) on the NYSE/Euronext Alternext Paris market in August 2011 and from the exercise of BCE 2009-1 and BCE 2009-2 options during 2012.
  - The exercising of 892 BCE-2009-2 warrants in 2012 led to an overall capital increase of €892 on April 28, 2011, whereby share capital rose from €165,111.80 to €166,003.80 through the issue of 22,300 ordinary shares with a nominal value of €0.04 at a unit price of €8, i.e. at an issue premium of €7.96 per share. Issue premiums in the balance sheet consequently rose from €52,625,318 to €52,802,826.
  - The exercising of 308 BCE-2009-1 warrants in 2012 led to a capital increase of €308, whereby share capital rose from €166,003.80 to €166,311.80 through the issue of 7,700 ordinary shares with a nominal value of €0.04 at a unit price of €8, i.e. at an issue premium of €7.96 per share. Issue premiums in the balance sheet consequently rose from €52,802,826 to €52,864,118.
  - The exercising of 116 BCE-2009-2 warrants in 2013 led to a capital increase of €116, whereby share capital rose from €166,311.80 to €166,427.80 through the issue of 2,900 ordinary shares with a nominal value of €0.04 at a unit price of €8, i.e. at an issue premium of €7.96 per share. Issue premiums in the balance sheet consequently rose from €52,864,118 to €52,887,202.
- And by a €10,500 grant from the Association Nationale de la Recherche et de la Technologie for the employment of a doctoral student.

10.4 RESTRICTIONS ON THE USE OF CAPITAL THAT HAVE HAD OR COULD HAVE A MARKED INFLUENCE, DIRECTLY OR INDIRECTLY, ON THE ISSUER

None.

10.5 ANTICIPATED SOURCES OF FINANCE

The OSEO Innovation agreement provides for the payment of a total sum of €17,442,639 by way of subsidies. As at December 31, 2012, €3,032,793 of this amount remained to be received before end of the project. The agreement also provides for the payment of a total sum of €14,507,324 in the form of repayable advances, of which €10,764,169 remained to be received between December 31, 2012 and the end of the project (see chapter 22, Important contracts).

The company also opted to take the Research Tax Credit (CIR) for the calendar year 2012. This option was first exercised for the calendar year 2009 and renewed in 2010 and 2011. The CIR relating to the 2012 period was recorded under Income taxes in the income statement and appears under Other debtors in the balance sheet. The income statement for the period shows a CIR of € -5,015,433, broken down as follows:

- €5,022,922 by way of CIR for the period 1/1/2012 to 12/31/2011, compared with €2,566,103 disclosed in 2011;
- an adjustment of € -7,489 to the CIR for 2011, representing the difference between the amount recorded in the 2011 accounts (€2,566,103) and the actual amount reimbursed by the tax authorities in July 2012 (€2,558,614).

11 RESEARCH AND DEVELOPMENT, PATENTS AND LICENSES

11.1 RESEARCH AND DEVELOPMENT

Please refer to paragraphs 6.3.3 "Process and development stage of the total artificial heart project"; 6.4.6 "Innovation strategy - application of know-how", and to note 5.2 in the Annex to the Financial Statements under paragraph 20.1.1 "CARMAT financial statements as at December 31, 2011 in accordance with French standards" of this Document de Référence.

11.2 INTELLECTUAL PROPERTY

Patents and other intellectual property rights are of fundamental importance in the medical devices sector. CARMAT regularly files patent applications to protect its innovations.

11.2.1 Patents

CARMAT's portfolio of patents is made up of ten patents held in the name of the Company, classified in two categories: firstly, patents associated with the architecture of the total artificial heart project and secondly, patents linked to the hemocompatible materials and subassemblies of the prosthesis.

Details of these patents are set out below:

Title	Geographical area	Application/publication number	Date filed	Status
“Prothèse cardiaque implantable à chambres ventriculaires indépendantes” (Implantable heart prosthesis with independent ventricular chambers)	France	FR9812941 FR2784585	10/15/1998	Granted on 01/26/2001 Expiring on: 10/15/2018
"Prothèse cardiaque monobloc implantable en position anatomique" (One-piece heart prosthesis implantable in an anatomical position)	France	FR0605333 FR2902345	6/15/2006	Granted on 9/5/2008 Expiring on: 6/15/2026
	Europe	EP07290725.6 EP1867352	6/11/2007	Granted on 7/15/2009 Expiring on: 6/11/2027
	International	PCT/FR2007/000962 WO2007/144497	6/11/2007	Published on 12/21/2007.

Title	Geographical area	Application/publication number	Date filed	Status
"Prothèse cardiaque monobloc implantable" (Implantable one-piece heart prosthesis)	France	FR200800184 FR2926223	1/14/2008	Granted on 1/22/2010 Expiring on: 1/14/2028
	Europe	EP09290009.1 EP2078533	1/7/2009	Granted on 1/12/2011 Expiring on: 1/7/2029
	International	WO2009FR00008 WO2009/112662	1/7/2009	Published on 9/17/2009.
"Matériau hémocompatible composite et son procédé d'obtention" (Composite hemocompatible material and method for its production)	France	FR0511430 FR2892939	11/10/2005	Granted on 1/22/2010 Expiring on: 11/10/2025
	Europe	EP06291657.2 EP1785154	10/25/2006	Granted on 9/23/2009 Expiring on: 10/25/2026
	International	PCT/FR2006/002471 WO2007/054637	11/7/2006	Published on 5/18/2007.
"Pompe volumétrique rotative à encombrement radial réduit" (Volumetric rotating pump with reduced axial space)	France	FR060004206 FR2900988	5/12/2006	Granted on 1/1/2010 Expiring on: 5/12/2026
	Europe	EP7290571.4 EP1855005	5/7/2007	Granted on 1/28/2009 (no opposition within the time allowed) Expiring on: 5/7/2027
	International	PCT/FR2007/000778 WO2007/135261	5/7/2007	Published on 11/29/2007.
"Dispositif de connexion rapide entre une prothèse cardiaque totalement implantable et des oreillettes naturelles" (Device for rapid connection between a totally implantable heart prosthesis and natural atria)	France	FR0605331 FR2902343	6/15/2006	Granted on 9/5/2008 Expiring on: 6/15/2026
	Europe	EP07290723.1 EP1867350	6/11/2007	Granted on 9/24/2008 (no opposition within the time allowed) Expiring on: 6/11/2027
	International	PCT/FR2007/000959 WO2007/144495	6/11/2007	Published on 12/21/2007.
"Dispositif de raccordement entre une prothèse cardiaque et les oreillettes naturelles" (Device for connection between a heart prosthesis and the natural atria)	France	FR0605332 FR2902344	6/15/2006	Granted on 9/5/2008 Expiring on: 6/15/2026
	Europe	EP07290724.9 EP1867351	6/11/2007	Granted on 9/24/2008 (no opposition within the time allowed) Expiring on: 6/11/2027
	International	PCT/FR2007/000960 WO2007/144496	6/11/2007	Published on 12/21/2007.

Title	Geographical area	Application/publication number	Date filed	Status
“Procédé pour la réalisation d’un objet hémocompatible de configuration complexe et objet ainsi obtenu” (Process for producing a hemocompatible item with a complex configuration and item thereby obtained)	France	FR0703339 FR2915903	5/10/2007	Granted on 6/4/2010 Expiring on: 5/10/2027
	Europe	EP08290405.3 EP1992369	4/28/2008	Published on 11/19/2008.
	International	PCT/FR2008/000607 WO2008/1145870	4/28/2008	Published on: 12/4/2008
“Procédé pour l’obtention d’un matériau hémocompatible composite et matériau obtenu” (Process for obtaining a composite hemocompatible material and material obtained)	France	FR1001724	4/22/2010	Granted on 7/13/2012 Expiring on 4/22/2030
	Europe	EP11161291.7 EP2380608	4/6/2011	Published on 10/26/2011.
	International	PCT/FR2011/050768 WO2011/131887	4/6/2011	Published on 10/27/2011.
"Prothèse pour assurer le raccordement d’un canal anatomique" (Process to ensure the connection of an anatomical duct)	France	FR1152364 FR2972919	3/22/2011	Published on 9/28/2012.
	Europe	EP12158011.2 EP2502577	3/5/2012	Published on 9/26/2012.
	International	PCT/FR2012/050449 WO2012/127145	3/5/2012	Published on 9/27/2012.

The table below indicates the number of patents granted and the applications by country or geographical zone:

Country / Geographical zone	Patents granted	Current patent applications
National patents	127	52
South Africa	6	2
Germany	7	0
Australia	3	5
Austria	7	0
Belgium	7	0
Canada	0	8
China (People's Republic)	4	4
South Korea	0	8
Denmark	5	0
Spain	7	0
United States of America	4	4
Russian Federation	7	1
France	9	1
Greece	5	0
India	0	8
Ireland	5	0
Italy	7	0
Japan	2	6
Norway	2	5
Netherlands	7	0

Country / Geographical zone	Patents granted	Current patent applications
Poland	7	0
United Kingdom	7	0
Sweden	7	0
Switzerland	7	0
Turkey	5	0
European Patents (EPO)	7	2
International (OMPI)	0	9
Total	**134**	**63**

11.2.2 Exclusive license agreements

11.2.2.1 Exclusive license agreement with the Université Pierre et Marie Curie:

Under the terms of an exclusive license agreement of June 17, 1993, amended by addendum no. 1 of June 27, 1995 and by addendum no. 2 of November 12, 1997, the Université Pierre et Marie Curie granted Matra Défense the right to use patent no. 8800381 in order to plan for additional research and development with a view to the construction of prototype artificial hearts implantable in humans.

Although initially it was Matra Défense which used the intellectual property rights thus granted, the benefit of this license was subsequently assumed by CARMAT, to which the Université Pierre et Marie Curie consented by way of an agreement duly signed by the Université Pierre et Marie Curie, Matra Défense, the Scientific Research Association of the Alain Carpentier Foundation and CARMAT. Under this agreement (i) the Université Pierre et Marie Curie expressly waived any benefit from all intellectual property rights linked to or resulting directly or indirectly from the work on the total artificial heart project and acknowledged that CARMAT was the sole owner of all the intellectual property rights that could have been attributed to the Université Pierre et Marie Curie; and (ii) in return, the Scientific Research Association of the Alain Carpentier Foundation granted at no cost, in its name and for its account and in the interest of Matra Défense, 400 CARMAT shares (equivalent to 10 000 CARMAT shares following the 25:1 stock split) to the benefit of the Université Pierre et Marie Curie.

11.2.2.2 Exclusive license agreement with the Centre Technique des Industries Mécanique (Technical Center for Mechanical Industries)

Under a framework agreement of October 30, 2001, amended by an initial addendum of August 28, 2002, the Centre Technique des Industries Mécaniques (**CETIM**) granted Professor Carpentier an exclusive right to implement French patent no. 2760973 concerning the fully implantable artificial heart project for the remainder of its duration as at the date of signature (the patent concerned expires on September 25, 2018), in return for payment of the costs associated with maintaining the patent concerned.

This license was granted without financial consideration. The benefit of this license was subsequently assumed by CARMAT, to which CETIM consented in a second addendum to the framework agreement, signed on October 2, 2008 between CETIM and Professor Carpentier.

European patent No EP0971756 (equivalent to French patent No 2760973) is currently in force in France, Germany and Great Britain (expiring on March 18, 2018).

11.2.3 Trademarks

The company has registered the “CARMAT” trademark in the following countries or geographical zones:

Trademark	Registration number	Status	Date filed	Renewal date	Territories	Classes
CARMAT	023184827	Registered	9/23/2002	9/30/2022	France	9, 10, 42
CARMAT	007374821	Registered	10/29/2008	10/29/2018	Community (European Union)	10, 42

Trademark	Registration number	Status	Date filed	Renewal date	Territories	Classes
CARMAT	1022720	Registered	6/19/2009	6/19/2019	International Designations: China, Japan, Switzerland, Russian Federation	9, 10, 42 10, 42
CARMAT	3663230	Registered	1/7/2009	8/4/2019	United States	10, 42
CARMAT	1442665	Registered	6/25/2009	9/27/2026	Canada	10, 42
CARMAT	200911637[(1)]	Filed	6/24/2009	6/24/2019	South Africa	10, 42
CARMAT	1838058	Registered	7/9/2009	7/9/2019	India	10, 42

[(1)] Application number

11.2.4 Domain names

The company has registered the following domain names:

Domain name	Date reserved	Renewal date
carmatsas.com	10/29/2008	10/29/2013
carmatsas.fr	10/29/2008	10/29/2013
carmatsas.eu	10/29/2008	10/29/2013
carmat.tel	3/23/2009	3/23/2014
carmatsa.fr	4/29/2010	4/29/2014
carmatsa.com	4/29/2010	4/29/2014
carmatsa.eu	4/29/2010	4/29/2014
carmatsa.tel	4/29/2010	4/29/2014

12 TRENDS

12.1 MAIN TRENDS SINCE THE END OF THE PREVIOUS FINANCIAL YEAR

Please refer to paragraph 20.8 “Significant changes in the financial or commercial situation”

The company is exclusively dedicated to the development of the total artificial heart project.

During 2012, the Company completed preclinical test bench trials in advance of obtaining Clinical Trial Authorization (CTA) from the competent regulatory authorities. This authorization will enable clinical trials to be begun, with a view to filing an application for CE Marking in 2014 at the earliest..CE Marking is a prerequisite for a commercial product launch.

The Company has obtained the agreement of four world-renowned cardiac surgery centers in four countries to carry out the first human implantations (see press release of May 14, 2013). As of the date of registration of this document, the training of these centers is underway, as are the preclinical activities required by the ANSM. Implantations could begin shortly after finalization of the training process in the international centers, or upon obtaining consent from the ANSM in respect of the three French centers that have already been trained.

The Company's cash reserves and the subsidies expected should allow the Company to ensure the advancement of the aforementioned activities in 2013 (see paragraph 4.4.2 Liquidity risk)

12.2 EXISTENCE OF ANY KNOWN TREND, UNCERTAINTY OR DEMAND OR ANY UNDERTAKING OR EVENT REASONABLY LIKELY TO SIGNIFICANTLY INFLUENCE THE PROSPECTS FOR THE COMPANY

Please refer to paragraphs 4 "Risk Factors", 6.2 "Heart Failure", 6.3.3 "Process and development stage of the total artificial heart project" and 6.4 "Market and strategies".

13 PROFIT FORECASTS OR ESTIMATES

The Company does not intend to make any profit forecasts or estimates.

14 ADMINISTRATIVE, MANAGEMENT AND SUPERVISORY BODIES AND EXECUTIVE BOARD

The Company is organized in the form of a French public limited company with a board of directors. The functions of the Chairman and Chief Executive are separated.

14.1 COMPOSITION OF THE COMPANY'S ADMINISTRATIVE AND MANAGEMENT BODIES

14.1.1 Composition of the Board of Directors

At the date of registration of this reference document, the directors are as follows:

Full name or registered name of the member	Term of office	Functions fulfilled within the Company	Other positions currently held in other companies	Other positions and functions in other companies over the last five years, but not exercised at the date of registration of the reference document
Jean-Claude Cadudal	First appointment (as a Plc): May 7, 2010 Term of office: Until GM to consider the accounts for year ending 12/31/2015	Chairman of the Board of Directors	- Chairman of KARDIOZIS SAS - Chairman of HOLDING INCUBRATRICE MEDICAL DEVICES - Chairman of ZETAVACS SAS	- Chairman and MD of Matra Défense - Director of International Operations of the EADS Group
Professor Alain Carpentier	First appointment (as a Plc): May 7, 2010 Term of office: Until GM to consider the accounts for year ending 12/31/2015	Director	- Honorary Chairman of the ACADEMY OF SCIENCES - Chairman of the Scientific Council of the Fondation Lefoulon-Delalande (Institut de France) - Member of the Board of Directors of the FONDATION SINGER POLIGNAC - Director of the ASSOCIATION RECHERCHE SCIENTIFIQUE DE LA FONDATION ALAIN CARPENTIER (Scientific Research Association of the Alain Carpentier Foundation) (Fondation de France)	- Chairman of the ACADEMY OF SCIENCES
Marcello Conviti	First appointment (as a Plc): May 7, 2010 Term of office: Until GM to consider the accounts for year ending 12/31/2015	Director Chief Executive	Not applicable	- Director at EUCOMED - Director of EDWARDS LIFESCIENCES ITALY - Senior Vice President of Strategy and New Business Development at EDWARDS LIFESCIENCES

Full name or registered name of the member	Term of office	Functions fulfilled within the Company	Other positions currently held in other companies	Other positions and functions in other companies over the last five years, but not exercised at the date of registration of the reference document
Truffle Capital represented by Dr. Philippe Pouletty	First appointment (as a Plc): May 7, 2010 Term of office: Until GM to consider the accounts for year ending 12/31/2015	Director	- Chairman of the Board of Directors of DEINOVE SA (Philippe Pouletty) - Member of the Supervisory Board of INNATE PHARMA SA (Philippe Pouletty) - Managing Director and Director at TRUFFLE CAPITAL SAS - Director and Chairman of SPLICOS SAS (Philippe Pouletty) - Manager at NAKOSTECH SARL (Philippe Pouletty) - Director at FRANCE BIOTECH (an association under the Law of 1901) - Director of THERADIAG SA (Truffle Capital) - Director of THERACLION SA (Truffle Capital) - Director of NEOVACS SA (Truffle Capital) - Director of VEXIM SA (Truffle Capital) - Director at MYOPOWERS SA (Switzerland) (Truffle Capital) - Director of PHARNEXT SAS (Truffle Capital) - Director of PLASMAPRIME SAS (Truffle Capital) - Director of WITTYCELL SAS (Truffle Capital) - Director at IMMUNE TARGETING SYSTEMS LTD (UK) (Truffle Capital) - Director at SYMETIS (Switzerland) (Truffle Capital)	- Chairman and Chief Executive from October 2009 to November 2010: THERADIAG SA - Chairman of the Board of Directors from November 2010 to May 2012: THERADIAG SA - Director until 2008: CONJUCHEM BIOTECHNOLOGIES Inc. (Canada) - Director until 2007: DRUGABUSE SCIENCES SAS - Chairman from 2001 until 2009: FRANCE BIOTECH - Member of the Supervisory Board at CYTOMICS SA until December 2010 (in liquidation)
André-Michel Ballester	First appointment (as a Plc): May 7, 2010 Term of office: Until GM to consider the accounts for year ending 12/31/2015	Independent Director	- Admistratore Delegato (CEO) Sorin Spa – Milan (Italy) - Independent Director of MAUNA KEA TECHNOLOGIES SA - Independent Director of PIXIUM VISION SA	- Independent Director of NEXWAY SAS - Independent Director of IMI GmbH

Full name or registered name of the member	Term of office	Functions fulfilled within the Company	Other positions currently held in other companies	Other positions and functions in other companies over the last five years, but not exercised at the date of registration of the reference document
Michel Finance	First appointment (as a Plc): May 7, 2010 Term of office: Until GM to consider the accounts for year ending 12/31/2015	Independent Director	- Chairman and MD of HOLDING INCUBATRICE BIOTECHNOLOGIE SA - Director at NEOVACS SA - Chief Executive and Director at THERADIAG SA - Chairman of ZOPHIS SAS - Chairman of BIOKINESIS SAS - Chairman of PRESTIZIA SAS - Director of France Biotech (an association under the Law of 1901)	Not applicable
Henri Lachmann	First appointment (as a Plc): December 23, 2010 Term of office: Until GM to consider the accounts for year ending 12/31/2015	Independent Director	- Member of the Supervisory Board of SCHNEIDER ELECTRIC SA - Member of the Supervisory Board of VIVENDI SA - Member of the Supervisory Board of NORBERT DENTRESSANGLE SA - Chairman of the Board of Directors of the CENTRE CHIRURGICAL MARIE LANNELONGUE (Marie Lannelongue Surgical Center) (an association under the Law of 1901) - Chairman of the INSTITUT TELEMAQUE (an association under the Law of 1901) - Director of the FONDATION ENTREPRENDRE - Vice-Chairman and Treasurer of the INSTITUT MONTAIGNE (an association under the Law of 1901)	- Member of the Supervisory Board of AXA - Director at AXA ASSURANCES IARD MUTUELLE - Director of various companies in the SCHNEIDER ELECTRIC Group - Member of the Taxation and Social Security Contributions Board

As far as the Company is aware:

- there is no family link between the Company's directors;
- no director has been convicted of fraud in the last five years;
- no director has been associated with any bankruptcy, sequestration of assets or liquidation in the last five years;
- no director has been found guilty of any offense or any official public sanction pronounced by the statutory or regulatory authorities (including designated professional bodies) in the last five years; and
- no director has been prevented by a court from acting as a member of an administrative, management or supervisory board of an issuer or from taking part in the management or conduct of the affairs of an issuer over the past five years.

14.1.2 Biographies of the Members of the Board of Directors

Jean-Claude Cadudal is the Chairman of the CARMAT Board of Directors. He was previously Director of International Operations at the EADS Group until early 2008, a former director of Matra Défense, former Group Finance Controller at MBDA, and he was the CARMAT Program Director. He was involved in the Matra Group's principal mergers and acquisitions. A graduate in industrial automation, he began his career in nuclear plant development research offices then in industrial management with ITT where he received the Production & Inventory Control Worldwide Award in 1979. After a period working in operations management with Revlon Europe, he joined the MATRA Group in 1983.

Prof Alain Carpentier is a director at CARMAT. Professor emeritus at the Pierre and Marie Curie University (University of Paris VI) and lecturer at the Mount Sinai School of Medicine in New York, he is the founder and director of the Biosurgical Research Laboratory at the Scientific Research Association of the Alain Carpentier Foundation. Winner of the Foundation for Medical Research Prize in 1998 and President of the French Academy of Sciences (2010), he received the prestigious Albert Lasker Award for Clinical Medical Research in 2007 in recognition of his two main contributions to the field – the invention of the first valve bioprosthesis (Carpentier-Edwards valve) and the development of techniques for plastic and reconstructive surgery of heart valves, which benefit several hundred thousand patients worldwide every year.

Dr. Philippe Pouletty is the permanent representative of Truffle Capital on the CARMAT board of directors. Philippe Pouletty is a medical doctor (University of Paris VI) and an immunologist. He worked as an intern at the Pasteur Institute and was a postdoctoral research fellow at Stanford University. He is the inventor of 29 patents, the second of which has been the most lucrative for Stanford University in life sciences. In 2012 he entered the prestigious Stanford University Hall of Fame of Inventors. Philippe Pouletty was founder and chief executive of Truffle Capital, a private equity firm whose funds come to a total of €520 million. He was chairman of France Biotech and chairman of the French Association of Biotechnology Enterprises and former vice-chairman of the Europabio, the European Federation of Biotechnologies. He is also the founder of three biotechnology companies in Europe and the United States, which have generated stock market shares worth more than US$800 million, and he is a member of the board of directors of 12 biotechnology and medical apparatus undertakings in Europe and North America (Theradiag, Conjuchem, Cytomics, Deinove, Innate Pharma, ITS, Neovacs, Pharnext, Splicos, Theraclion, Vexim and Wittycell). Philippe Pouletty helped set up several government initiatives in France, including the 1999 Act simplifying the law on joint stock companies (SAS), the 2002 Biotech Plan to relaunch and develop biotechnology and the Young Innovative Enterprise status, which grants significant tax exemptions to technological enterprises.

Marcello Conviti is Chief Executive and Director of CARMAT. He began his career in Italy with IBM in 1978. After a few years working for Italian companies, including Fiat, Marcello Conviti quickly focused on European positions within the life sciences industry. For 12 years he held several strategic positions in SORIN BIOMEDICA, an Italian company that designs cardiac medical devices. Before joining CARMAT, Marcello Conviti held several senior international positions with EDWARDS LIFESCIENCES during a period of 17 years (most recently Senior Vice President for Strategy and New Business Development). EDWARDS LIFESCIENCES is the world leader in heart valves, including its flagship product, the Edwards-Carpentier heart valve, which revolutionized cardiac surgery. Marcello Conviti is also a member of the Board of Directors at EUCOMED, the European confederation of associations of manufacturers of medical devices. Marcello Conviti speaks five languages, and he has an MBA from the University of Turin and a PhD in IT technologies from the University of Pisa.

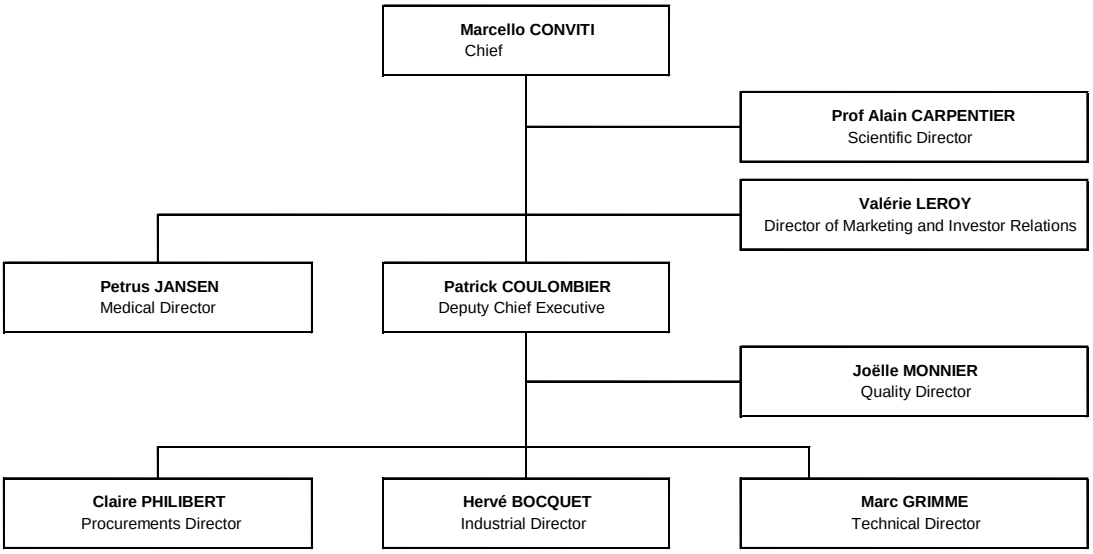
André-Michel Ballester is an independent director at CARMAT. He is currently Chief Executive of Sorin S.P.A., one of the world leaders in the manufacture of devices for cardiovascular illnesses, and he has an excellent knowledge of the workings and the international issues of this industry. André-Michel Ballester is a cardiac surgery specialist, and he began his career in the medical industry with Travenol S.A. more than 25 years ago. He then occupied several management positions in the cardiac medical device and life science industries in several European countries and in the United States. André-Michel Ballester is a graduate of INSEAD and the Ecole Centrale in Lille.

Michel Finance is Director of CARMAT, of which he was interim Chief Executive from June 2008 to September 2009. He has dual experience in both general and financial management. He is current Chief Executive and Director of Theradiag. He began his career as a financial auditor at PricewaterhouseCoopers, and over a period of

25 years he occupied different posts as Chief Executive and Financial Director in the pharmaceutical and biotechnology industries for multinationals such as Sanofi Aventis. Before joining CARMAT, Michel Finance was Deputy Chief Executive at Flamel Technologies (from 2005 to 2008). Michel Finance is a graduate of the EM Lyon Business School and a Chartered Accountant. He has also been a director at Neovacs since 2010, where he held the position of Deputy Chief Executive from 2009 to 2010 and handled the company's flotation on the Alternext Paris market, and has been a director with France Biotech (the French association of life sciences enterprises) since 2006.

Henri Lachmann is an independent director of CARMAT. Henri Lachmann began his career in 1963 with the international auditing firm, Arthur Andersen. In 1970 he joined Strafor Facom, of which he became Chairman in 1981. A Director of Schneider Electric since 1996, Henri Lachmann was appointed Chairman and Chief Executive of the Group in 1999. He has been Chairman of the Supervisory Board of Schneider Electric since 2006. Henri Lachmann has occupied other important positions: Vice Chairman of the Supervisory Board of Vivendi, Member of the Supervisory Board of Norbert Dentressangle, Director of the AXA Group Mutuelles, Chairman of the Board of Directors at the Marie Lannelongue Surgical Center since 2006, Chairman of the Continental Law Foundation, Chairman of the Fondation Télémaque, nonexecutive director at Fimalac, Director at the Fondation Entreprendre, Chairman of the Advisory Council of the Campus of Excellence at the Office of the Commissioner General for Investment (Large Loans), Vice-Chairman and Treasurer of the Institut Montaigne and Member of the Steering Committee of the Enterprise Institute. Henri Lachmann is also an Officer of the Legion of Honor, an Officer of the Academic Palms and a Commander of the National Order of Merit. Henri Lachmann is a graduate of the Ecole des Hautes Etudes Commerciales (HEC) and is a chartered accountant.

14.1.3 Other Members of the Board of Directors



Marcello Conviti – Chief Executive. Please refer to paragraph 14.1.2 "Backgrounds of the members of the Board of Directors".

Prof Alain Carpentier, Scientific Director. Please refer to paragraph 14.1.2 "Backgrounds of the members of the Board of Directors".

Patrick Coulombier, Deputy Chief Executive. Patrick Coulombier has headed the project team for the CARMAT total artificial heart within the EADS Group since July 2001. Before that he worked for MBDA France as director of two international programs in the area of defense, one concerning a British air combat training system and the other relating to a Franco-German drone system. Between 1978 and 1990, before joining MBDA France, Patrick Coulombier had a number of different research and development posts in connection with a range of aeronautic and space projects at THALES AVIONIQUE (Airbus A130, A320, Rafale Combat Aircraft, Super Puma Helicopter and the Hermes Spacecraft). Patrick Coulombier has a degree in electronic engineering.

Dr. Petrus Jansen, Medical Director. Petrus Jansen began his career in 1997 in the Netherlands with EDWARDS LIFESCIENCES as Head of Research and Clinical Trials, particularly in connection with the NOVACOR program (left ventricular assistance device). Petrus Jansen then held similar positions in Europe and the United States with JARVIK HEART in charge of clinical trials and obtaining the CE Conformity Marking for its products. Before joining CARMAT in December 2009, Petrus Jansen was the Medical Director at WORLD HEART USA for five years. Petrus Jansen qualified as a medical doctor from the Catholic University of Nijmegen, he has a PhD in medicine from the University of Amsterdam, and he was research fellow at the University of Rotterdam.

Valérie Leroy, Director of Marketing and Investor Relations. Valérie Leroy began her career in information technology in 1984, where she held various sales positions until 1996. She was in particular in charge of key accounts for TOSHIBA SYSTEMES from 1988 to 1994. In 1996 she joined the marketing teams at MEDTRONIC for the range of cardiac stimulators. In 2001, Valérie Leroy joined EDWARDS LIFESCIENCES, where she spent over nine years working in different sales and marketing positions at their European headquarters in Switzerland and their world headquarters in California. From 2008 to 2010, she became Director of European Marketing for their range of surgical heart valve therapies (repair and bioprosthesis). Valérie Leroy has a Master's Degree in Marketing (IAE, Paris – Panthéon, Sorbonne, 1996).

Marc Grimmé, **Technical Director.** As project manager, Marc Grimmé has piloted the technical studies for the CARMAT total artificial heart since 1996, giving him over 15 years' experience in the artificial heart field. Between 1991 and 1996 at MBDA France, Marc Grimmé covered the full range of activities connected with developing critical electronic equipment: from upstream studies ahead of production, to the design phases, missile equipment, such as an image processing calculator, and installation of the firing system. Marc Grimmé has a degree in electronic engineering.

Joëlle Monnier, Quality Director. Joëlle Monnier held a number of different positions as marketing and regulatory affairs coordinator at DEPUY FRANCE from 1991 to 1997. She was in charge of quality assurance and regulatory affairs and was site manager at an orthopedic implants company from 1998 to 2007, before becoming project coordinator for the medicoeconomic and organizational studies at IRIS HEALTH CONSULTING. Since 2009, as Quality Director at CARMAT, Joëlle Monnier has been in charge of training and putting in place the management system on quality, monitoring subcontractors and preparing for the ISO 13485 Certification and the CE Conformity Marking for the CARMAT total artificial heart. Joëlle Monnier qualified as a medical doctor from the Rennes Faculty of Medicine. She also has a diploma (epidemiology elective) from CESAM, the education center for applied statistics in medicine and medical biology, and a quality assurance and certification diploma from CEGOS.

Claire Philibert, Procurements Director. Claire Philibert began her career in marketing at GRANDOPTICAL, when the chain of opticians was first launched. She then worked as a procurement manager for over 10 years in different companies, including NYCOMED AMERSHAM MEDICAL SYSTEMS (manufacturer of cardiology, radiology and interventional neuroradiology products) and DIAGNOSTICA STAGO, global specialists in hemostasis. Claire Philibert is a graduate of EAD, the School of Business Administration and Management.

Hervé Bocquet, Industrial Director. Since 2001, Hervé Bocquet held the posts of chief engineer on a drones program, developed as part of an international collaboration, and head of UAV production at CASSIDIAN, the defense and security branch of EADS. Previously, he worked on upstream industrialization and the integration of on-board equipment and drone systems at MBDA. Before that he was technical manager of missile equipment and the motor division of aerospace systems from 1985 to 1990. Hervé Bocquet has a degree in mechanical engineering and aeronautics.

14.2 CONFLICTS OF INTEREST IN THE ADMINISTRATIVE, MANAGEMENT AND SUPERVISORY BODIES AND THE EXECUTIVE BOARD

14.2.1 Potential conflicts of interest

At the date of registration of this reference document and as far as the Company is aware, there are no current or potential conflicts of interest between the private interests of the members of the Board of Directors of the Company and the interests of the Company.

Similarly, as at the same date, the Company has no knowledge of any current or potential conflicts of interest between the private interests of the members of the audit committee, the remunerations committee or the scientific committee and the interests of the Company.

As far as the Company is aware, there are no potential conflicts of interest between the duties of the members of the Board of Directors towards the Company and their private interests and/or other duties.

14.2.2 Commitments of the directors and executive members to preserve shareholdings

At the date of registration of this reference document, there is no commitment of the directors and executive members to preserve shareholdings.

15 REMUNERATION AND BENEFITS

15.1 REMUNERATION AND BENEFITS IN KIND OF THE MANAGEMENT AND DIRECTORS

15.1.1 Remuneration of directors for the years ending December 31, 2009, December 31, 2010, December 31, 2011, and December 31, 2012

Note that the Company was incorporated on June 30, 2008, and has completed four years ending respectively on December 31, 2009 (19 months), December 31, 2010 (12 months), December 31, 2011 (12 months), and December 31, 2012 (12 months).

All the information required under the AMF recommendation of December 22, 2008, on the remuneration of the corporate officers is presented below.

Remuneration of directors for the financial year ended December 31, 2009:

In euros	**Position**	**Fixed remuneration**	**Variable remuneration**	**Special remuneration**	**Directors' fees**	**Benefits in kind**
Jean-Claude Cadudal[(1)]	Chairman of the Board of Directors	0	0	0	60,000	0
Professor Alain Carpentier	Director	0	0	0	0	0
Dr. Philippe Pouletty, Representative of Truffle Capital	Director	0	0	0	0	0
André-Michel Ballester[(2)]	Director	0	0	0	5,000	0
Peter Steinmann[(2)(3)]	Director	0	0	0	5,000	0
Michel Finance[(2)]	Director	0	0	0	5,000	0

(1) At the board meeting of February 17, 2009, it was decided to allocate to the directors a sum of €100,000 per annum by way of directors' fees to compensate them for the work they do. This sum can be shared freely between the directors. At the Board meeting of April 22, 2009, it was decided to allocate the sum of €60,000 to Jean-Claude Cadudal in his position as Chairman of the Board of Directors, payable half-yearly and for period running from July 1, 2008 until December 31, 2009.
It was also decided to allocate to Jean-Claude Cadudal a fixed sum of €40,000 gross by way of supplementary remuneration, payable in the event of him securing for the company financing in excess of €2 million (see below).

(2) At the board meeting of July 8, 2009, it was decided to grant €10,000 per annum in directors' fees to Messrs. Ballester, Steinmann, and Finance (€30,000 in total), or €5,000 for the 2009 year, payable during the second half-year.

(3) On December 16, 2009, Peter Steinmann resigned from his post as company director because a change in his employment circumstances meant that his new role was incompatible with being a director of CARMAT.

Remuneration of directors for the financial year ended December 31, 2010:

In euros	Position	Fixed remuneration	Variable remuneration	Special remuneration	Directors' fees	Benefits in kind
Jean-Claude Cadudal [1]	Chairman of the Board of Directors	0	0	0	60,000	0
Professor Alain Carpentier	Director	0	0	0	0	0
Dr. Philippe Pouletty, Representative of Truffle Capital	Director	0	0	0	0	0
André-Michel Ballester [2]	Director	0	0	0	10,000	0
Michel Finance [2]	Director	0	0	0	10,000	0
Henri Lachmann	Director	0	0	0	0	0

(1) At the Board meeting of May 7, 2010, it was decided to allocate the sum of €60,000 to Jean-Claude Cadudal in his position as Chairman of the Board of Directors, payable half-yearly and for the 2010 financial year.

(2) At the Board meeting of May 7, 2010, it was decided to grant €2,000 each in directors' fees to Messrs. Ballester and Finance per meeting of the Board attended by them in person, capped at €10,000 each for 2010.

Remuneration of directors for the financial year ended December 31, 2011:

In euros	Position	Fixed remuneration	Variable remuneration	Special remuneration	Directors' fees	Benefits in kind
Jean-Claude Cadudal [1]	Chairman of the Board of Directors	0	0	40,000	60,000	0
Professor Alain Carpentier [3]	Director	0	0	0	5,000	0
Dr. Philippe Pouletty, Representative of Truffle Capital [3]	Director	0	0	0	5,000	0
André-Michel Ballester [2]	Director	0	0	0	10,000	0
Michel Finance [2]	Director	0	0	0	10,000	0
Henri Lachmann [2]	Director	0	0	0	10,000	0

(1) At the Board meeting of June 6, 2011, it was decided to allocate the sum of €60,000 to Jean-Claude Cadudal in his position as Chairman of the Board of Directors, payable half-yearly and for the 2011 financial year, as well as exceptional remuneration of €40,000 for the task entrusted to him in the context of the Company's IPO, insofar as he obtained financing in excess of €2 million for the Company.

(2) At the Board meeting of June 6, 2011, it was decided to grant €2,000 each in directors' fees to Messrs. Ballester, Finance, and Lachmann per meeting of the Board attended by them in person, capped at €10,000 each for 2011.

(3) At the Board meeting of June 6, 2011, it was decided to grant €1,000 each in directors' fees to Mr. Carpentier and Truffle Capital per meeting of the Board attended by them in person (for Truffle Capital, its legal representative), capped at €5,000 each for 2011.

Remuneration of directors for the financial year ended December 31, 2012:

In euros	Position	Fixed remuneration	Variable remuneration	Special remuneration	Directors' fees	Benefits in kind
Jean-Claude Cadudal[1]	Chairman of the Board of Directors	0	0	0	60,000	0
Professor Alain Carpentier[3]	Director	0	0	0	5,000	0
Dr. Philippe Pouletty, Representative of Truffle Capital[3]	Director	0	0	0	5,000	0
André-Michel Ballester[2]	Director	0	0	0	10,000	0
Michel Finance[2]	Director	0	0	0	10,000	0
Henri Lachmann[2]	Director	0	0	0	10,000	0

(1) At the Board meeting of February 28, 2013, the remuneration of Jean-Claude Cadudal, in his position as Chairman of the Board of Directors, equivalent to that for the 2011 financial year, was confirmed for the 2012 financial year and is maintained for the following financial years until the Board decides otherwise.

(2) At the Board meeting of February 28, 2013, the remuneration of Messrs. Ballester, Finance, and Lachmann, equivalent to that for the 2011 financial year, was confirmed for the 2012 financial year and is maintained for the following financial years until the Board decides otherwise.

(3) At the Board meeting of February 28, 2013, the remuneration of Mr. Carpentier and Truffle Capital, equivalent to that for the 2011 financial year, was confirmed for the 2012 financial year and is maintained for the following financial years until the Board decides otherwise.

Directors do not enjoy any particular retirement benefits, severance payments due when they leave office, or noncompetition payments.

15.1.2 Remuneration of the Chief Executive

In euros	Position	Year	Fixed remuneration received	Variable remuneration	Special remuneration	Directors' fees	Benefits in kind
Marcello Conviti [1]	Chief Executive	2009	96,023	0	0	0	9,800
		2010	337,582	123,965	0	0	23,211
		2011	326,625	23,729	0	0	6,612
		2012	332,749	52,260	0	0	6,612

(1) Marcello Conviti has performed the duties of unsalaried Chief Executive of CARMAT since September 1, 2009. He receives fixed annual remuneration, to which is added variable remuneration that can go as high as 40% of this remuneration subject to performance conditions. For the 2013 financial year, the performance conditions determined by the Compensation Board and determining the amount of his variable remuneration concern mainly completion of the initial clinical trials and observance of the annual budget. Marcello Conviti also has a company car for a monthly amount of €1,350.

The Chief Executive does not enjoy any particular retirement benefits, severance payments due when he leaves office, or noncompetition payments.

15.2 SUMS SET ASIDE OR DETERMINED BY THE COMPANY FOR THE PAYMENT OF PENSIONS, RETIREMENT OR OTHER BENEFITS OF THE MANAGEMENT AND DIRECTORS

The company has not signed a specific agreement on retirement commitments. These are therefore limited to the agreed retirement lump-sum payment. By application of the preferential accounting method, the provision for retirement commitments has been accounted for as at December 31, 2012.

The calculation assumptions made were as follows:

- time-apportioned rights method in accordance with Regulation 2003 R-01 of the CNC;
- retirement at the initiative of the member of staff, at 62 years (nonmanagement) or 65 years (management);
- salaried employee progression of 2% per annum;
- low staff turnover;
- Discount rate of 3% per annum (against 4.6% at 12/31/2011 and 3.38% at 06/30/2012);

The overall amount of the provision was €73,334 at the end of the period, an increase of €37,674 on the previous period.

15.3 STOCK SUBSCRIPTION WARRANTS (BSA) OR START-UP COMPANY SHARE OPTIONS (BCE) ASSIGNED TO MANAGEMENT AND DIRECTORS

The following table shows at the date of registration of this reference document, all the stock subscription warrants (BSA) and start-up company share options (BCE) issued by the company to its corporate officers and management and subscribed by the beneficiaries, on the stipulation that at the date of registration of this reference document 308 BCE-2009-1 and 150 BCE-2009-2 had been exercised:

Holder		**BSA-2009-1**	**BCE-2009-1**	**BCE-2009-2**	**BCE-2012-1**
Jean-Claude Cadudal	Chairman of the Board of Directors	1,554			
Michel Finance	Director	518			
André-Michel Ballester	Director	518			
Marcello Conviti	Chief Executive / Director		2,800		4,000
Patrick Coulombier	Deputy Chief Executive / Staff member			1,176	

The exercising of each BSA-2009-1 or BCE-2009-1 and BCE-2009-2 gives an entitlement to 25 new shares in CARMAT. The exercising of each BCE-2012-1 gives an entitlement to 1 new share in CARMAT. For a detailed description of the characteristics of BSA-2009-1, BCE-2009-1, BCE-2009-2, and BCE-2012-1, please refer to paragraph 17.2 “Interests and share options held by members of the management and supervisory bodies”.

16 OPERATION OF THE ADMINISTRATION AND MANAGEMENT BODIES

16.1 EXPIRY OF THE TERM OF OFFICE OF DIRECTORS

Please refer to paragraph 14.1.1 “Composition of the Board of Directors”.

16.2 SERVICE CONTRACTS LINKING THE MEMBERS OF THE BOARD OF DIRECTORS AND THE GENERAL MANAGEMENT OF THE COMPANY

As at the date of registration of this reference document, there were no service contracts linking the members of the Board of Directors and the general management of the company.

16.3 BOARDS

As at the date of registration of this reference document, the company had set up the following boards:

16.3.1 Board of Auditors

By decision of the Board of Directors of July 8, 2009 the company set up a Board of Auditors for an unlimited duration. As at the date of this reference document, the Board of Auditors is comprised of three members:

- Michel Finance, director and chairman of the Board of Auditors;
- Jean-Claude Cadudal, Chairman of the Board of Directors and member of the Board of Auditors;
- Christian Pierret, independent member of the Board of Auditors.

In accordance with the stated intentions of the company expressed at the time the company was listed on the Alternext Paris market of NYSE-Euronext, the company has appointed two further members to its Board of Auditors: Jean-Claude Cadudal, appointed at the Board meeting of May 7, 2010 and Christian Pierret, appointed at the Board meeting of December 15, 2010.

Michel Finance – Chairman of the Board of Auditors. Please refer to paragraph 14.1.2 “Backgrounds of the members of the Board of Directors”.

Jean-Claude Cadudal – Member of the Board of Auditors. Please refer to paragraph 14.1.2 “Backgrounds of the members of the Board of Directors”.

Christian Pierret – Independent member of the Board of Auditors. Christian Pierret is a former Deputy Minister for Industry, Small Business, Trade, and Crafts, a position he held from June 1997 to May 2002. Christian Pierret has had a dual career, in both politics and the private sector: Rapporteur général for the budget to the National Assembly (1981-1986), Chairman of the monitoring committee of the Caisse des Dépôts (1988-1993). Deputy chairman of the Accor Group (1993-1996). Member of parliament for Vosges from 1978 to 1993 and mayor of Saint-Dié des Vosges since 1989. Christian Pierret is a specialist in public company regulation, company and business law, the public-private interface (concerning the environment, for example) and European law (concentration, competition, state aid). He was behind the “Pierret law” of February 2002 opening up the French electricity and telecommunications markets to competition. Christian Pierret holds a postgraduate diploma in economic sciences (IEP Paris, 1970) and a master's degree in public administration (1972).

The mission of the Board of Auditors is to assist the Board of Directors, independently from the company’s management, in ensuring the truthfulness of the financial statements, the quality of the internal control, the quality and relevance of the information provided and the correct discharge by the statutory auditors of their mandate.

To that end the Board of Auditors issues opinions and makes proposals and recommendations to the Board of Directors.

The Board of Auditors’ vocation is thus to:

- evaluate the existence and relevance of the financial control and internal audit procedures;
- assess the relevance of the accounting policy of the company;
- examine the company accounts and the information provided by these prior to them being presented to the Board of Directors;
- examine the changes and adaptations to the accounting principles and rules used in the preparation of the company accounts and the relevance of these;
- examine the candidates proposed for the positions of regular statutory auditor or substitute statutory auditor;
- ensure the independence and competence of the statutory auditors;
- examine the significant risks faced by the company, and in particular the off-balance sheet risks and commitments.

It reports to the Board of Directors on its activities at regular intervals.

The audit committee met:

- three times during the 2012 financial year, the first time to examine the 2012 budget, the second time to approve the 2011 financial statements, and finally to examine the 2013 budget;
- and once in 2013 so far, to approve the 2012 financial statements and conduct a review of risk factors.

16.3.2 Compensation Board

The company has established a Compensation Board which as at the date of this reference document is comprised of two members, appointed by the Board of Directors at its meeting on April 22, 2009 for an unlimited term:

- Philippe Pouletty, director and Chairman of the Compensation Board;
- Jean-Claude Cadudal, chairman of the Board of Directors and member of the Compensation Board.

The Compensation Board makes recommendations to the Board of Directors on the remuneration (fixed and variable) of the corporate officers and its senior management, and on shareholder policy and ownership schemes for management and employees, taking into account the objectives of the company and the levels of individual or collective performance.

It also plays a part in setting up the company's corporate governance bodies.

It reports to the Board of Directors on its activities at regular intervals.

The Remuneration Board met three times during the 2012 financial year:

- the first time to decide on the allocation of bonuses on 2011 targets;
- the second time to approve the BSPCE 2012 plan and review the performance clause of the 2009-2 plan; and
- finally to rule on the remainder of the bonuses on 2011 targets.

16.3.3 Medical and Scientific Advisory Boards

The meeting of the Board of Directors of December 16, 2009 approved the setting of two scientific boards for an unlimited term.

16.3.3.1 Medical Advisory Board

The Medical Advisory Board is responsible for preparations for the clinical trials. The Medical Advisory Board is comprised:

Professor Christian Latrémouille: Cardiac surgeon in charge of transplantation at the Hôpital Européen Georges Pompidou, former pupil of Professor Alain Carpentier, he spent part of his hospital training in the United States, in Washington DC and Philadelphia. He is also Professor of Clinical Anatomy at the Faculty of Medicine at the University Paris V – René Descartes. He has published many scientific works such as *L'organisation des appareils et des systèmes* (2011), and many academic publications in renowned scientific magazines like the European Journal of Cardio-Thoracic Surgery or the Journal of Thorac Cardiovascular Surgery.

Professor Daniel Duveau: Professor of thoracic and cardiovascular surgery at the Guillaume et René Laënnec hospital. He is a full member of a number of associations including, in particular, the Société Française de Chirurgie Thoracique et Cardio-vasculaire (French Society of Thoracic and Cardiovascular Surgery), the International Society of Heart and Lung Transplantation and also the European Society for Cardiovascular Surgery. He also has an administrative role within the Scientific Council of the Nantes Faculty of Medicine and the In-house Medical Commission. He is also Medical Director of the Institute of the Thorax and Vice-chairman of the National Commission for Materiovigilance (AFSSAPS). Winner of first prize from the Conseil Général in 1966 and 1967, he received the Médaille d'Or des Hôpitaux in 1967.

Dr. Rémi Nottin: Surgeon and head of department at the Marie Lannelongue hospital, where he specializes in the areas of adult cardiac surgery and peripheral vascular surgery. He is also a specialist in coronary artery bypass, aortic dissection, heart transplant, mitral valve repair, repair of the aortic root, and aortic aneurysm.

Professor Alain Carpentier: Please refer to paragraph 14.1.2 “Backgrounds of the members of the Board of Directors”.

16.3.3.2 Scientific Advisory Board

The Scientific Advisory Board is responsible for monitoring the international development of the total artificial heart project.

The Scientific Advisory Board is comprised:

Professor Günther Laufer: Professor and Head of the Department of Cardiac Surgery at the Vienna Medical University, he specializes in the area of mini-invasive coronary surgery. He is currently Chairman of the Austrian Society for Cardiothoracic Surgery. He is also a member of the European Society for Cardiothoracic Surgery.

Professor Paul Mohacsi: Head of the Department of Cardiac Failure and Transplantation at the Bern Clinic and Polyclinic for Cardiology (Inselspital).

Professor Frederick Mohr: Professor of Cardiac Surgery and Medical Director of the Center for Cardiology at the University of Leipzig and Professor of Cardiovascular Surgery at the University of Göttingen in Germany, Frederick Mohr carries out research in various areas including adult cardiac surgery, peripheral vascular surgery and valve repair. He is also a member of a number of associations such as the German Society for Vascular Surgery, the American Association for Thoracic Surgery and the International Society of Heart and Lung Transplantation.

Dr. Edoardo Gronda: With a degree in medicine and surgery, Dr. Edoardo Gronda is the Director of the Department of Clinical Cardiology and Cardiac Failure at the Humanitas Clinical Institute in Italy. He was also a lecturer at the Faculty of Internal Medicine at the University of Milan until 2000. He is also Chairman of the working group of the international association of cardiac and pulmonary transplantations. He has contributed to the European Journal of Congestive Heart Failure, and to the Journal of Heart and Lung Transplant. He is also a medical consultant to the Precision Reports in collaboration with the American Heart Association.

Professor Gilles Dreyfus: Professor of cardiovascular surgery at the Imperial College School of Medicine (United Kingdom), Gilles Dreyfus is a consultant in cardiothoracic surgery and Director of Research at the Royal Brompton & Harefield Trust where his research is centered on cardiac valvulopathy, cardiac failure, transplantation, and left ventricular assistance devices. He was in charge of the cardiovascular surgery department of the Foch Hospital until 2001. With a worldwide reputation as an expert in repairing the mitral valve, he is editor in chief of the Journal of Cardiac Failure and has published many articles on this subject in numerous scientific magazines. Since January 2010 he has been Medico-surgical Director of the Centre Cardio-thoracique de Monaco (CCM).

Dr. Mark Slaughter: Professor of Surgery and Head of the Thoracic and Cardiovascular Surgery Division at the University of Louisville in Kentucky, Dr. Mark Slaughter is also Director of the Cardiac Transplantation and Mechanical Assistance Devices Program. He is also a member of the scientific advisory board of Cardiology Online Inc. and a council member of the Society for Artificial Internal Organs.

Professor Alain Carpentier: Please refer to paragraph 14.1.2 “Backgrounds of the members of the Board of Directors”.

Members of the Scientific and Medical Boards met several times during the 2012 financial year, as a whole, individually, or in small groups, to analyze developments made in the CARMAT total artificial heart and prepare for the clinical trials.

The Medical Board met many times to discuss study protocols, to validate technical dossiers, and after each ex-vivo or in-vivo trial session to share the lessons learned from these experiments.

The Scientific Board met on July 4, 2012, and during the 26th annual meeting of the European Association for Cardio-thoracic Surgery in Barcelona in October 2012 to evaluate the methodology of preclinical trials, particularly concerning the results of experimental implantations on animals. Its members regularly make individual visits to the Association's head office for the project's progress points and to review the results of tests.

16.3.4 Advisory Board

Article 17-VI of the Articles of Association gives the Ordinary General Meeting the power to appoint, at its discretion, three actual persons or legal entities, who may or may not be shareholders, for a term of office of one year expiring at the General Meeting of Shareholders called to decide on the accounts for the year just ended and held during the year in which their terms of office expire. This term of office may be renewed an unlimited number of times. The task of the observers on the Advisory Board is to ensure the strict application of the Articles of Association and to present their observations at the meetings of the Board of Directors. The observers perform a general and permanent task within the company through advice and monitoring. In connection with their role they may make observations to the Board of Directors.

Observers must be invited to each meeting of the Board of Directors in the same way as directors. Observers have only consultative powers on an individual or joint basis and have no voting rights on the Board.

As at the date of registration of this reference document no observer had been appointed.

16.4 STATEMENT ON CORPORATE GOVERNANCE

16.4.1 Corporate governance

The aim of the company is to follow the principal recommendations of the Code of Corporate Governance for

Quoted Companies issued by the AFEP-MEDEF in December 2008, to the extent that these principles are compatible with the organization, the size, the resources and the ownership structure of the company.

To this end the company has proceeded with a review of its corporate governance in respect of the 22 recommendations of the Code of Corporate Governance for Quoted Companies issued by the AFEP/MEDEF. The principal recommendations not applied are as follows:

- given the size of the company and the fact that it has only recently been listed on the Alternext Paris market, it has not yet proceeded with an evaluation of the Board of Directors;
- the company's Articles of Association provide for terms of office of the directors of six years, whereas the AFEP/MEDEF recommends a limit of four years;
- given the size of the company, no appointments board has been set up and no independent director sits on the Compensation Board.

Apart from setting up the Board of Auditors, the Compensation Board and the Scientific Boards mentioned in paragraph 16.3 “Boards” and in order to meet the standards of corporate governance that the company has set itself the elements described below have now been put in place.

16.4.2 Bylaws

The Board of Directors has provided itself with Bylaws, the purpose of which is to define the ways in which it is organized and operates over and above the legal and statutory provisions in force.

The Bylaws specifically provide that the Board of Directors shall decide on corporate policy and monitor the implementation of this. It deals with any matter affecting the proper operation of the company and through its deliberations rules on matters relating to it. In this context the Board of Directors approves significant operations by the company before these are carried out. These specifically include:

- the strategic, economic, social, financial and scientific policy of the company;
- operations extending beyond the company’s stated strategy;
- the securing of loans or advances in order to acquire shares or securities of any subsidiary company except where such subsidiary is wholly-owned;
- the furnishing of guarantees on behalf of a subsidiary or to guarantee bank accounts;
- all investments in excess of €250,000;
- all commitments in excess of €100,000 and not provided for in the annual budget;
- hiring, laying off, and amending of the employment contracts of employees at management level;
- a change in the normal business of the company and in its development strategy;
- the disposal, transfer, licensing or pledging of any industrial or intellectual property or of any substantial asset;
- any decision relating to a secondary offering.

The Board of Directors shall proceed with the controls and verifications that it deems appropriate and may call for the documents that it deems appropriate for performing its task.

- Separation of the mandates of the Chairman of the Board of Directors and the Chief Executive

When the company converted to a limited liability company, the Board of Directors opted for a dissociation of the mandates of the Chairman of the Board of Directors and of the Chief Executive.

In respect of the shareholders and without this restriction being binding upon third parties, the Chief Executive may not take any decision on behalf of the company in the following areas without the prior authorization of the Board of Directors:

- the securing of loans or advances in order to acquire shares or securities of any subsidiary company except where such subsidiary is wholly-owned;
- the furnishing of guarantees on behalf of a subsidiary or to guarantee bank accounts;
- all investments in excess of €250,000;
- all commitments in excess of €100,000 and not provided for in the annual budget;
- hiring, laying off and amending of the contracts of employment of employees at management level;
- a change in the normal business of the company and in its development strategy;
- the disposal, transfer, licensing or pledging of any industrial or intellectual property or of any substantial asset;
- approval of the budget and the strategic plan.

Furthermore, the Chief Executive may not take, without a prior decision of the Board of Directors by a qualified majority of three quarters of the directors making up the Board as at the date that the decision is taken:

- any decision to proceed with the transfer of any substantial asset or any intellectual/industrial property belonging to the company;
- any decision to take a holding in a company, quoted or unquoted.

For a detailed description of the provisions governing the functioning of the Board of Directors and the General Management, please refer to paragraph 20.2.2 “Provisions of the articles, a charter or a regulation of the company

regarding members of the Board of Directors and of the General Management".

16.4.3 Independent directors

The company has three independent directors: André-Michel Ballester, Michel Finance, and Henri Lachmann. The company considers that they have since their appointment complied with the AFEP-MEDEF code of December 2008, namely:

- not being a member of staff or corporate officer, member of staff or director of the parent company or a company with which it consolidates and not having been so in the previous five years;
- not being a corporate officer of a company in which the company holds, directly or indirectly, a position of director or in which a member of staff appointed as such or a corporate officer (current or having been so within the last five years) holds a director's post;
- not being a major client, supplier, commercial banker or financial banker of the company or its group, or for whom the company or its group represents a significant part of its business;
- not having a close family tie with a corporate officer;
- not having been an auditor of the company within the last five years; and
- not having been a director of the company for more than twelve years.

André-Michel Ballester saw the 506 BSA 2009-1 allocated to him at the Board meeting of July 8, 2009, raised to 518 BSA 2009-1 and received €10,000 of directors' fees for 2012.

Michel Finance saw the 506 BSA 2009-1 allocated to him at the Board meeting of July 8, 2009, raised to 518 BSA 2009-1 and received €10,000 of directors' fees for 2012.

Henri Lachmann received €10,000 of directors' fees for 2012.

16.4.4 Internal control

The company is not obliged to draw up a report on its internal control provided for in article L 225-37 of the Commercial Code.

At the date of registration of this reference document, the company nevertheless had internal control procedures, in particular in the administrative, accounting, and financial areas, with a view to implementing its strategic policies. The company's audit committee reviews all the procedures annually. The internal control procedures in force are summarized below.

A. Administrative and financial organization (please refer to paragraph 17.1.1 "Functional organizational chart")

The administrative and financial functions are provided by three employees and four service providers under the direct or delegated supervision of the Deputy Chief Executive. Positions are held by a purchasing manager, a head of finance, and a management controller. The company uses an accounting firm to handle all its accounts.

The company has also put in place a procedure to delegate powers and signatures for signing order forms and paying invoices. Thus, from €20,000, order forms must be signed by one of the following persons: the Chief Executive, the Deputy Chief Executive, or the Chairman of the Board of Directors. From €100,000, order forms must be signed either by the Chief Executive or by the Chairman of the Board of Directors and the Deputy Chief Executive. From €250,000, at least two of them must sign order forms.

B. External purchases

Strategic purchases are the subject of tenders and contracts. Any order, regardless of the amount, nature, or requisitioner, must be the subject in advance of:

- a computerized purchase requisition to the Purchasing Department, which must make reference to the corresponding budget forecast for deduction and include, as the case may be, the specific purchasing conditions;
- the approval of the Deputy Chief Executive or the approvals defined above depending on the amounts.
- Only the Purchasing Department is then authorized to issue an order form, accompanied by the general conditions of purchase or, as the case may be, the special conditions and specifying the supplier's contact persons in respect of purchasing, content, delivery, and settlement.

C. Settlements

On receipt of an invoice, the Finance division has proper execution of the order by the requisitioner validated. Payments made by the company to third parties (suppliers, government, employees, etc.) are prepared, on the company's instruction, by the accounting firm. Settlements are executed, without exception, by bank transfer. Transfer orders are generated exclusively in computerized format and are checked by the Finance division then systematically validated by the Company's Management.

D. "Financial internal control" procedures

Internal control related to the preparation and processing of financial and accounting information is hereinafter called “financial internal control”.

Accounting records and tax returns

The company entrusts to an accounting firm the holding of all accounting records and the preparation of tax returns. All the elements produced by the accounting firm comply with the ethical obligations laid down by the Ordre des Experts Comptables and are in particular reviewed and systematically validated by the partner accountant responsible for the file.

- Accounting

Accounting is done by the accounting firm, on the basis of information provided by the company. The accounting firm reports monthly on the progress of the state of the accounts through various dashboards submitted to the company's Management and coming within the framework of the budget control put in place.

- Tax returns

All tax returns are prepared by the accounting firm and validated by the partner accountant responsible for the file. The accounting firm complies with the obligations in respect of online returns.
The Research Tax Credit is the subject of a filing of a full supporting dossier accompanying the return and made available to the tax authorities.

Preparation of the financial statements

- Financial information published

The semiannual and annual financial statements, which are notified to the AMF, are prepared by the accounting firm in liaison with the company's Management and the heads of the departments concerned (management control, finance and human resources, purchasing). The procedures put in place to ensure the reliability of the financial information have been drafted and distributed to the parties concerned.
The methodology for capturing the company's expenses is applied systematically and generally. It is applied mainly on the principle of progress of orders under way, which is determined, for each order, by the technical head concerned and is the subject of a monthly control by the Management Control department.

- Computerized reporting

The company's expenses are monitored using a twofold procedure:

- Preparation of an annual budget, revised periodically, constructed in accordance with the forecasts of the divisional heads and confronted with the company's general objectives;
- Preparation of monthly reporting, on the basis of accounting data, enabling in particular budgetary monitoring of expenses.

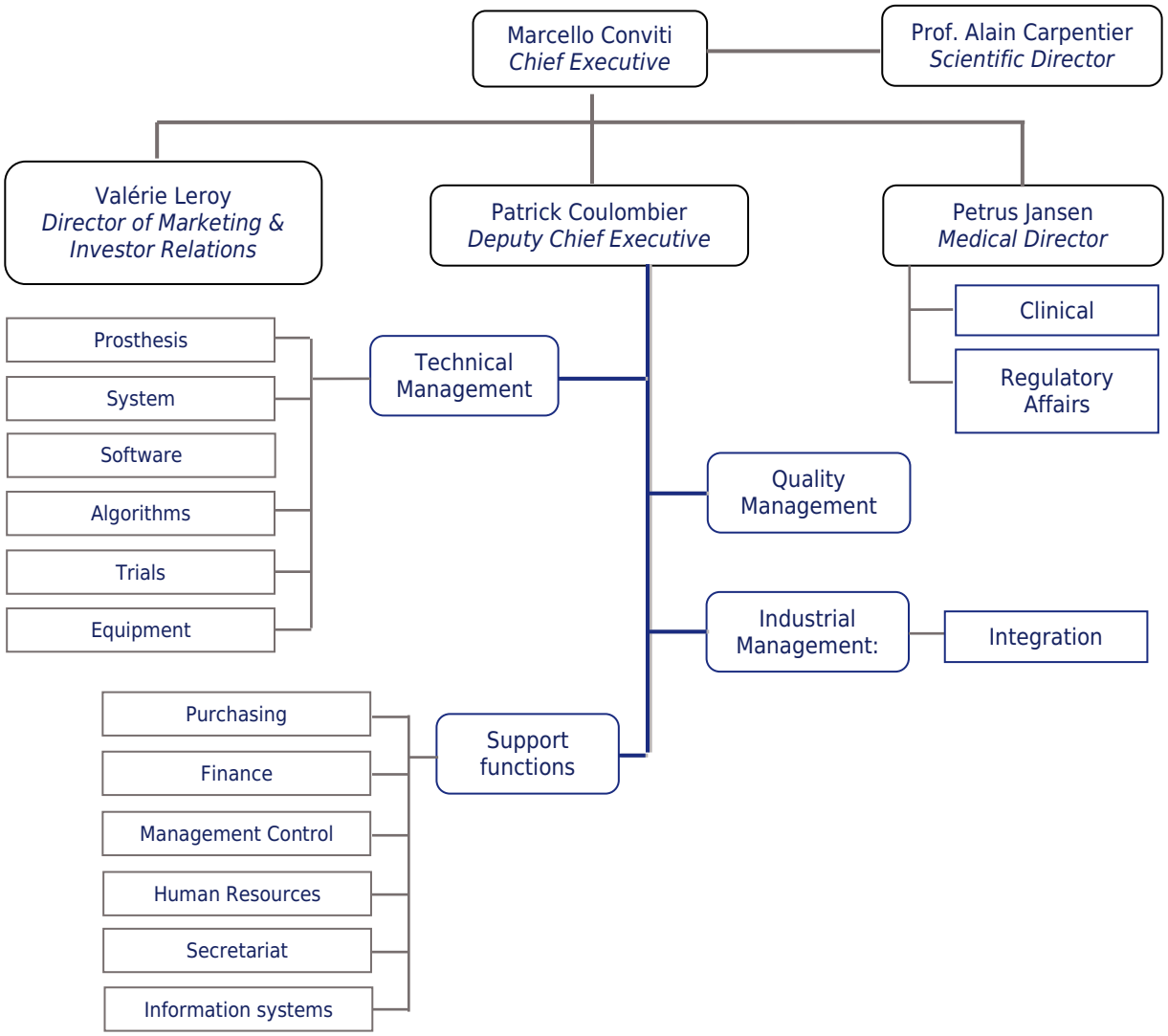
The company takes the view that the procedures in force are suited to its size, organization, and current objectives.

17 STAFF

17.1 HUMAN RESOURCES

17.1.1 Operational structure

As at the date of registration of this reference document, the operational structure of the company was as follows:



For a description of the experience and roles of the main members of the management, please refer to paragraph 14.1.3 “Other members of the management”.

At certain stages of the development of the total artificial heart project, the company has used a number of outside providers of specific services. At the date of registration of the reference document, 44 outside service providers work for CARMAT and are divided up as follows:

- Technical: 32 service providers, including:
  - Prosthesis Unit: 5 service providers
  - System Unit: 4 service providers
  - Software Unit: 11 service providers
  - Test Unit: 5 service providers
  - Algorithms Unit: 4 service providers
  - Equipment Unit: 3 service providers
- Regulatory and Clinical Affairs: 2 service providers
- Integration: 3 service providers
- Quality: 4 service providers
- Purchasing: 1 service provider
- Information systems: 2 service providers

17.1.2 Number and breakdown of staff

At the date of registration of this reference document, the company's workforce numbered 37 persons and two trainees.

17.1.2.1 Changes in workforce

Changes in workforce at	12/31/2012	12/31/2011	12/31/2010	12/31/2009	12/31/2008
Managers	30	29	25	17	11
Non-management	7	7	7	8	3
Trainees	5	0	0	0	0
Total	42	36	32	25	14

At December 31, 2012, all members of staff were employed under permanent employment contracts, except two staff under temporary employment contracts and five trainees. One employee is employed part-time.

17.1.2.2 Status of Young Innovative Enterprise (JEI)

CARMAT opted for the status of Young Innovative Enterprise in September 2008. On July 8, 2009, the Yvelines tax services department issued a favorable opinion (“ruling”) in respect of the company's JEI application. This opinion is valid vis-à-vis the URSSAF.

The status of JEI is a tax status for young enterprises conducting research and development projects and whose workforce comprises less than 250 staff. If the conditions surrounding its profits are met, the employer enjoys exemption from employer contributions towards social security and family benefits. The period of exemption is a maximum of eight years from the date of establishment of the company, or for CARMAT up until 2015 (please refer to paragraph 4.2.10 “Risks associated with loss of Young Innovative Enterprise status”).

Parliament has voted two amendments to the arrangements for JEI status, the first within the framework of article 78 of the 2011 Finance Law and the second within the framework of article 37 of the amended 2011 Finance Law of December 28, 2011. These amendments aim to cap and taper the arrangements for exemption from social security contributions payable by the JEI employer.

CARMAT benefited from the JEI exemption at the reduced rate of 80% in 2012, the fifth year of application of the status (date of establishment: June 30, 2008). This reform of the status, effective since January 1, 2011, resulted in an additional social security cost of €380,000 in 2012.

17.1.3 Human resources policy

Staff management is of considerable importance to the company. In fact, the company must have qualified employees available with strong skill sets since the business of CARMAT relies to a significant extent on the quality and effectiveness of its members of staff. The company believes that it has good staff relations.

The workforce at December 31, 2012, was made up of 12 women and 25 men and included two doctors, 24 engineers, and seven senior graduate technicians. The average age of the salaried workforce was 38.5. About a quarter of staff are aged under 30. In 2012 the company financed around 560 hours of training.

The company applies the National Collective Agreements of the “Metallurgical Industries: workers, employees, technicians, and supervisors” and the “Metallurgical Industries: engineers and managers”, as well as the Regional Collective Agreement of the “Metallurgical Industries: workers, employees, technicians, and supervisors of the Paris Region”. There are no company agreements other than the Bylaws.

Standard contracts of employment contain no clauses relating to breach of the contract of employment or an anti-competition and anti-poaching undertaking (staff and/or customers).

All members of staff of the company benefit, in addition to their basic salary, from a potential annual bonus subject to achieving quantitative and qualitative targets set in advance by the Board of Directors of the company and individual targets agreed in advance with the line manager. The amount of this bonus is limited to a percentage of the gross annual salary (between 5% and 40% of the gross annual salary according to the staff or managers concerned).

The working week at the company is 35 hours for non-managers with a fixed number of days per year for managers of 218. There is no agreement on work time within the company, but an internal memorandum concerning work time and working hour arrangements was issued on January 16, 2009 (over and above the provisions of the collective agreement applicable within the company). This memorandum makes provision for the length of the working day (07:00 – 20:00 hours), and for core time (10:00 – 15:30 hours).

17.2 INTERESTS AND SHARE OPTIONS HELD BY MEMBERS OF THE MANAGEMENT AND SUPERVISORY BODIES, AND BY STAFF

The following table shows as at the date of registration of this reference document, all the stock subscription warrants (BSA) and start-up company share options (BCE) issued by the company to its corporate officers and staff and not yet exercised.

The number of BSA-2009-1, BCE-2009-1, BCE-2009-2, BCE-2012-1, and BCE-2012-2 allocated to each corporate officer or member of staff is the result of the decision of the Compensation Board of the company.

Making use of a delegation granted by the shareholders on July 8, 2009, the Board of Directors meeting on June 27, 2012, decided, on a proposal from the Compensation Board and subject (i) to the agreement of the holders of BCE-2009-2 options and (ii) to retroactive ratification of its decision by the next shareholders' general meeting, to amend the exercise periods and terms of BCE-2009-2 options appearing in article 4 of the plan rules of these BCE-2009-2 options as follows:

Old wording:

"Special conditions

The beneficiaries may exercise the BCE-2009-2 options assigned to them under the following conditions:

- 20% of BCE-2009-2 options may be exercised on the date of the first anniversary of the beneficiary joining the company, subject to his/her actual and continued presence within the company at that date;
- 40% of BCE-2009-2 options may be exercised on the basis of monthly periods, up to a number X of BCE-2009-2 options calculated in accordance with the following rule and, for the first time, from the date of the first anniversary of the beneficiary joining the company, subject to his/her actual and continued presence within the company at that date:
- X = (40% of BCE-2009-2 options held by the beneficiary) multiplied by ((number of months elapsed since the date of the first anniversary of the beneficiary joining the company)/48)
- 40% of BCE-2009-2 options may be exercised from the finalization and success of the initial clinical trials of the CARMAT total artificial heart project before the end of the second quarter of 2012 (medical report on completion of the trial covering the safety and efficiency aspects), subject to his/her actual and continued presence within the company at that date."

New wording:

"Special conditions

The beneficiaries may exercise the BCE-2009-2 options assigned to them under the following conditions:

- 20% of BCE-2009-2 options may be exercised on the date of the first anniversary of the beneficiary joining the company, subject to his/her actual and continued presence within the company at that date;
- 40% of BCE-2009-2 options may be exercised on the basis of monthly periods, up to a number X of BCE-2009-2 options calculated in accordance with the following rule and, for the first time, from the date of the first anniversary of the beneficiary joining the company, subject to his/her actual and continued presence within the company at that date:
- X = (40% of BCE-2009-2 options held by the beneficiary) multiplied by ((number of months elapsed since the date of the first anniversary of the beneficiary joining the company)/48)
- 10% of BCE-2009-2 options may be exercised from the finalization and success of the initial clinical trials of the CARMAT total artificial heart before the end of the second quarter of 2012 (medical report on completion of the trial covering the safety and end point aspects), subject to his/her actual and continued presence within the company at that date;
- 10% of BCE-2009-2 options may be exercised from the success of the initial clinical implantation of the CARMAT total artificial heart before the end of November 2012 (third-party report), subject to his/her actual and continued presence within the company at that date;
- 6.5% of BCE-2009-2 options may be exercised from the success of the pivotal round of clinical trials of the CARMAT total artificial heart (report from the Scientific Board), subject to his/her actual and continued presence within the company at that date;
- 6.5% of BCE-2009-2 options may be exercised once the CE marking has been obtained for the CARMAT total artificial heart, subject to his/her actual and continued presence within the company at that date;
- 7% of BCE-2009-2 options may be exercised from the realization at December 31 of the first year of marketing of the CARMAT total artificial heart, recorded by the Board of Directors, of revenue and gross margin in line with the business plan established by the General Management and approved by the Board of Directors, subject to his/her actual and continued presence within the company at that date."

The lapsing of 10% of BCE-2009-2 options whose exercise is dependent on the finalization and success of the initial clinical trials of the CARMAT total artificial heart before the end of the second quarter of 2012 was recorded by the Board of Directors meeting on November 8, 2012, and said BCE-2009-2 options were canceled.

The lapsing of 10% of BCE-2009-2 options whose exercise is dependent on the success of the initial clinical implantation of the CARMAT total artificial heart before the end of November 2012 was recorded by the Board of Directors meeting on February 28, 2013, and said BCE-2009-2 options were canceled.

Holder		BSA-2009-1	BCE-2009-1	BCE-2009-2	BCE-2012-1	BCE-2012-2
Jean-Claude Cadudal	Chairman of the Board of Directors	1,554				
Michel Finance	Director	518				
André-Michel Ballester	Director	518				
Marcello Conviti	Chief Executive / Director		2,800		4,000	
Patrick Coulombier	Deputy Chief Executive / Staff member			1,176		
Marc Grimmé	Staff member			583		
Petrus Jansen	Staff member			351		
Jean-Marc Parquet	Staff member			343		
Paul Kohler	Staff member			330		
Fabien Bousquet	Staff member			121		
Antoine Capel	Staff member			185		
Marion Melot	Staff member			190		
Joëlle Monnier	Staff member			182		
Pierre Da Cruz	Staff member			152		
Hélène Lebreton	Staff member			57		
Clément Ducros	Staff member			68		
Karima Djabella	Staff member			121		
Nathalie Bottereau	Staff member			67		
Rekia Benmerrah	Staff member			29		
Yann Mery	Staff member			67		
Gregory Mingot	Staff member			67		
Hervé Bocquet	Staff member				15,000	
Valérie Leroy	Staff member				10,000	
Claire Philibert	Staff member				5,000	
Emmanuel Leclerc de Hauteclocque	Staff member				2,500	
Mohammed Zagdoud	Staff member				3,500	
Jean-Christophe Perles	Staff member				2,500	
Nicolas Gras	Staff member				2,500	
Alexandre Mendes	Staff member				2,000	
Aurélien Corbel	Staff member				2,000	
Marine Bonnenfant	Staff member				2,000	
Pierre Emeric Destors	Staff member				2,000	
Sylvie Claquin	Staff member				1,500	
Foulques Parra d'Andert	Staff member					2,000
Raouia Bouyanzer	Staff member					1,200
Frédéric Pene	Staff member					1,500
Philippe Martel	Staff member					2,000
TOTAL ASSIGNED		**2,590**	**2,800**	**4,090**	**54,500**	**6,700**
NOT ASSIGNED		0	0	0	0	
TOTAL		**2,590**	**2,800**	**4,090**	**54,500**	**6,700**
NUMBER OF SHARES LIKELY TO BE CREATED BY EXERCISING BSA WARRANTS OR BCE OPTIONS		**64,750**	**70,000**	**102,250**	**54,500**	**6,700**

The following table shows the main characteristics of the BSA warrants granted to member of the Board of Directors and of the BCE options assigned to members of management and to staff:

Type of security	BSA-2009-1	BCE-2009-1
Beneficiaries	3 members of the Board of Directors: Jean-Claude Cadudal, Michel Finance and André-Michel Ballester	Marcello Conviti – Chief Executive and Director
Date of the General Meeting	July 8, 2009	July 8, 2009
Date of the meeting of the Board of Directors	July 8, 2009	September 9, 2009
Exercise price per new share subscribed	€8	€8
Exercise deadline	10 years from the date of assignment of the BSA warrants	10 years from the date of assignment of the BCE options
Ratio	1 BSA-2009-1 warrant for 25 new CARMAT shares	1 BCE-2009-1 warrant for 25 new CARMAT shares
General conditions of exercise	- 25% of BSA-2009-1 warrants may be exercised on the date of the first anniversary of the beneficiary joining the company, subject to actual and continued presence within the company at that date; - 75% of BSA-2009-1 options may be exercised on the basis of monthly periods in tranches of 1/36th from the date of the first anniversary of the beneficiary joining the company over a period of 3 years, subject to actual and continued presence within the company at that date. Early exercise at the end of a period expiring 18 months after the establishment of the company if the beneficiary has occupied the position of Chairman of the company for a period expiring 18 months after the establishment of the company. As a result of the success of the initial listing of the company on the Alternext market of NYSE-Euronext Paris, according to the assessment of the meeting of the Board of Directors of September 8, 2010, 20% of BSA-2009-1 warrants that were not exercisable as at the date of the initial listing may be exercised early.	- 25% of BCE-2009-1 options may be exercised on the date of the first anniversary of the beneficiary joining the company, subject to actual and continued presence within the company at that date; - 75% of BCE-2009-1 options may be exercised on the basis of monthly periods in tranches of 1/36th from the date of the first anniversary of the beneficiary joining the company over a period of three years, subject to actual and continued presence within the company at that date. Early exercising in the event of a share transfer agreement being entered into, with or without conditions precedent, resulting in a change in control of the company to the benefit of the transferee on the basis of a valuation in excess of €100 million. As a result of the success of the initial listing of the company on the Alternext market of NYSE-Euronext Paris, according to the assessment of the meeting of the Board of Directors of September 8, 2010, 20% of BCE-2009-1 options that were not exercisable as at the date of the initial listing may be exercised early.
Number of new shares that may be subscribed	64,750 shares for the BSA-2009-1 warrants assigned	70,000 shares

Type of security	BCE-2009-2	BCE-2012-1
Beneficiaries	Patrick Coulombier – Deputy Chief Executive – member of staff and 17 members of staff	Marcello Conviti – Chief Executive and 12 members of staff
Date of the General Meeting	July 8, 2009	April 26, 2012
Date of the meeting of the Board of Directors	July 8, 2009	June 27, 2012
Exercise price per new share subscribed	€8	€108.483
Exercise deadline	10 years from the date of assignment of the BCE options	10 years from the date of assignment of the BCE options
Ratio	1 BCE-2009-2 option for 25 new CARMAT shares	1 BCE-2012-1 option for 1 new CARMAT share
General conditions of exercise[3]	- 20% of BCE-2009-2 options may be exercised on the date of the first anniversary of the beneficiary joining the company, subject to his/her actual and continued presence within the company at that date; - 40% of BCE-2009-2 options may be exercised on the basis of monthly periods in tranches of 1/36th from the date of the first anniversary of the beneficiary joining the company over a period of three years, subject to actual and continued presence within the company at that date. - 10% of BCE-2009-2 options may be exercised from the finalization and success of the initial clinical trials of the CARMAT total artificial heart before the end of the second quarter of 2012 (medical report on completion of the trial covering the safety and end point aspects), subject to his/her actual and continued presence within the company at that date;[1] - 10% of BCE-2009-2 options may be exercised from the success of the initial clinical implantation of the CARMAT total artificial heart before the end of November 2012 (third-party report), subject to his/her actual and continued presence within the company at that date;[2] - 6.5% of BCE-2009-2 options may be exercised from the success of the pivotal round of clinical trials of the CARMAT total artificial heart (report from the Scientific Board), subject to his/her actual and continued presence within the company at that date; - 6.5% of BCE-2009-2 options may be exercised once the CE marking has been obtained for the CARMAT total artificial heart, subject to his/her actual and continued presence within the company at that date; - 7% of BCE-2009-2 options may be exercised from the realization at December 31 of the first year of marketing of the CARMAT total artificial heart, recorded by the Board of Directors, of revenue and gross margin in line with the business plan established by the General Management and approved by the Board of Directors, subject to his/her actual and continued presence within the company at that date.	- 50% of BCE-2012-1 options may be exercised on the basis of monthly periods in tranches of 1/48th from the date of assignment of BCE-2012-1 options to the beneficiary for four years, subject to actual and continued presence within the company at that date. - 16.25% of BCE-2012-1 options may be exercised from the success of the pivotal round of clinical trials of the CARMAT total artificial heart (report from the Scientific Board), subject to his/her actual and continued presence within the company at that date; - 16.25% of BCE-2012-1 options may be exercised once the CE marking has been obtained for the CARMAT total artificial heart, subject to his/her actual and continued presence within the company at that date; - 17.5% of BCE-2012-1 options may be exercised from the realization at December 31 of the first year of marketing of the CARMAT total artificial heart, recorded by the Board of Directors, of revenue and gross margin in line with the business plan established by the General Management and approved by the Board of Directors, subject to his/her actual and continued presence within the company at that date.
Number of new shares that may be subscribed	102,250 shares[4]	54,500 shares[5]

(1) This tranche of BCE-2009-2 options has lapsed since July 1, 2012. The lapsing of these BCE-2009-2 options was recorded by the Board of Directors meeting on November 8, 2012, and said BCE-2009-2 options were canceled.
(2) This tranche of BCE-2009-2 options has lapsed since December 1, 2012. The lapsing of these BCE-2009-2 options was recorded by the Board of Directors meeting on February 28, 2013, and said BCE-2009-2 options were canceled.
(3) Please refer to paragraph 17.2 for the conditions of the amendment of the exercise periods and terms for BCE-2009-2 options.
(4) Taking account of the lapsing of 20% of BCE-2009-2 options
(5) Taking account of the lapsing of 2,000 BCE-2012-1 options

Type of security	BCE-2012-2
Beneficiaries	4 members of staff
Date of the General Meeting	April 26, 2012
Date of the meeting of the Board of Directors	November 8, 2012
Exercise price per new share subscribed	€122.00
Exercise deadline	10 years from the date of assignment of the BCE options
Ratio	1 BCE-2012-1 option for 1 new CARMAT share
General conditions of exercise	- 50% of BCE-2012-2 options may be exercised on the basis of monthly periods in tranches of 1/48th from the date of assignment of BCE-2012-2 options to the beneficiary for four years, subject to actual and continued presence within the company at that date. - 16.25% of BCE-2012-2 options may be exercised from the success of the pivotal round of clinical trials of the CARMAT total artificial heart (report from the Scientific Board), subject to his/her actual and continued presence within the company at that date; - 16.25% of BCE-2012-2 options may be exercised once the CE marking has been obtained for the CARMAT total artificial heart, subject to his/her actual and continued presence within the company at that date; - 17.5% of BCE-2012-2 options may be exercised from the realization at December 31 of the first year of marketing of the CARMAT total artificial heart, recorded by the Board of Directors, of revenue and gross margin in line with the business plan established by the General Management and approved by the Board of Directors, subject to his/her actual and continued presence within the company at that date.
Number of new shares that may be subscribed	6,700 shares

If all the BSA-2009-1 warrants and BCE-2009-1, BCE-2009-2, BCE-2012-1, and BCE-2012-2 options assigned were exercised, 298,200 new shares, representing 7.10% of the capital and 4.28% of the voting rights as at the date of this reference document would then be created.

17.3 EMPLOYEE OWNERSHIP AND PROFIT SHARING SCHEMES

As at the date of registration of this reference document, the company had not set up any employee ownership or profit sharing scheme.

18 PRINICIPAL SHAREHOLDERS

18.1 DISTRIBUTION OF CAPITAL AND VOTING RIGHTS

18.1.1 Current distribution of capital and voting rights

The table below shows the distribution of the capital and voting rights (please refer to paragraph 18.2 of this Document de Référence "Voting rights" which indicates the conditions under which double voting rights may be obtained) of the Company at the date of registration of this Document de Référence:

Shareholder	Number of shares (undiluted capital)	Number of voting rights	% of capital	% of voting rights
MATRA DEFENSE (EADS Group)	**1,265,382**	**2,246,782**	**30.41**	**32.60**
Professor Alain Carpentier	**548,583**	**1,097,166**	**13.19**	**15.92**
Scientific Research Association of the Alain Carpentier Foundation	**115,000**	**230,000**	**2.76**	**3.34**
FCPI UFF INNOVATION 5	526,008	1,052,016	12.64	15.27
FCPI EUROPE INNOVATION 2006	213,607	427,214	5.14	6.20
FCPR TRUFFLE CAPITAL II	194,014	388,028	4.66	5.63
FCPI FORTUNE	72,496	144,992	1.74	2.10
FCPI UFF INNOVATION 7	73,886	147,772	1.78	2.14
FCPI INNOVATION PLURIEL	5,488	5,488	0.13	0.08
Sub-total for funds managed by Truffle Capital	**1,085,499**	**2,165,510**	**26.09**	**31.42**
Treasury stock[(1)]	2,010	0	0.05	0.00
Secondary offering	1,144,221	1,152,028	27.50	16.72
TOTAL	**4,160,695**	**6,891,486**	**100.00**	**100.00**

[(1)] At April 30, 2013

As far as the Company is aware, there is no other shareholder owning more than 5% of the capital or the voting rights.

Truffle Capital:

Founded in 2001 in Paris, Truffle Capital is an acknowledged European player in the area of investment capital, investing in and developing innovative SMEs and building technological leaders in the areas of Life Sciences, Information Technology and Energy.
Backed by €550 million under management or under advisement from "Fonds Communs de Placements à Risques" (Mutual Funds for Risk Investment - FCPR), "Fonds Commun de Placement dans l'Innovation" (Mutual Funds for Investment in Innovation - FCPI), under management, and Incubator Holding Companies, under advisement, Truffle Capital is run by a team of four partners with successful entrepreneurial and investment backgrounds both in Europe and in North America.
Truffle Capital often acts as leader, as the single or majority investor, and finances in particular technological spin-offs from large industrial groups, technological research institutes and universities, but also new start-ups. Truffle Capital's concern is for socially responsible investment and this is demonstrated by the sectors in which it invests - specifically health and energy-saving.
The unique feature of Truffle Capital's team of "entrepreneurial investors" is its ability to identify innovations that respond to new markets; to promote breakthrough innovations, beyond simple finance, with the aim of building and developing technology companies with high potential in terms of their value and their capacity to be the leaders of tomorrow. Truffle Capital is a co-founder and shareholder of CARMAT.

EADS Group:

The EADS Group, born out of a merger in July 2000 between DaimlerChrysler Aerospace AG, Aérospatiale-Matra and Construcciones Aeronáuticas SA, is a world leader in the aeronautic, space and defense and associated services sectors. In 2009 the EADS Group comprising specifically Airbus, Eurocopter, EADS Astrium and EADS Défense & Sécurité, turned in sales of €49.1 billion in 2011 with a workforce of nearly 133,000. The EADS Group holds shares in CARMAT through its wholly-owned subsidiary Matra Défense.

Professor Carpentier:

Emeritus professor at the Pierre and Marie Curie University (University of Paris VI) and professor at the Mount Sinaï

School of Medicine in New York, he is the founder and manager of the Biosurgical Research Laboratory – Scientific Research Association of the Alain Carpentier Foundation. Winner of the 1998 Foundation for Medical Research Grand Prize, and vice-chairman of the Academy of Sciences, he also received the prestigious Albert Lasker Award for Clinical Medical Research in 2007 in recognition of his two main contributions to the field - invention of the first valve bioprostheses (Carpentier-Edwards valves) and the development of techniques for plastic and reconstructive surgery of heart valves, which benefit several hundred thousand patients worldwide each year.

Scientific Research Association of the Alain Carpentier Foundation:

Set up in December 2007 by Professor Alain Carpentier, the purpose of the Scientific Research Association of the Alain Carpentier Foundation is to finance medical research projects, in particular in the surgical, cardiovascular and neurological areas. The Alain Carpentier Foundation is hosted by the Fondation de France

18.1.2 Change in the distribution of capital and voting rights

The table below shows the change in the distribution of capital and voting rights in the Company as at December 31, 2012, 2011, 2010, 2009 and 2008:

Shareholder	As at 12/31/2012			
	Number of shares	Number of voting rights	% of capital	% of voting rights
MATRA DEFENSE (EADS Group)	1,265,382	2,246,782	30.43	32.46
Professor Alain Carpentier	548,583	1,097,166	13.19	15.85
Scientific Research Association of the Alain Carpentier Foundation	115,000	230,000	2.76	3.32
FCPI UFF INNOVATION 5	542,546	1,085,092	13.05	15.68
FCPI EUROPE INNOVATION 2006	220,497	440,994	5.30	6.37
FCPR TRUFFLE CAPITAL II	199,872	399,744	4.81	5.78
FCPI FORTUNE	74,909	149,818	1.80	2.16
FCPI UFF INNOVATION 7	76,298	152,596	1.84	2.21
FCPI INNOVATION PLURIEL	5,833	5,833	0.14	0.08
Sub-total for funds managed by Truffle Capital	**1,119,955**	**2,234,077**	**26.94**	**32.28**
Treasury stock	1,260	0	0.03	0.00
Secondary offering	1,107,615	1,113,350	26.65	16.09
TOTAL	**4,157,795**	**6,921,375**	**100.00**	**100.00**

Shareholder	As at 12/31/2011			
	Number of shares	Number of voting rights	% of capital	% of voting rights
MATRA DEFENSE (EADS Group)	1,265,382	2.140.382	30.66	34.06
Mr Alain Carpentier and the Alain Carpentier Association	663,583	1,309,833	16.07	20.84
FCPI UFF INNOVATION 5	565,326	865,576	13.70	13.78
FCPI EUROPE INNOVATION 2006	238,022	400,522	5.77	6.38
FCPR TRUFFLE CAPITAL II	234,916	365,916	5.69	5.82
FCPI FORTUNE	81,043	112,293	1.96	1.79
FCPI UFF INNOVATION 7	81,553	81,553	1.98	1.30
FCPI INNOVATION PLURIEL	6,715	6,715	0.16	0.11
Sub-total for funds managed by Truffle Capital	**1,207,575**	**1,832,575**	**29.25**	**29.18**
Pierre and Marie Curie University	10,000	20,000	0.24	0.32
Treasury stock	1,395	0	0.03	0.00
Secondary offering	979,860	979,860	23.74	15.60
TOTAL	**4,127,795**	**6,282,650**	**100.00**	**100.00**

Shareholder	As at 12/31/2010			
	Number of shares (undiluted capital)	Number of voting rights	% of capital	% of voting rights
MATRA DEFENSE (EADS Group)	1,248,066	2,123,066	32.60	37.59
Professor Alain Carpentier	548,583	1,079,833	14.33	19.12
Scientific Research Association of the Alain Carpentier Foundation	115,000	230,000	3.00	4.07
FCPI UFF INNOVATION 5	597,051	897,301	15.60	15.89
FCPI EUROPE INNOVATION 2006	257,923	257,923	6.74	4.57
FCPR TRUFFLE CAPITAL II	260,482	260,482	6.80	4.61
FCPI FORTUNE	86,850	86,850	2.27	1.54
FCPI UFF INNOVATION 7	85,430	85,430	2.23	1.51
FCPI INNOVATION PLURIEL	7,204	7,204	0.19	0.13
Sub-total for funds managed by Truffle Capital	**1,294,940**	**1,595,190**	**33.83**	**28.24**
Pierre and Marie Curie University	10,000	10,000	0.26	0.18
Treasury stock	1,118	0	0.03	0.00
Secondary offering	610,154	610,154	15.94	10.80
TOTAL	**3,827,861**	**5,648,243**	**100.00**	**100.00**

Taking into account on the one hand the division of the face value of the shares by 25 and the subsequent multiplication of the number of shares by 25 in accordance with Resolution 18 of the Combined General Meeting of May 7, 2010, and on the other the conversion of the category A preference shares into normal shares at a ratio of one for one (under the condition precedent of the admission for trading and initial listing of the shares of the Company on the Alternext Paris market of NYSE-Euronext).

Shareholder	As at 12/31/2009		
	Number of shares and voting rights (undiluted capital)		% of capital and of voting rights
	Category O	Category A	
MATRA DEFENSE (EADS Group)	24,999	10,001	40.58
Professor Alain Carpentier	19,999	1,251	24.64
Scientific Research Association of the Alain Carpentier Foundation	4,600	0	5.33
FCPI UFF INNOVATION 5	0	12,010	13.92
FCPI EUROPE INNOVATION 2006	0	6,500	7.54
FCPR TRUFFLE CAPITAL II	0	5,240	6.08
FCPI FORTUNE	0	1,250	1.45
Sub-total for funds managed by Truffle Capital	**0**	**25,000**	**28.99**
Pierre and Marie Curie University	400	0	0.46
TOTAL	**49,998**	**36,252**	**100.00**

Shareholder	As at 12/31/2008		
	Number of shares and voting rights (undiluted capital)		% of capital and of voting rights
	Category O	Category A	
MATRA DEFENSE (EADS Group)	24,999	10,001	40.58
Professor Alain Carpentier	19,999	1,251	24.64
Scientific Research Association of the Alain Carpentier Foundation	5,000	0	5.80
FCPI UFF INNOVATION 5	0	12,010	13.92
FCPI EUROPE INNOVATION 2006	0	6,500	7.54
FCPR TRUFFLE CAPITAL II	0	5,240	6.08
FCPI FORTUNE	0	1,250	1.45
Sub-total for funds managed by Truffle Capital	**0**	**25,000**	**28.99**
Pierre and Marie Curie University	0	0	0.00
TOTAL	**49,998**	**36,252**	**100.00**

18.2 VOTING RIGHTS

The voting right attaching to shares is proportional to the percentage of capital that they represent and each share gives an entitlement to at least one vote.

However, in accordance with Article 14 of the Articles of Association and in accordance with the provisions of the French Commercial Code (Code de Commerce), all fully paid up shares which can be shown to have been registered to the same shareholder for at least two years will benefit, with effect from the first listing of the shares of the Company on the Alternext Paris market of NYSE-Euronext, from double voting rights compared with those given to other shares having regard to the percentage of share capital that they represent.

18.3 STATEMENT CONCERNING CONTROL OF THE COMPANY

As at the date of registration of this Document de Référence, no single shareholder was in control of the Company, directly or indirectly or with others, within the meaning of Article L.233-3 et seq. of the French Commercial Code (Code de Commerce).

18.4 AGREEMENTS THAT MAY BRING ABOUT A CHANGE IN CONTROL

As at the date of registration of this Document de Référence, and to the knowledge of the Company, there are no agreements that may bring about a change in control of the Company.

19 OPERATIONS WITH ASSOCIATED COMPANIES

19.1 ROYALTIES AGREEMENT

Under a royalties agreement signed on June 24, 2008 and amended by an addendum of February 5, 2010 between CARMAT, Professor Alain Carpentier and Matra Défense (a subsidiary of the EADS Group) as a result of contributions made when the Company was established, it was agreed that CARMAT will pay Professor Alain Carpentier and Matra Défense a total sum equal to 2% of the direct net sales generated by the Total Artificial Heart in the countries covered by at least one of the patents initially brought by them to the Company. These payments will be made on a half-yearly basis within thirty days of the end of each sixth-month period, according to a distribution between Professor Alain Carpentier and Matra Défense established in proportion to their holdings in the capital of the Company on the date it was established.

However, CARMAT may repurchase this right to royalties by paying Professor Alain Carpentier and Matra Défense, in proportion to their holdings in the capital of the Company on the date it was established, a total sum of €30 million less the amount of royalties already paid at the time this right to royalties is repurchased. This sum of €30 million is indexed-linked to the *Indice du Prix à la Production de l'Industrie et des Services aux Entreprises – Matériel médicochirurgical et d'orthopédie-exportation zone Euro – Code PVIC 3310921007M* (Production prices index for industry and services to companies – Medico-chirurgical and orthopedic material for export in the eurozone PVIC Code 3310921007M) with a base level of 100.3 in April 2008 as calculated and published by the French National Institute for Statistics and Economic Studies (INSEE).

19.2 RELATIONSHIPS BETWEEN CARMAT AND SUBSIDIARIES OF THE EADS GROUP

Because of the specific skills it requires and its historical links the Company has commercial relationships with the following EADS Group subsidiaries in the normal context of its business and under normal financial conditions for the types of services provided (amount of charges for the 12 month period ended on December 31, 2012):

- EADS FRANCE for €426,327 for the supply of IT and telephone services;
- MATRA ELECTRONIQUE for €1,117,141 for the production of the prothesis' integrated electronics and its testing;
- APSYS for €239,072 for performing operational safety studies and risk analysis of the system and by way of a staff loan agreement for specialists in the areas of industrialization and onboard equipment testing;
- ASTRIUM for €182,620 for monitoring the manufacture of the electronics of the prosthesis and preparation of the performance support file;
- MBDA FRANCE for €155,100 for expert appraisal of electronic and electromechanical aspects and production consultancy;
- CASSIDIAN for €256,344 in respect of the staff loan agreement with CARMAT;
- EADS Aeroassurances for €5,073 for personal accident insurance cover.

19.3 SPECIAL REPORT OF THE AUDITORS ON REGULATED AGREEMENTS (GENERAL MEETING TO APPROVE THE FINANCIAL STATEMENTS FOR THE YEAR ENDED DECEMBER 31, 2012)

PricewaterhouseCoopers Audit
63, rue de Villiers
92208 Neuilly-sur-Seine Cedex

Lison Chouraki
13, rue Spontini
75016 Paris

CARMAT SA
36, Avenue de l'Europe
78941 Vélizy-Villacoublay cedex

To the shareholders,

In our capacity as statutory auditors of your company, we hereby report to you on regulated agreements.

The terms of our engagement do not require us to identify other agreements, but to communicate to you, based on information provided to us, the principal terms and conditions of those agreements brought to our attention, without expressing an opinion on their usefulness and appropriateness. It is your responsibility, pursuant to Article R. 225-31 of the French Commercial Code (Code de Commerce), to assess the interest involved in respect of the conclusion of these agreements and commitments for the purpose of approving them.

Furthermore, we are required, as necessary, to provide you with the information pursuant to Article R. 225-31 of the French Commercial Code (Code de Commerce) concerning the execution of agreements, in the year just ended, previously approved by general meeting.

We have performed all the checks that we considered necessary into the professional practice of the national firm of auditors in relation to this assignment. These checks consisted of verifying the correspondence between the information provided to us and the base documents from which this originates.

AGREEMENTS SUBJECT TO THE APPROVAL OF A GENERAL MEETING

We hereby inform you that we were not advised of any agreement authorized during the previous year that must be submitted for the approval of a general meeting in accordance with the provisions of Article L. 225-38 of the French Commercial Code (Code de Commerce).

AGREEMENT PREVIOUSLY APPROVED BY GENERAL MEETING

In accordance with Article R.225-30 of the French Commercial Code (Code de Commerce), we have been advised that the following agreement previously authorized by general meeting was not executed during the year just ended.

ROYALTIES AGREEMENT BETWEEN CARMAT (HEREAFTER REFERRED TO AS "THE COMPANY"), PROFESSOR ALAIN CARPENTIER AND MATRA DEFENSE

On June 24, 2008 your company signed a royalties agreement ("hereinafter referred to as "the Agreement") with Professor Alain Carpentier and Matra Défense, founding shareholders in the Company. Under this Agreement, the Company undertakes to pay Professor Alain Carpentier and Matra Défense 2% of the net proceeds from sales of the "CARMAT" Artificial Heart produced and distributed by CARMAT SAS, with this sum being shared between the two beneficiaries in proportion to their respective shares in the capital of the Company on the date it was established. These royalties will be payable every 6 months within 30 days of the end of each six-month period, following the first marketing of the "CARMAT" Artificial Heart and up until expiry of the patents shown in Annex 1 to the agreement.

The Company is also authorized to repurchase at any time the right to benefit from these royalties for a sum of €30,000,000, less the royalties already paid under this agreement, with this total sum being shared between the two beneficiaries in proportion to their respective shares in the capital of the Company on the date it was established. This sum of €30,000,000 is indexed-linked to the Indice du Prix à la Production de l'Industrie des Services aux Entreprises - Matériel médicochirurgical et d'orthopédie-exportation zone Euro.

The rights allocated to Professor Alain Carpentier and to Matra Défense in this way are non-transferable.

As at December 31, 2012, since the marketing of the "CARMAT" Artificial Heart had not started, no royalty had been paid by the Company under the Agreement.

Signed in Neuilly-sur-Seine and Paris, March 20, 2013

The Auditors

PricewaterhouseCoopers Audit **Lison Chouraki**

Pierre Riou

20 FINANCIAL INFORMATION ON THE ASSETS, THE FINANCIAL POSITION AND THE RESULTS OF THE COMPANY

20.1 HISTORICAL FINANCIAL INFORMATION

20.1.1 Company accounts of CARMAT as at December 31, 2012 according to French standards

	ASSETS (IN EUROS)	12/31/2012			12/31/2011
		Gross	Amortization/depreciation and impairments	Net	Net
	Uncalled share capital **(TOTAL I)**				
FIXED ASSETS	INTANGIBLE FIXED ASSETS (Notes 4.1 and 4.2)				
	Start-up costs				
	Development costs				
	Licenses, patents and similar rights	1,295,515	1,127,046	168,468	234,707
	Goodwill (1)				
	Intangible fixed assets				
	Advances and payments on account				
	PROPERTY, PLANT AND EQUIPMENT (Notes 4.1 and 4.2)				
	Land				
	Buildings				
	Technical plant, equipment and tooling	4,141,610	3,416,593	725,017	1,262,724
	Other property, plant and equipment	1,001,737	355,170	646,566	708,751
	Assets under construction	184,621		184,621	476,583
	Advances and payments on account				
	FINANCIAL FIXED ASSETS (2) (Notes 4.1 and 4.3)				
	Holdings accounted for on an equity basis				
	Other holdings				
	Other equity investments				
	Loans				
	Other financial assets	542,090		542,090	465,178
	TOTAL II	**7,165,572**	**4,898,809**	**2,266,763**	**3,147,942**
CURRENT ASSETS	STOCKS AND WORK IN PROGRESS				
	Raw materials, supplies				
	Work in progress - goods				
	Work in progress - services				
	Semi-finished and finished products				
	Goods				
	Advances and prepayments on orders				486,860
	DEBTORS (3)				
	Trade receivables and other receivables				
	Other debtors (Note 4.4)	6,092,119		6,092,119	4,120,628
	Subscribed capital – called, not paid in				
	Marketable securities				10,039,822
	Cash instruments (Note 4.5)	5,006,854		5,006,854	17,066,499
	Cash on hand	6,127,584		6,127,584	2,263,372
Accruals					
	Accrued charges (3) (Note 4.7.4)	203,577		203,577	300,960
	TOTAL III	**17,430,133**		**17,430,133**	**34,278,141**
	Bond issuance costs to be amortized (IV)				
	Bond redemption premiums (V)				
	Unrealized foreign exchange losses (VI)				
	GRAND TOTAL (I+II+III+IV+V+VI)	**24,595,705**	**4,898,809**	**19,696,896**	**37,426,083**
	(1) including lease rights				
	(2) of which of less than one year			423,855	353,565
	(3) of which of more than one year				

LIABILITIES (IN EUROS)		12/31/2012	12/31/2011
EQUITY	Capital (of which, paid in: 166,312) (Note 4.6)	166,312	165,112
	Issue, merger and acquisition premiums (Notes 1 and 4.6)	52,864,118	52,625,318
	Excess of restated assets		
	RESERVES		
	Legal reserve		
	Statutory or contractual reserves		
	Regulatory reserves		
	Other reserves		
	Losses brought forward	- 25,899,511	- 12,458,488
	RESULT FOR THE PERIOD (profit or loss)	**- 17,189,691**	**- 13,441,022**
	Capital grants		
	Regulatory provisions		
	TOTAL I	**9,941,228**	**26,890,919**
OTHER EQUITY	Proceeds of issues of participating stock		
	Conditional advances (Note 4.7.1)	3,743,141	3,743,141
	TOTAL II	**3,743,141**	**3,743,141**
PROVISIONS	Provisions for risks		
	Provisions for charges (Notes 4.3 and 4.7.3)	73,334	35,660
	TOTAL III	**73,334**	**35,660**
DEBTS (1)	FINANCIAL DEBTS		
	Convertible bond loans		
	Other bond loans		
	Loans from credit institutions		
	Bank loans and overdraft		
	Sundry loans and financial debts (Notes 4.4 and 4.7.1)	460,054	217,066
	Advances and payments on account received for current orders		
	ACCOUNTS PAYABLE (Note 4.4)		
	Trade accounts payable and related payables	4,012,870	4,992,835
	Tax and social liabilities	1,313,901	1,159,416
	Liabilities secured to property and related liabilities (Note 4.4)	148,669	380,547
	Other debts (Note 4.4)	3,698	6,498
Accruals	Accrued income (1) (Note 4.7.4)		
	TOTAL IV	**5,939,193**	**6,756,362**
	Unrealized foreign exchange gains **TOTAL V**		
	GRAND TOTAL (I+II+III+IV+V)	**19,696,896**	**37,426,083**
	(1) Debts and deferred income of less than one year	5,479,139	6,539,296

INCOME STATEMENT (IN EUROS)	12/31/2012			12/31/2011
	France	Export	Total	Total
OPERATING INCOME (1)				
Sale of goods				
Sales of finished goods				
Sales of finished services				
NET TURNOVER				
Production left in stock				
Fixed asset production				
Subsidies (Note 5.1)			10,500	6,051,177
Write-backs of impairments, provisions (and amortization/depreciation) and transfer of expenditure			7,489	50,576
Other revenues				
TOTAL OPERATING INCOME (I)			17,989	6,101,753
OPERATING EXPENSES (2)				
Purchase of goods				
Inventory change (goods)				
Purchase of raw materials and other supplies				
Change in inventory (raw materials and other supplies)				
Other purchases and external expenditure[*, **]			16,467,584	16,276,476
Taxes, fees and similar payments			135,111	95,056
Wages and salaries			3,089,888	3,057,107
Social security costs			1,093,916	1,099,853
Amortization/depreciation and impairments				
Of fixed assets: amortization/depreciation (Note 4.2)			1,473,858	1,496,234
Of fixed assets: impairments				
Of current assets: impairments				
Provisions (Notes 4.3 and 6.1.3)			45,163	67,879
Other expenses			97,984	100,202
TOTAL OPERATING EXPENSES (II)			22,403,502	22,192,807
1 – OPERATING RESULT (I-II)			**- 22,385,513**	**- 16,091,054**
SHARES IN RESULT FOR JOINT OPERATIONS				
Profits allocated or loss transferred (III)				
Loss or profit transferred (IV)				

INCOME STATEMENT (IN EUROS) continued	12/31/2012	12/31/2011
FINANCIAL INCOME		
Financial income from equity interests (3)		
Income from other securities and fixed asset receivables (3)		
Other interest receivable and similar income (3)	355,793	229,461
Write-backs of impairments and provisions, and transfer of expenditure		272
Positive exchange differences	276	319
Net proceeds from sales of marketable securities		10,431
TOTAL (V)	**356,068**	**240,483**
FINANCIAL EXPENSES		
Amortization/depreciation, impairments and provisions		
Interest expenses and similar charges (4)	242,988	141,504
Negative exchange differences	2,981	1,708
Net expenses from sales of marketable securities		
TOTAL (VI)	245,970	143,212
2 – FINANCIAL RESULT (V-VI)	**110,099**	**97,271**
3 – EARNINGS BEFORE INTEREST AND TAX (I-II+III-IV+V-VI)	**- 22,275,415**	**- 15,993,783**
EXTRAORDINARY INCOME (Note 4.5.5)		
Extraordinary income from management operations		
Extraordinary income from capital operations	104,101	133,603
Write-backs of impairments and provisions, and transfer of expenditure		
TOTAL (VII)	104,101	133,603
EXTRAORDINARY EXPENSES (Note 4.5.5)		
Extraordinary expenses from management operations		
Extraordinary expenses from capital operations	33,810	96,370
Amortization/depreciation, impairments and provisions		
TOTAL (VIII)	33,810	96,370
4 – EXTRAORDINARY RESULT (VII-VIII)	70,290	37,234
Employee profit-sharing (IX)		
Income taxes (X) (Note 4.5.3)	- 5,015,433	- 2,515,527
TOTAL INCOME (I+III+V+VII)	478,158	6,475,839
TOTAL EXPENSES (II+IV+VI+VIII+IX+X)	17,667,849	19,916,862
5 – PROFIT OR LOSS (total income – total expenses)	- 17,189,691	- 13,441,022

* Including: Fee from real-estate leasing
** Including: Fee from equipment leasing

(1) Including income from previous years
(2) Including expenses from previous years
(3) Including income from related enterprises
(4) Including interest from related enterprises

ANNEX TO THE FINANCIAL STATEMENTS

Annex to the balance sheet for the year ended December 31, 2012, totaling €19,696,896, and to the income statement for the year ended December 31, 2012, presented in list form and showing zero revenue resulting in a loss of €17,189,691.

The financial year commenced on 1/1/2012 and ended on 12/31/2012, a duration of 12 months which is identical to that of the comparative period.

The notes and tables presented in the following are an integral part of the financial statements for the period ended on December 31, 2012 as approved by the Board of Directors on February 28, 2013. They are presented in euros unless otherwise stated.

1. HIGHLIGHTS OF THE YEAR

The activity of the Company is exclusively focused on the research and development of an innovative product in the medical sector. No marketing is envisaged in the immediate short term. The Company has benefited from Young Innovative Enterprise status since 2008.

Over the period the Company increased its capital by exercising twenty-two BCE warrants dated January 17, January 18, January 23, January 30, February 2, February 9, May 2, May 31, June 14, July 5, July 9, July 19, September 21, October 2, October 3, October 10, October 22, October 23, November 16, November 21 and November 22 for a total of 1,200 BCE 2009-2 warrants, increasing the capital by €1,200 to raise it from €165,111.80 to €166,311.80, and by issuing 30,000 ordinary shares of a face value of €0.04, issued at a unit price of €8, i.e. with an issue premium of €7.96 per share. The issue premiums in the balance sheet consequently rose from €52,625,318 to €52,864,118.

The Company is maintaining the Research Tax Credit (CIR) option for 2012. The first option was exercised for the calendar year 2009 and renewed in 2010 and 2011. In 2012, a €5,022,922 Research Tax Credit was recorded under "Income tax" in the income statement (details in Note 5.3 e of this annex), after the deducting of €7,489 to adjust for the 2011 CIR, and appears under "other receivables" on the balance sheet.

2. SIGNIFICANT EVENTS AFTER THE END OF THE REPORTING PERIOD

No event occurring after the closing of the reporting period is liable to change the presentation or valuation of the items in the balance sheet or the income statement as approved by the Board of Directors

3. ACCOUNTING RULES AND METHODS

(French Commercial Code (Code de Commerce) – Articles L.123-12 and L.123-28)
(Decree No 83-1020 of 11/29/83) (Accounting Regulation Committee Regulation No 99-03: PCG)

The valuation methods for this period have not been changed from those used in the previous financial year.

3.1. General principles and conventions

The accounts for the period have been prepared and presented in accordance with the accounting regulations and the principles laid down in Articles 120-1 et seq. of the General Accounting Plan 2005.

The basic method of valuation for the items shown in the accounts is that of historical cost.

The accounting conventions have been applied in accordance with the provisions of the French Commercial Code (Code de Commerce), the Accounting Decree of 11/29/83 and the CRC regulations concerning the redrafting of the General Accounting Plan 2005 applicable as at the end of the period.

The general accounting conventions have been applied in accordance with the prudent person rule, on the basis of the following assumptions:

- The business is a going concern;
- The accounting methods are consistent from one year to the next;
- The accounting periods are independent of each year.

The Board of Directors has assumed that the business is a going concern, having taken the following points in particular into account:

- Cash, cash instruments and liquid marketable securities totaling €11,134,438 as at December 31, 2012;
- The payment of subsidies (€3,033,000) and refundable advances (€10,764,000) still to be claimed between now and the end of the Oseo aid program signed in 2009.

3.2. Supplementary information

3.2.1. Applied research and development costs
(Decree No. 83-1020 of 11/29/83, Article 19)

Research and development costs are accounted for under expenses for the year in which they are incurred.

3.2.2. Intangible fixed assets
(Decree No. 83-1020 of 11/29/83, Article 24-4)

Patents, licenses and other intangible fixed assets have been valued at their cost of acquisition, excluding the expenses incurred in acquiring them.

The methods and periods of depreciation used are as follows:

Category	Mode	Period
Licenses and software	Straight line	1 to 3 years
Patents	Straight line	15 years

3.2.3. Property, plant and equipment
(Decree No. 83-1020 of 11/29/83, Article 24-4)

The gross value of property, plant and equipment fixed assets corresponds to the value at which the goods were entered in the assets, with an allowance being made for the expenditure required to render these items usable but excluding costs incurred in their acquisition.

The methods and periods of depreciation used are as follows:

Category	Mode	Period
Fixtures and fittings	Straight line	9 to 10 years
Technical plant	Straight line	3 years
Equipment and tooling	Straight line	2 to 6 years
Furniture	Straight line	8 years
IT equipment	Straight line	3 years

3.2.4. Financial assets

- Other equity investments

In 2010 the Company entered into a liquidity contract with Dexia Securities France (now named BIL Finance), the purpose of which is to increase the liquidity of transactions and smooth quotations for CARMAT shares without impeding the normal operation of the market and without introducing any error. To this end the Company made an amount of €300,000 available to this provider. Treasury shares acquired through the implementation of this liquidity agreement are recorded under financial assets at their purchase price. If necessary, a provision is made for impairments based on the average official stock market price for the final month prior to the end of the reporting period.

- Other financial assets

These are comprised of:

- obligatory deposits paid, which are shown at face value and
- the balance of the sums paid under the liquidity contract for own shares.

3.2.5. Receivables and payables
(Decree No. 83-1020 of 11/29/83, Article 24-5)

Receivables and payables are shown at face value. If necessary receivables are depreciated by making a provision to take account of difficulties with recovery that are likely to occur. Any provisions for impairments are determined by comparison between the acquisition value and the likely realization value.

3.2.6. Cash on hand in euros

Cash on hand or at the bank is entered at face value.

3.2.7. Marketable securities

Marketable securities are shown in the assets at cost of acquisition. This cost of acquisition of marketable securities comprises the purchase price and the directly attributable expense.

Any provisions for impairments are determined by comparison between the acquisition value and the likely realization value.

Marketable securities comprise certificates of deposit.

3.2.8. Cash instruments

These comprise the time deposit accounts shown under assets at acquisition value.

3.2.9. Cash and cash equivalents

For the purposes of the cash-flow statement, cash and cash equivalents are defined as being the sum of the “Marketable securities”, “Cash instruments” and “Cash on hand” items under the assets, to the extent that marketable securities and cash instruments are available in the very short term and do not present a significant risk of a loss in value in the event of a change in interest rate. An analysis of cash according to this definition is provided at the foot of the cash-flow statement.

3.2.10. Repayable advances made by public bodies

Advances received from public bodies to finance the research activities of the Company and which are subject to repayment are shown under liabilities in the “Other equity – Conditional advances” item. The corresponding interest is shown in the balance sheet liabilities under Sundry loans and financial debts.

3.2.11. Subsidies

Subsidies received are recorded as soon as the corresponding credit becomes certain, taking account of the conditions set at the time the subsidy was granted. Subsidies are recorded under income taking account, if necessary, of the corresponding rate of expenditure in order to adhere to the principle of matching of expenses with revenue.

3.2.12. Retirement indemnities

The amount of future payments for benefits to members of staff are valued according to an actuarial method, based on assumptions concerning the change in salaries, retirement age and mortality, and then these valuations are discounted to their present value. These commitments are the subject of provisions in the balance sheet liabilities.

3.2.13. Sub-contracting expenses

The progress of third-party sub-contract agreements for certain research services is assessed at the end of each reporting period in order to allow the cost of services already rendered to be recorded under accrued charges.

3.2.14. Share issue costs

In accordance with the preferential method, share issue costs are recorded in the balance sheet minus a deduction for the issue premium.

4. SUPPLEMENTARY INFORMATION ON THE BALANCE SHEET

4.1. Schedule of fixed assets

	Gross value at start of period	Additions	
		Line to line transfers	Acquisitions
Licenses, patents and similar rights (1)	1,090,522	49,800	155,193
Other intangible fixed assets	0		49,800
TOTAL	1,090,522	49,800	204,993
Technical plant, equipment and industrial tooling (2)	3,587,034	381,926	172,649
General plant, sundry fixtures and fittings	697,575		34,077
Office and IT equipment, furniture	256,002		14,083
Assets under construction (3)	476,583		89,964
TOTAL	5,017,194	381,926	310,773
Other equity investments (4)	117,529		1,440,695
Other financial fixed assets (5)	347,649		38,562
TOTAL	465,178		1,479,257
GRAND TOTAL	6,572,894	431,726	1,995,023

	Reductions		Gross value at end of period	Revaluation of original value at end of period
	Line to line transfers	Disposals		
Licenses, patents and similar rights (1)			1,295,515	
Other intangible fixed assets	49,800			
TOTAL	49,800		1,295,515	
Technical plant, equipment and industrial tooling (2)			4,141,609	
General plant, sundry fixtures and fittings			731,652	
Office and IT equipment, furniture			270,085	
Assets under construction (3)	381,926		184,621	
TOTAL	381,926		5,327,967	
Other equity investments (4)		1,402,345	155,879	
Other financial fixed assets (5)			386,211	
TOTAL		1,402,345	542,090	
GRAND TOTAL	431,726	1,402,345	7,165,572	

(1) This item includes a sum of €411,284, accounted for as the share of the contribution in kind made on September 30, 2008, with a total value of €960,000, relating to the contribution of patents.
(2) This item includes the commissioning of the clean room at a total cost of €943,582. The item also includes a sum of €548,716, accounted for as the share of the contribution in kind made on September 30, 2008, with a total value of €960,000, relating to the contribution of equipment and tooling.
(3) The assets under construction item consists of industrial equipment and tooling (test benches) amounting to €130,197, technical plant amounting to €30,000 and fitting works totaling €24,424.
(4) This item includes the 1,260 own shares held in connection with the liquidity contract, valued at €155,879.
(5) This item includes (i) the liquidities not invested in own shares as at the end of the period under the liquidity contract of €267,976, and (ii) obligatory deposits totaling €118,235, mainly comprising deposits under premises lease contracts.

4.2. Schedule of amortization/depreciation

Statements and movements for the period	Value at start of period	Allowances for the period	Reductions Write-backs	Value at end of period
Licenses, patents and similar rights	855,815	271,231		1,127,046
TOTAL	855,815	271,231		1,127,046
Technical plant, equipment and industrial tooling	2,324,310	1,092,283		3,416,593
General plant, sundry fixtures and fittings	167,511	75,061		242,572
Office and IT equipment, furniture	77,315	35,283		112,598
TOTAL	2,569,137	1,202,627		3,771,763
GRAND TOTAL	3,424,952	1,473,858		4,898,809

Breakdown of allowances for the period	Straight-line depreciation	Reducing balance	Exceptional depreciation	Depreciation for tax purposes

		depreciation		Allowances	Write-backs
Licenses, patents and similar rights	271,231				
TOTAL	271,231				
Technical plant, equipment and industrial tooling	1,092,283				
General plant, sundry fixtures and fittings	75,061				
Office and IT equipment, furniture	35,283				
TOTAL	1,202,627				
GRAND TOTAL	1,473,858				

4.3. Schedule of provisions

Provisions	Value at start of period	Increases Allowances	Reductions Amounts used	Reductions Amounts not used	Value at end of period
Sundry risks (1)		7,489	7,489		
Pensions and similar commitments (2)	35,660	37,674			73,334
TOTAL	35,660	45,163	7,489		73,334
Impairment of other equity investments					
TOTAL					
GRAND TOTAL	35,660	45,163	7,489		73,334
Including allowances and operational write-backs		45,163	7,489		
Including allowances and financial write-backs					

(1) Corresponds to the provision for the Research Tax Credit for 2011 made on June 30, 2012 and written back when actual payment took place in July 2012
(2) See Note 6.1.3

4.4. Schedule of maturities of receivables and payables

Schedule of receivables	Gross sum	1 year or less	More than 1 year
	104	104	
Income taxes	5,022,922	5,022,922	
Value Added Tax	1,028,677	1,028,677	
Sundry debtors	40,416	40,416	
TOTAL	6,092,119	6,092,119	

Schedule of payables	Gross sum	1 year or less	1 to 5 years	More than 5 years
Sundry loans and financial debts	460,054		460,054	
Trade accounts payable and related payables	4,012,870	4,012,870		
Staff and related payables	722,240	722,240		
Social security and other social bodies	575,416	575,416		
Other taxes and related payables	16,246	16,246		
Liabilities secured to property and related liabilities	148,669	148,669		
Other debts	3,698	3,698		
TOTAL	5,939,193	5,479,139	460,054	

4.5. Cash instruments

Cash instruments comprised certificates of deposit totaling €5,000,000. This amount was made up of two deposit agreements made in November and December 2012, maturing respectively on January 26, 2013 (€1,000,000) and February 6, 2013 (€4,000,000). Accrued interest of €6,854 was recorded in the accounts as at December 31, 2012 in relation thereto. These investments present no risk to the invested capital.

4.6. Capital

(Decree No. 83-1020 of 11/29/83, Article 24-12)

4.6.1. Composition of the share capital

Categories of shares	Face value in euros	Number of shares			
		Opening	Created	Redeemed	Closing
Ordinary shares	0.04	4,127,795	30,000		4,157,795
TOTAL		4,127,795	30,000		4,157,795

The capital increases through the exercising of BCE in 2012 resulted in the creation of 30,000 ordinary shares of a unit face value of €0.04 and a price of €8, i.e. accompanied by a €7.96 issue premium.

4.6.2. Changes in equity

Equity at the start of the period	**26,890,919**
Increase in capital through exercising of BCE warrants	240,000
Result for the period	- 17,189,691
Equity at the end of the period	**9,941,228**

4.6.3. Stock warrants

BSA 2009-1

At the General Meeting and the meeting of the Board of Directors of July 8, 2009 and following the Board of Directors' meeting of September 8, 2011, 4,615 BSA 2009-1 warrants were issued, of which 1,519 BSA 2009-1 warrants were not assigned. These 1,519 BSA 2009-1 warrants not assigned lapsed on 01/08/2011. 506 BSA 2009-1 warrants issued were canceled following the resignation of a director. As at December 31, 2012, there remained 2,590 BSA 2009-1 warrants conferring subscription rights to 64,750 new shares, representing 1.56% of the existing capital as at December 31, 2012, at a unit price of €8.

Summary table of BSA warrants

	Issued	Subscribed	Canceled	Spare	Exercised	Balance	Lapsing on
BSA-2009-1 GM of 07/08/2009	4,615	2,590	2,025	0	0	2,590	07/08/19

4.6.4. Start-up Company Stock Warrants (BCE)

BCE 2009-1

At the General Meeting and the meeting of the Board of Directors of July 8, 2009 and following the Board of Directors' meeting of September 8, 2011, 3,108 fully assigned and subscribed BCE 2009-1 warrants were issued, 308 of which have been exercised. The 2,800 BCE 2009-1 warrants subscribed and not exercised as at December 31, 2012 confer subscription rights to 70,000 new shares, representing 1.68% of the existing capital as at December 31, 2012, at a unit price of €8.

BCE 2009-2

At the General Meeting and the meeting of the Board of Directors of July 8, 2009 and following the Board of Directors' meeting of September 8, 2011, 7,566 fully assigned and subscribed BCE 2009-2 warrants were issued, 1,821 of which have been exercised and 1,655 have lapsed and been canceled. The 4,090 BCE 2009-2 warrants subscribed and not exercised as at December 31, 2012 confer subscription rights to 102,250 new shares, representing 2.46% of the existing capital as at December 31, 2012, at a unit price of €8.

BCE 2012-1

In accordance with the Board of Directors' decision of June 27, 2012, as authorized by the Combined General Meeting of April 26, 2012, 56,500 fully assigned and subscribed BCE 2012-1 warrants have been issued. The 56,500 BCE 2012-1 warrants subscribed and not exercised as at December 31, 2012 confer subscription rights to 56,500 new shares, representing 1.36% of the existing capital as at December 31, 2012, at a unit price of €108.483403.

BCE 2012-2

In accordance with the Board of Directors' decision of November 8, 2012, as authorized by the Combined General Meeting of April 26, 2012, 6,700 fully assigned and subscribed BCE 2012-2 warrants have been issued. The 6,700 BCE 2012-2 warrants subscribed and not exercised as at December 31, 2012 confer subscription rights to 6,700 new shares, representing 0.16% of the existing capital as at December 31, 2012, at a unit price of €122.00279.

Summary table of BCE warrants

	Issued	Subscribed	Canceled	Spare	Exercised	Balance	Lapsing on
BCE 2009-1 GM of 07/08/2009	3,108	3,108	0	0	308	2,800	09/09/19
BCE 2009-2 GM of 07/08/2009	7,566	7,566	1,655	0	1,821	4,090	07/08/19
BCE 2012-1 GM of 04/26/2012	56,500	56,500	0	0	0	56,500	06/27/22
BCE 2012-2 GM of 04/26/2012	6,700	6,700	0	0	0	6,700	11/08/22
BCE TOTAL	**73,874**	**73,874**	**1,655**	**0**	**2,129**	**70,090**	

4.7. Other balance sheet details

4.7.1. Conditional advances

The conditional advances item is comprised of repayable advances received from OSEO, the total amount of which as at the end of the period was €3,743,141. Note 6.1.1 below states the repayment conditions of these advances.

They are interest-bearing at the contracted rate of 5.59%. The interest accrued calculated using the capitalization method stood at €460,054 at period end and appears in liabilities under the Sundry loans and financial debts heading.

4.7.2. Accrued income
(Decree No. 83-1020 of 11/29/83, Article 23)

Value of accrued income included in the following balance sheet items	Value
Other debtors	17,852
TOTAL	17,852

4.7.3. Accrued charges
(Decree No. 83-1020 of 11/29/83, Article 23)

Value of accrued charges included in the following balance sheet items	Value
Sundry loans and financial debts	460,054
Trade accounts payable and related payables	2,697,684
Tax and social liabilities	1,034,162
Liabilities secured to property and related liabilities	148,669
TOTAL	4,340,569

4.7.4. Accrued income and charges
(Decree No. 83-1020 of 11/29/83, Article 23)

Accrued charges	Value
Operating expenses	203,577
TOTAL	203,577

The accrued charges item is comprised in particular of the following:

- The share of rent for the 1st quarter of 2013 billed in December 2012, totaling €123,878;
- The share of software license royalties and insurance premiums for the period after December 31, 2012, for a total amount of €79,699;

Accrued income	Value
Operating income	NOT APPLICABLE
TOTAL	NOT APPLICABLE

4.7.5. Information on related enterprises

The following balance sheet items include sums in connection with associates:

Trade accounts payable and related payables	1,348,145

5. SUPPLEMENTARY INFORMATION ON THE INCOME STATEMENT

5.1. Subsidies

In 2012, the Company did not receive any subsidies from Oseo. The €10,500 recorded in income relates to a subsidy received from the Agence Nationale de la Recherche et de la Technologie (French National Agency for Research and Technology) for the employment of a PhD student. Moreover, as the right to payment of the next contractually agreed Oseo subsidy had not been accrued at the end of the reporting period, the subsidy that will be received after Oseo has declared the completion of project milestone No. 4 (conditional authorization from the ANSM and the CPP to begin human clinical trials) was not recorded in Accrued income on the balance sheet as at December 31, 2012 for the share corresponding to the expenses already incurred at this date, although the Company has been authorized since July 1, 2012 to begin the EC5 research phase. When this subsidy is received, which is expected in 2013, €2,874,000 will be recorded in income.

5.2. Applied research and development costs

Research and development costs are accounted for under expenses. They amounted to €14,450,400 in 2012 compared to €14,281,761 the previous year.

5.3. Research Tax Credit

The income statement for the period shows a Research Tax Credit of €5,015,433, which breaks down as follows:

- €5,022,922 Research Tax Credit for the period from January 1 to December 2012, compared with €2,566,103 recorded for 2011;
- -€7,489 adjustment for the 2011 Research Tax Credit, resulting from the comparing of the amount accounted for as at the end of 2011 (€2,566,103) with the amount reimbursed by the tax authorities (€2,558,614).

5.4. Auditors' fees

The total amount of auditors' fees paid over the year is €49,300 excluding taxes and expenses and breaks down as follows:

- Fees for the statutory auditing of the financial statements and the services provided for by law: €44,900.
- Fees for consultancy and services rendered in connection with activities directly linked to the statutory audit, as defined by the professional standards referred to in Article L.822-11 (II): €4,400

5.5. Extraordinary income and expenses

(Resolution of April 27, 1982)

Type	2011	2010
Extraordinary income		
- Property disposal		
- Disposal of own shares	104,101	119,081
TOTAL	104,101	119,081
Extraordinary expenses		
- Property disposal		
- Disposal of own shares	33,810	81,847
- Fines and penalties		
TOTAL	33,810	81,847

In 2012 as in 2011, the extraordinary income results solely from the sale of own shares under the liquidity contract described in Note 3.2.4

5.6. Information on associates

The following income statement items include sums in connection with associates:

Other purchases and external expenditure	2,381,676

6. FINANCIAL COMMITMENTS AND OTHER INFORMATION

6.1. FINANCIAL COMMITMENTS

6.1.1. Commitments made

The total value of orders signed by the Company as at the end of the period, for items not yet delivered or built, came to €5,508,851.

Total repayable advances of €3,743,141 have been received over the past few years. This sum is repayable subject to achieving revenue of at least €38,000,000. The Oseo agreement provides for supplementary payments if certain conditions are met, so that the total amount repayable could exceed the amount of the advance initially granted.

On June 24, 2008 the Company signed a royalties agreement with Professor Alain Carpentier and Matra Défense, who were 13.20% and 30.45% shareholders respectively as at December 31, 2012. Under this Agreement, the Company undertakes to pay Professor Alain Carpentier and Matra Défense 2% of the net proceeds from sales of the “CARMAT” Artificial Heart produced and distributed by CARMAT SA, with this sum being shared between the two beneficiaries in proportion to their respective shares in the capital of the Company on the date it was established. These royalties will be payable every 6 months within 30 days of the end of each six-month period, following the first marketing of the “CARMAT” Artificial Heart and up until expiry of the patents shown in Annex 1 to the agreement.

The Company is also authorized to repurchase at any time the right to benefit from these royalties for a sum of €30,000,000, less the royalties already paid under this Agreement, with this total sum being shared between the two beneficiaries in proportion to their respective shares in the capital of the Company on the date it was established. This sum of €30,000,000 is indexed-linked to the Indice du Prix à la Production de l'Industrie des Services aux Entreprises - Matériel médicochirurgical et d'orthopédie-exportation zone euro.

The rights allocated to Professor Alain Carpentier and to Matra Défense in this way are non-transferable.

As at December 31, 2012, since the marketing of the “CARMAT” Artificial Heart had not started, no royalty had been paid by the Company under the agreement.

6.1.2. Commitments received

The Oseo agreement provides for payment of a total sum of €17,442,639 by way of subsidies, of which €3,032,793 remain to be paid between now and the end of the program.

It also provides for payment of a total sum of €14,507,324 by way of repayable advances, €10,764,169 of which remain to be paid between now and the end of the program.

6.1.3. Pension and retirement commitments

The Company has not signed a specific agreement on retirement commitments. These are therefore limited to the agreed retirement lump-sum payment.

In accordance with the preferential accounting method, the provision for retirement commitments has been accounted for as at December 31, 2012.

The calculation assumptions made were as follows:

- Time-apportioned rights method in accordance with CNC Regulation 2003 R-01;
- Retirement on the initiative of the member of staff, at 62 years (non-management) or 65 years (management);
- Salaried employee progression of 2% per annum;
- Low staff turnover;
- Discount rate of 3% per annum (vs. 4.6% at 12/31/2011 and 3.38% at 06/30/2012).

The overall amount of the provision was €73,334 as at the end of the reporting period, an increase of €37,674 over the previous period.

6.2. Other information

6.2.1. Cash-flow statement

	As at 12/31/2012	As at 12/31/2011
Net result	- 17,189,691	-13,441,022
Amortization/depreciation and provisions	1,519,021	1,564,113
Write-backs of amortization/depreciation and provisions	- 7,489	-50,848
Gains or losses on asset sales	-70,291	0
Investment subsidies transferred to income	0	0
Other income and expenses with no impact on cash flow	242,988	138,970
Self-financing capacity	**- 15,505,462**	**-11,788,787**
Tax and social liabilities	154,485	324,612
Trade accounts payable	-1,211,843	858,523
Other debts	-2,800	1,050
Accrued income	0	-103,157
Stocks and work in progress	0	0
Advances and prepayments on orders	486,860	-486,860
Other debtors	-1,971,491	1,574,642
Trade receivables	0	0
Accrued charges	97,383	53,035
Changes in cash position (change in Working Capital Requirements)	**-2,447,406**	**2,221,845**
Cash flow from operations	**-17,952,868**	**-9,566,942**
Acquisition of property, plant and equipment	-310,773	-878,960
Acquisition of intangible fixed assets	-204,993	-143,649
Acquisition of financial fixed assets	-1,479,257	-38,694
Proceeds from financial fixed asset disposals	1,472,636	0
Cash flow from investment operations	**-522,387**	**-1,061,303**
Increase in capital	1,200	11,997
ORA/BSA	0	0
Issue premium	238,800	26,845,869
Capitalization of current accounts	0	0
Loans and conditional advances	0	1,724,249
Cash flow from financing operations	**240,000**	**28,582,115**
Change in cash and cash equivalents	**-18,235,255**	**17,953,870**
Opening cash and cash equivalents (Note 3.2.9)	**29,369,693**	**11,415,823**
Closing cash and cash equivalents (Note 3.2.9)	**11,134,438**	**29,369,693**

6.2.2. Information on the management

6.2.2.1. Advances and loans to management

No loans or advances were made to the management of the Company during the year, in accordance with the provisions of Article R. 123-197 of the French Commercial Code (Code de Commerce).

6.2.2.2. Management remuneration

The total remuneration paid to directors in the form of attendance fees amounted to €100,000 for the year (sums recorded in the income statement under "Other expenses").

The total remuneration allocated to members of the management bodies was €592,469 for the year and breaks down as follows:

Type	2012	2011
Gross salaries	502,696	533,444
Benefits in kind	9,780	9,780
Bonuses	79,994	34,051
Total remuneration	**592,469**	**577,275**

6.2.3. Increases and reductions in future tax liabilities (Decree No. 83-1020 of 11/29/83, Article 24-24)

Type of temporary differences	Value
Allowable loss carry-forwards [1]	56,481,356

[1] This amount comprises:

- The tax loss carried forward made during previous periods and available as at January 1, 2012, in the sum of €36,118,532;
- The tax loss made in the 2012 fiscal year in the sum of €20,362,824.

6.2.4. Average staffing levels (Decree No. 83-1020 of 11/29/83, Article 24-22)

Salaried staff	2012	2011
Managers	30	30
Supervisors and technicians	4[1]	1
Employees	6[2]	4
Total	40	35

[1] including 2 temporary employees versus zero the previous year
[2] including 1 temporary employee versus zero the previous year

6.2.5. Individual right to training

In connection with the individual right to training instituted by Law 2004-391 of May 4, 2004 concerning ongoing professional training, on December 31, 2012 the aggregate number of hours of training in relation to rights accrued and not exercised was 2,050.17 hours.

20.2 PRO-FORMA FINANCIAL INFORMATION

None.

20.2.1 CHECKS ON THE ANNUAL HISTORICAL FINANCIAL INFORMATION

Auditors' report on CARMAT's financial statements (year ended December 31, 2012)

To the Shareholders,

CARMAT SA
36, Avenue de l'Europe
78941 Vélizy-Villacoublay

In compliance with the assignment entrusted to us by your General Shareholders' Meeting on October 16, 2008, we hereby report to you, for the year ended December 31, 2012, on:

- The audit of the accompanying financial statements of CARMAT SA;
- The justification of our assessments;
- The specific verifications and information required by law.

These financial statements have been approved by the Board of Directors. Our role is to express an opinion on these financial statements based on our audit.

I - Opinion on the financial statements

We conducted our audit in accordance with professional standards applicable in France. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit involves performing procedures, on a test basis or by selection, to obtain audit evidence about the amounts and disclosures in the financial statements. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as the overall presentation of the financial statements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

In our opinion, the financial statements give a true and fair view of the financial position and assets and liabilities of the Company and of the results of its operations for the year elapsed in accordance with the accounting rules and principles applicable in France.

II - Justification of our assessments

In accordance with the requirements of Article L.823-9 of the French Commercial Code (Code de Commerce) relating to the justification of our assessments, we bring to your attention that the assessments that we carried out centered on the appropriateness of the accounting principles applied.

These assessments were made in the context of our audit of the financial statements, taken as a whole, and therefore contributed to the opinion we formed which is expressed in the first part of this report.

III – Specific verifications and information

We have also performed, in accordance with professional standards applicable in France, the specific verifications required by French law.

We have no matters to report regarding the fair presentation and the conformity with the financial statements of the information given in the management report of the Board of Directors, and in the documents addressed to the shareholders with respect to the financial position and the financial statements.

In accordance with French law, we have verified that the required information concerning the controlling interests and the identity of the shareholders has been properly disclosed in the management report.

Signed in Neuilly-sur-Seine and Paris, March 20, 2013

The Auditors

PricewaterhouseCoopers Audit
Pierre Riou

Lison Chouraki

20.3 DATE OF THE MOST RECENT FINANCIAL INFORMATION

The most recent financial information available relating to the Company is that for the financial year ended December 31, 2012.

20.4 FINANCIAL INFORMATION ON INTERMEDIARIES AND OTHERS

None.

20.5 DIVIDEND DISTRIBUTION POLICY

The Company has not paid any dividends since it was established.

The Company is focusing on growth and as at the date of this Document de Référence had no plans to adopt a policy of paying regular dividends.

20.6 LEGAL AND ARBITRATION PROCEEDINGS

As at the date of this Document de Référence's registration, there are no administrative, judicial or arbitration proceedings, including any proceedings the Company is aware of which are pending or which are being threatened, which are capable of having or which in the course of the last 12 months have had a significant impact on the financial position or the profitability of the Company.

20.7 SIGNIFICANT CHANGES IN THE COMPANY'S FINANCIAL OR COMMERCIAL POSITION

No significant changes have occurred in the Company's financial or commercial position since the end of the reporting period on December 31, 2012.

21 ADDITIONAL INFORMATION

21.1 COMMON STOCK

21.1.1 Value of common stock

On the date of registration of this "Document de Référence", the common stock totaled €166,427.80.

The common stock is divided into 4,160,695 ordinary shares with a nominal value of €0.04 each, all of which are of the same category and fully paid up.

21.1.2 Securities not representing capital

As at the date of registration of this "Document de Référence", no securities not representing capital existed.

21.1.3 Pledges, guarantees and collateral

As at the date of registration of this "Document de Référence", and to the Company's knowledge, there exists no pledge, guarantee or collateral taken on the Company's equity.

21.1.4 Acquisition by the Company of its own shares

As at April 30, 2013, the Company holds 2,010 of its own shares, i.e. 0.05% of its common stock.

The Combined General Assembly of April 26, 2012, in accordance with the provisions of Articles L.225-209-1 et seq. of the Commercial Code valid at the time, authorized the implementation by the Board of Directors of a program to repurchase company shares up to a maximum of 10% of the capital of the Company. This program will expire on October 26, 2013 at the latest.

The Company may acquire its own shares in or outside of the market, and sell all or part of the shares thereby acquired subject to the limits below:

- The aggregate quantity of shares held will not exceed 10% of the total number of shares (this condition will apply to an amount of the common stock that would be adjusted, if needed, to take into account the operations which would impact the common stock during the mandate of this authorization; the acquisitions made by the Company may not directly or indirectly result in its holding more than 10% of its own common stock);
- The number of shares taken into account to determine the limit 10% referred to above corresponds to the number of shares bought, minus the number of shares sold during the period of authorization;
- The unit price at which a share can be bought should not be over €280 (transaction costs not included). The Board of Directors, holding the power of sub delegation, may nevertheless adjust the maximum unit price at which a share can be bought in the case of the incorporation of reserves, profits or issue or share premium, of a merger, a capital contribution, or any other quantity of money which would be considered capitalization, and resulting in either an increase in the nominal value of a share or a group of shares or any other operation affecting equity to take into account the value of those operations on the value of the share;
- Purchase, sale or transfer of shares may take place by any means on the market or by private sale, including by purchase or sale of blocks, under the conditions allowed by the market authorities. These operations may be carried out at any time in accordance with the legal and regulatory provisions in force.

This authorization is intended to allow the Company to ensure liquidity and stimulate the market by means of a liquidity contract through the intermediary of an investment services provider in accordance with the professional charter of the AMAFI of March 8, 2011 acknowledged by the decision of March 21, 2011 of the Financial markets authority.

21.1.5 Other securities giving access to capital

As at the date of registration of this "Document de Référence", exercise of all the rights to securities giving access to capital would allow the subscription of 295,300 new shares representing 7.10% of the current issued common stock and 6.63% of the common stock after the issue of shares.

Thus, the size of the holding of a shareholder holding 1% of the current common stock would reduce to 0.93% if the rights to all these securities were exercised.

Start-up company share options ("**BCE options**")

Type of security	**BCE-2009-1**
Number of BCE options issued and assigned	3,108 (1)
Number of BCE options issued and not assigned	0
Number of BCE options lapsed	0
Number of BCE options exercised	308
Balance of BCE options to be exercised	2,800
Date of the General Meeting	July 8, 2009
Date of the meeting of the Board of Directors	September 9, 2009
Exercise price per new share subscribed	€8
BCE option exercise deadline	10 years from the date of award of the BCE options
Ratio	1 BCE-2009-1 option for 25 new CARMAT shares
General conditions of exercise	- 25% of BCE-2009-1 options may be exercised on the date of the first anniversary of the beneficiary joining the Company, subject to his actual and continued presence within the Company at that date; - 75% of BCE-2009-1 options may be exercised on the basis of full monthly periods in tranches of 1/36th, from the date of the first anniversary of the beneficiary joining the Company over a period of 3 years, subject to his actual and continued presence within the Company at that date. Early exercising in the event of a share transfer agreement being entered into, with or without conditions precedent, resulting in a change in control of the Company to the benefit of the transferee on the basis of a valuation in excess of €100 million. As a result of the success of the listing of the Company on the Alternext market of NYSE-Euronext Paris, according to the assessment of the meeting of the Board of Directors of September 8, 2010, 20% of the BCE-2009-1 options that were not exercisable as at the date of the initial listing may be exercised early.
Number of new shares that may be subscribed	70,000
Maximum dilution of shares and % resulting from exercise of the BCE options	70,000 shares or a maximum dilution of approximately 1.68% of the common stock issued(2)

(1) After adjustments resulting from the increase in capital with preferential subscription rights performed in August 2011.
(2) Given a capital of 4,160,695 shares as at the date of registration of this "Document de Référence".

Type of security	BCE-2009-2
Number of BCE options issued and assigned	7,566 (1)
Number of BCE options issued and not assigned	0
Number of BCE options lapsed	1,655
Number of BCE options exercised	1,937
Balance of BCE options to be exercised	3,974 (2)
Date of the General Meeting	July 8, 2009
Date of the meeting of the Board of Directors	July 8, 2009
Exercise price per new share subscribed	€8
BCE option exercise deadline	10 years from the date of award of the BCE options
Ratio	1 BCE-2009-2 option for 25 new CARMAT shares
General conditions of exercise(2)	- 20% of BCE-2009-2 options may be exercised on the date of the first anniversary of the beneficiary joining the Company, subject to his actual and continued presence within the Company at that date; - 40% of the BCE-2009-2 options may be exercised by full monthly periods in tranches of 1/48th from date of the first anniversary of the beneficiary joining the Company - 10% of the BCE-2009-2 options may be exercised after the successful completion of the initial clinical trials of the CARMAT total artificial heart before the end of the second quarter of 2012 (medical report on completion of the trial including aspects of study safety and end point), subject to the actual and continued presence of the beneficiary within the Company at that date(2); - 10% of the BCE-2009-2 warrants may be exercised after the completion and success of the first clinical implantation of the CARMAT total artificial heart before the end of November 2012 (report from a third party), subject to the actual and continued presence of the beneficiary within the Company at that date; - 6.5% of the BCE-2009-2 options may be exercised after the completion and success of the trial's pivotal study on the CARMAT total artificial heart (report from the Scientific Committee), subject to the actual and continued presence of the beneficiary within the Company at that date; - 6.5% of the BCE-2009-2 options may be exercised from the date on which the CE mark is obtained for the CARMAT total artificial heart, subject to actual and continued presence of the beneficiary within the Company at that date; - 7% of the BCE-2009-2 options may be exercised after completion at December 31 of the first year of commercialization of the CARMAT total artificial heart, confirmed by the Board of Directors, in accordance with the expectations in terms of revenue and gross profit margin set out in the business plan drawn up by the Management and approved by the Board of Directors, subject to the actual and continued presence of the beneficiary within the Company at that date.
Number of new shares that may be subscribed	99,350
Maximum dilution of shares and % resulting from exercise of the BCE options	99,350 shares or a maximum dilution of approximately 2.39 % of the common stock issued(3)

(1) After adjustments resulting from the increase in capital with preferential subscription rights performed in August 2011.

(2) Using a delegation approved by the shareholders on July 8, 2009, The Board of Directors meeting on June 27, 2012 decided, upon recommendation of the Remunerations Committee of the Company and subject to (i) the approval of the owners of the BCE-2009-2 and (ii) the retroactive ratification of its decisions by the next General Meeting of shareholders, to modify the timings and arrangements for exercise of the BCE-2009-2 options appearing in article 4 of the Bylaws with reference to these BCE-2009-2 options. Please refer to 17.2 Participatory rights and options in relation to subscription or share purchase held by the members of the managerial and supervisory bodies, and also by the employees.

(3) Given a capital of 4,160,695 shares as at the date of registration of this "Document de Référence".

Type of security	BCE-2012-1
Number of BCE options issued and assigned	56,500
Number of BCE options issued and not assigned	0
Number of BCE options lapsed	2,000
Number of BCE options exercised	0
Balance of BCE options to be exercised	54,500
Date of the General Meeting	April 26, 2012
Date of the meeting of the Board of Directors	June 27, 2012
Exercise price per new share subscribed	€108,483
BCE option exercise deadline	10 years from the date of award of the BCE options
Ratio	1 BCE-2012-1 option for 1 new CARMAT share
General conditions of exercise	- 50 % of BCE-2012-1 options may be exercised on the basis of monthly periods in tranches of 1/48th for a period of 4 years from the date on which the BCE-2012-1 options are awarded to the beneficiary, subject to his actual and continued presence within the Company at that date. - 16.25% of the BCE-2012-1 options may be exercised after the completion and success of the trial's pivotal study on the CARMAT total artificial heart (report from the Scientific Committee), subject to the actual and continued presence of the beneficiary within the Company at that date; - 16.25% of the BCE-2012-1 options may be exercised from the date on which the CE mark is obtained for the CARMAT total artificial heart, subject to actual and continued presence of the beneficiary within the Company at that date; - 17.5% of the BCE-2012-1 options may be exercised after completion at December 31 of the first year of commercialization of the CARMAT total artificial heart, confirmed by the Board of Directors, in accordance with the expectations in terms of revenue and gross profit margin set out in the business plan drawn up by the Management and approved by the Board of Directors, subject to the actual and continued presence of the beneficiary within the Company at that date.
Number of new shares that may be subscribed	54,500
Maximum dilution of shares and % resulting from exercise of the BCE options	54,500 shares or a maximum dilution of approximately 1.31% of the common stock issued(1)

(1) Given a capital of 4,160,695 shares as at the date of registration of this "Document de Référence".

Type of security	**BCE-2012-2**
Number of BCE options issued and assigned	6,700
Number of BCE options issued and not assigned	0
Number of BCE options lapsed	0
Number of BCE options exercised	0
Balance of BCE options to be exercised	6,700
Date of the General Meeting	April 26, 2012
Date of the meeting of the Board of Directors	November 08, 2012
Exercise price per new share subscribed	€122,003
BCE option exercise deadline	10 years from the date of award of the BCE options
Ratio	1 BCE-2012-2 option for 1 new CARMAT share
General conditions of exercise	- 50 % of the BCE-2012-2 options may be exercised on the basis of monthly periods in tranches of 1/48th for a period of 4 years from the date on which the BCE-2012-2 options are awarded to the beneficiary, subject to his actual and continued presence within the Company at that date. - 16.25% of the BCE-2012-2 options may be exercised after the completion and success of the trial's pivotal study on the CARMAT total artificial heart (report from the Scientific Committee), subject to the actual and continued presence of the beneficiary within the Company at that date; - 16.25% of the BCE-2012-2 options may be exercised from the date on which the CE mark is obtained for the CARMAT total artificial heart, subject to actual and continued presence of the beneficiary within the Company at that date; - 17.5% of the BCE-2012-2 options may be exercised after completion at December 31 of the first year of commercialization of the CARMAT total artificial heart, confirmed by the Board of Directors, in accordance with the expectations in terms of revenue and gross profit margin set out in the business plan drawn up by the Management and approved by the Board of Directors, subject to actual and continued presence of the beneficiary within the Company at that date.
Number of new shares that may be subscribed	6,700
Maximum dilution of shares and % resulting from exercise of the BCE options	6,700 shares or a maximum dilution of approximately 0.16% of the common stock issued[(1)]

(1) Given a capital of 4,160,695 shares as at the date of registration of this "Document de Référence".

Stock subscription warrants ("**BSA warrants**"):

Type of security	**BSA-2009-1**
Number of BSA warrants issued and assigned	3,096(1)
Number of BSA warrants issued and not assigned	1,579
Number of BSA warrants lapsed	2,025
Number of BSA warrants exercised	0
Balance of BSA warrants to be exercised	2,590
Date of the General Meeting	July 8, 2009
Date of the meeting of the Board of Directors	July 8, 2009
Exercise price per new share	€8
BSA warrant exercise deadline	10 years from the date of award of the BSA warrants
Ratio	1 BSA-2009-1 warrant for 25 new CARMAT shares
General conditions of exercise	- 25% of the BSA-2009-1 warrants may be exercised on the date of the first anniversary of the beneficiary joining the Company, subject to his actual and continued presence within the Company at that date; - 75% of BSA-2009-1 options may be exercised on the basis of full monthly periods in tranches of 1/36th from date of the first anniversary of the beneficiary joining the Company for a period of 3 years, subject to his actual and continued presence within the Company at that date. Early exercise at the end of a period expiring 18 months after the establishment of the Company if the beneficiary has occupied the position of Chairman of the Company for a period expiring 18 months after the establishment of the Company. As a result of the success of the listing of the Company on the Alternext market of NYSE-Euronext Paris, according to the assessment of the meeting of the Board of Directors of September 8, 2010, 20% of BSA-2009-1 warrants that were not exercisable at the date of the initial listing may be exercised early.
Number of new shares that may be subscribed	64,750
Maximum dilution of shares and % resulting from exercise of the BSA warrants	64,750 shares or a maximum dilution of approximately 1.56% of the common stock issued(2)

(1) After adjustments resulting from the increase in capital with preferential subscription rights performed in August 2011.
(2) Given a capital of 4,160,695 shares as at the date of registration of this "Document de Référence".

21.1.6 Common stock authorized but not issued

Resolution	Subject matter of the resolution	Maximum nominal amount in euros	Method of determining the issue price	Period of authorization and expiry
8th resolution of the Combined General Meeting of April 28, 2011	Delegation of authority allowing the Board of Directors to decide on the issue, with retention of the preferential subscription rights, of shares and/or transferable securities giving immediate or future access to capital or providing a right to a debt instrument.	Nominal amount of increases in capital: €120,000, of which €11,068.38 already used in 2011 Nominal amount of bonds and other debt instruments giving access to capital: €40,000,000		June 28, 2013 (26 months)
9th resolution of the Combined General Meeting of April 28, 2011	Delegation of authority allowing the Board of Directors to decide on the capitalization of profits, reserves or premiums	Nominal amount of increases in capital: €120,000		June 28, 2013 (26 months)
11th resolution of the Combined General Meeting of April 28, 2011	Delegation of authority allowing the Board of Directors to decide on the issue of shares and/or transferable securities giving immediate or future access to capital or providing a right to a debt instrument, with removal of the preferential subscription right without indicating the beneficiary and by public offering	Nominal amount of increases in capital: €120,000 Nominal amount of bonds and other debt instruments giving access to capital: €40,000,000	at least equal to the weighted average by volume of the last 5 stock market sessions prior to it being defined, less any discount (maximum 20 %)	June 28, 2013 (26 months)
12th resolution of the Combined General Meeting of April 28, 2011	Delegation of authority to the Board of Directors to decide on the issue of shares and/or securities giving immediate or future access to capital or providing a right to a debt instrument, by private placement and up to a limit of 20% of the share capital per year	The face value of the increases in capital will be limited (i) to 20% of the capital (as existing on the date of the operation) per annum and (ii) €120,000 Nominal amount of bonds and other debt instruments giving access to capital: €40,000,000	at least equal to the weighted average by volume of the last 5 stock market sessions prior to it being defined, less any discount (maximum 20 %)	June 28, 2013 (26 months)
7th resolution of the Combined General Meeting of April 26, 2012	Delegation of authority allowing the Board of Directors to decide on the issue of transferable securities giving access to capital, with removal of the preferential subscription right of shareholders in favor of any person working on behalf of and in the interest of the Company, whether or not they are paid, with or without any hierarchical relationship, in particular any employee, any consultant, any member of the Board of Directors or any member of a committee established by the Board of Directors.	€5,000, of which €2,260 have already been used	at least equal to the weighted average by volume of the last 5 stock market sessions prior to it being defined, less any discount (maximum 20 %)	October 26, 2013 (18 months)

N.B.: the above-mentioned ceilings may if necessary be raised by the additional value of shares or securities to be issued in order to preserve the rights of holders of securities giving access to capital in accordance with the provisions of the Commercial Code.

The full texts of the resolutions of the Combined General Meeting held on April 28, 2011 and the Combined General Meeting held on April 26, 2012 are available on the Company's website.

21.1.7 Details of common stock subject to an option or a conditional or unconditional agreement making them subject to an option

None.

21.1.8 Table of changes in the Company's common stock since its creation

Date of realization of the operation	Type of operation	Increase in capital (€)	Issue premium or contribution (€)	Number of shares created		Nominal value of shares (€)	Cumulative number of shares			Common stock following the operation (€)
				Cat. O	Cat. A		Cat. O	Cat. A	Cat. O and A	
6/28/2008	Establishment of the Company Increase in capital by cash	40,000.00	0.00	39,998	2	1	39,998	2	40,000	40,000.00
9/30/2008	Increase in capital by contribution in kind	960,000.00	950,000.00	10,000	0	1	49,998	2	50,000	50,000.00
10/1/2008	Increase in capital by cash contribution	7,250,000.00	7,213,750.00	0	36,250	1	49,998	36,252	86,250	86,250.00
2/5/2010	Increase in capital by cash contribution	950,000.00	945,250.00	0	4,750	1	49,998	41,002	91,000	91,000.00
2/5/2010	Increase in capital by cash contribution through the exercise of BSA warrants	21,478.00	0.00	0	21,478	1	49,998	62,480	112,478	112,478.00
7/7/2010	Division of nominal value by 25	0.00	0.00	0	0	0.04	1,249,950	1,562,000	2,811,950	112,478.00
7/7/2010	Conversion of category A shares into ordinary shares	0.00	0.00	1,562,000	0	0.04			2,811,950	112,478.00

Date of realization of the operation	Type of operation	Increase in capital (€)	Issue premium or contribution (€)	Number of shares created	Nominal value of shares (€)	Cumulative number of shares	Common stock following the operation (€)
7/7/2010	Increase in capital by cash contribution	33,080.08	15,473,207.42	827,002	0.04	3,638,952	145,558.08
7/7/2010	Increase in capital by cash contribution through the exercise of BSA warrants	1,751.00	0.00	43,775	0.04	3,682,727	147,309.08
7/7/2010	Increase in capital by cash contribution through the exercise of convertible options	4,266.64	1,995,720.86	106,666	0.04	3,789,393	151,575.72
7/7/2010	Increase in capital by cash contribution through the exercise of BSA warrants	426.64	0.00	10,666	0.04	3,800,059	152,002.36
7/22/2010	Increase in capital by cash contribution	1,112.08	520,175.42	27,802	0.04	3,827,861	153,114.44
04/28/2011	Increase in capital by cash contribution through the exercise of BCE options	786.00	156,414.00	19,650	0.04	3,847,511	153,900.44
6/19/2011	Increase in capital by cash contribution through the exercise of BCE options	95.00	18,905.00	2,375	0.04	3,849,886	153,995.44
8/10/2011	Increase in capital by cash contribution	11,068.38	29,320,085.64	276,709	0.04	4,126,595	165,063.80
9/26/2011	Increase in capital by cash contribution through the exercise of BCE options	48.00	9,952.00	1,200	0.04	4,127,795	165,111.80
3/8/2012	Increase in capital by cash contribution through the exercise of BCE options	118.00	23,482.00	2,950	0.04	4,130,745	165,229.80
6/27/2012	Increase in capital by cash contribution through the exercise of BCE options	298.00	59,302.00	7,450	0.04	4,138,195	165,527.80
7/19/2012	Increase in capital by cash contribution through the exercise of BCE options	70.00	13,930.00	1,750	0.04	4,139,945	165,597.80
11/8/2012	Increase in capital by cash contribution through the exercise of BCE options	301.00	59,899.00	7,525	0.04	4,147,470	165,898.80
12/13/2012	Increase in capital by cash contribution through the exercise of BCE options	413.00	82,187.00	10,325	0.04	4,157,795	166,311.80
5/17/2013	Increase in capital by cash contribution through the exercise of BCE options	116.00	23,084.00	2,900	0.04	4,160,695	166,427.80

Supplementary table showing the changes in the Company share capital since its creation

Date of realization of the operation	Type of operation	Number of shares issued	Nominal value of shares (in €)	Issue premium or contribution (in €)	Issue price or contribution (in €)	Increase in capital (in €), including issue premium
6/28/2008	Establishment of the Company: Increase in capital by cash contribution	1,000,000	0.04	0.00	0.04	40,000.00
9/30/2008	Increase in capital by contribution in kind	250,000	0.04	3.00	3.84	960,000.00
10/1/2008	Increase in capital by cash contribution	906,250	0.04	7.96	8.00	7,250,000.00
2/5/2010	Increase in capital by cash contribution	118,750	0.04	7.96	8.00	950,000.00
2/5/2010	Increase in capital by cash contribution through the exercise of BSA warrants	536,950	0.04	0.00	0.04	21,478.00
7/7/2010	Increase in capital by cash contribution	827,002	0.04	18.71	18.75	15,506,287.50
7/7/2010	Increase in capital by cash contribution through the exercise of BSA warrants	43,775	0.04	0.00	0.04	1,751.00
7/7/2010	Increase in capital by cash contribution through the conversion of convertible bonds	106,666	0.04	18.71	18.75	1,999,987.50
7/7/2010	Increase in capital by cash contribution through the exercise of BSA warrants	10,666	0.04	0.00	0.04	426.64
7/22/2010	Increase in capital by cash contribution	27,802	0.04	18.71	18.75	521,287.50
April 28, 2011	Increase in capital by cash contribution through the exercise of BCE options	19,650	0.04	7.96	8.00	157,200.00
6/19/2011	Increase in capital by cash contribution through the exercise of BCE options	2,375	0.04	7.96	8.00	19,000.00
8/10/2011	Increase in capital by cash contribution	276,709	0.04	105.96	106	29,331,154.00
9/26/2011	Increase in capital by cash contribution through the exercise of BCE options	1,200	0.04	7.96	8	9,600.00
3/8/2012	Increase in capital by cash contribution through the exercise of BCE options	2,950	0.04	7.96	8	23,600.00
6/27/2012	Increase in capital by cash contribution through the exercise of BCE options	7,450	0.04	7.96	8	59,600.00
7/19/2012[(1)]	Increase in capital by cash contribution through the exercise of BCE options	1,750	0.04	7.96	8	14,000.00
11/8/2012	Increase in capital by cash contribution through the exercise of BCE options	7,525	0.04	7.96	8	59,899.00
12/13/2012	Increase in capital by cash contribution through the exercise of BCE options	10,325	0.04	7.96	8	82,187.00
5/17/2013	Increase in capital by cash contribution through the exercise of BCE options	2,900	0.04	7.96	8	23,200.00
TOTAL	4,160,695				TOTAL	57,030,658.14

21.2 MEMORANDUM AND ARTICLES OF ASSOCIATION

21.2.1 Corporate object (Articles of Association No 2)

The object of the Company is, either directly or indirectly, both in France and abroad:

- research and development in the field of medical devices and equipment, specifically in the cardiovascular field, and in all scientific fields directly or indirectly related thereto;
- production and marketing of (i) medical devices and equipment in the cardiovascular field and (ii) all associated technologies;
- acquisition or creation of technology products and licenses connected with the cardiovascular field;
- investment in French or foreign enterprises having activities that are similar to, or which complement those mentioned above;
- and, more generally, all operations of any kind - economic, legal, financial, civil or commercial, industrial, movables or real estate – that may be directly or indirectly connected with the above-mentioned object or likely to contribute to the development thereof.

21.2.2 Provisions of the Articles of Association, a charter or Bylaws of the Company concerning the members of the Board of Directors and the General Management (Articles of Association Nos 15 – 21)

Article 15 – Board of Directors

The Company is administered by a Board of Directors consisting of a minimum of five (5) and a maximum of eighteen (18) members subject to the derogation provided for by law in the case of a merger.

Article 16 – Appointment and removal of directors

I. Appointment / removal of directors

Over the life of the Company, the directors are appointed by the Ordinary General Meeting. However, in the event of a merger or demerger, appointments may be made by the Extraordinary General Meeting. Their term of office is six (6) years. It concludes at the end of the Ordinary General Meeting of shareholders that approves the financial statements for the period just closed, and which is held in the year in which the term of office of the said director expires.

Any outgoing director may be re-elected subject to fulfilling the conditions of this Article.

Directors may be removed from office and replaced at any time by the Ordinary General Meeting.

Actual persons with an age of more than eighty-five (85) years may not be directors; where a director passes this age during a term of office they are deemed to have officially resigned at the next General Meeting. Any appointment made in breach of the above provisions is null and void, with the exception of those which may be made on an interim basis.

Any director who is a natural person must, at the time of their appointment and throughout their term of office, meet the legal requirements in terms of the total number of directorships that the same person may hold in limited companies based in Metropolitan France, save as otherwise provided for by law.

A Company staff member may only be appointed as a director if their contract of employment relates to an actual position within the Company. The number of directors having a contract of employment with the Company may not exceed one third of the directors in post.

II. Director in the form of a legal entity

Directors may be natural persons or legal entities. In the latter case, at the time of appointment, the legal entity is required to designate a permanent representative who will be subject to the same conditions and obligations and with the same civil and criminal liabilities as if they were a director in their own right, without prejudice to the joint and several liability of the legal entity that they represent. The permanent representative of a director in the form of a legal entity is subject to the age conditions that relate to directors who are natural persons.

The term of office of the permanent representative designated by the legal entity appointed as director is the same as the term of office of the latter.

If the legal entity revokes the mandate of its permanent representative, it is required to notify the Company, without delay, by registered letter, of this revocation and of the identity of its new representative. The same applies in the case of death or resignation of the permanent representative.

The designation of the permanent representative and the termination of their mandate are subject to the same publication formalities as if they were a director in their own right.

III. Vacancies, death, resignation

In the event of a vacancy due to death or resignation of one or more directors, the Board of Directors may proceed with interim appointments between two General Meetings.

When the number of directors falls below the legal minimum, the remaining directors must immediately call an Ordinary General Meeting in order to bring the Board up to strength.

Interim appointments made by the Board are subject to ratification by the next Ordinary General Meeting. In the absence of ratification, resolutions passed and acts performed previously by the Board will remain valid.

Article 17 – Organization and deliberations of the Board

I. Chairman

The Board of Directors elects a Chairman from among its members, who must be a natural person, failing which the appointment will be null and void. The Board of Directors defines the remuneration of the Chairman.

The Chairman of the Board of Directors organizes and directs the work of the latter, and reports thereon to the General Meeting. He ensures that the Company bodies are operating properly, and in particular that the directors are capable of performing their duties.

In order to perform his duties, the Chairman of the Board of Directors must be less than eighty-five (85) years of age. If the Chairman of the Board of Directors passes this age during his term of office, he will be deemed to have officially resigned and the appointment of a new Chairman will take place subject to the conditions provided for in this Article.

The Chairman is appointed for a term that may not exceed that of his term of office as a director. The Chairman is eligible for re-election.

The Board of Directors may revoke the appointment at any time.

In the event of the Chairman being temporarily unavailable, or of his death, the Board of Directors may delegate the duties of Chairman to a director.

In the event of a temporary impediment, this delegation is made for a limited period; it is renewable. In the event of death it remains valid until the election of a new Chairman.

II. Board meetings

The Board of Directors meets as often as the interests of the Company dictate, at the invitation of the Chairman and at least every two (2) months.

Where it has not met for more than two (2) months, a minimum of one third of the members of the Board of Directors may ask the Chairman to call a meeting with a specific agenda.

The Chief Executive may also ask the Chairman to call a meeting of the Board of Directors with a specific agenda.

The Chairman is bound to act on requests made to him by virtue of the above two paragraphs.

Notices may be given by any means and even verbally.

The Board meets at the head office or at any other location (in France or abroad) indicated in the notice, under the chairmanship of the Chairman or, if he is unavailable, the member designated by the Board to chair it.

The Chairman of the Board of Directors chairs the meetings. In the event of the Chairman being unavailable, the Board appoints a chairman for each meeting from among the members present.

At each meeting, the Board may appoint a secretary, who does not necessarily have to be a member.

A register is kept which is signed by the directors attending the Board meeting.

The directors and any person called upon to attend the meetings of the Board of Directors are bound by secrecy in respect of information of a confidential nature indicated as such by the Chairman.

III. Quorum, majority

Deliberations of the Board will only be valid if at least half of the directors are present or deemed present under the arrangements laid down in the Bylaws where videoconferencing and other means of telecommunication are used.

Unless otherwise stipulated by these Articles of Association and subject to the arrangements laid down in the Bylaws, where videoconferencing or other means of telecommunication are used, decisions are taken by a majority of votes of the members present or represented or deemed present.

Directors are deemed present for the purposes of calculating a quorum or majority where they take part via video-conference or telecommunication under the conditions defined by the Bylaws of the Board of Directors. However, physical presence or representation will be necessary for all deliberations of the Board relating to adoption of the annual financial statements and the consolidated financial statements, and also for drawing up the management report and the consolidated management report, as well as for decisions concerning the removal of the Chairman of the Board of Directors, the Chief Executive and the Deputy Chief Executive.

Furthermore, half of the directors in post may oppose a meeting of the Board being held via video-conference or telecommunication. Such opposition must be notified in the forms and by the deadline required by the Bylaws and/or in those that may be laid down in the legal or regulatory provisions.

IV. Representation

Any director may give another director written authority to represent him at a meeting of the Board.

Each director may hold only one proxy for the same meeting given by application of the above paragraph.

These provisions are applicable to the permanent representative of a director who is a legal entity.

V. Minutes of deliberations

The deliberations of the Board of Directors are recorded in minutes drawn up in a special register, numbered and initialed, and kept at the head office in accordance with the regulatory provisions.

VI. Observers

Throughout the lifetime of the Company, the Ordinary General Meeting may proceed with the appointment of observers who may or may not be shareholders.

The number of observers may not exceed three (3).

Observers are appointed for a term of one (1) year. Their terms of office conclude at the end of the Ordinary General Meeting of shareholders called to approve the financial statements for the period just closed, and held in the year during which their terms of office cease.

Any outgoing observer may be re-elected subject to meeting the conditions of this Article.

Observers may be removed and replaced at any time by the Ordinary General Meeting without any compensation being due to them. The functions of the observers also cease upon the death or incapacity of an observer who is a natural person, or in the event of winding up or receivership in the case of an observer who is a legal entity.

Observers may be natural persons or legal entities. In the latter case, at the time of appointment, the legal entity is required to designate a permanent representative who will be subject to the same conditions and obligations and with the same civil and criminal liabilities as if they were an observer in their own right, without prejudice to the joint and several liability of the legal entity that they represent.

The duty of the observers is to ensure the strict application of the Articles of Association and to present their observations at the meetings of the Board of Directors.
The observers perform a general and permanent duty within the Company through advice and monitoring. In the context of their duties they may make observations to the Board of Directors and request access to information at the head office of the Company.

Observers must be invited to each meeting of the Board of Directors in the same way as directors.

Observers have only consultative powers on an individual or joint basis and have no voting rights on the Board.

Failure to invite an observer or to send documents to an observer or observers prior to the meeting of the Board of Directors may in no case constitute grounds for nullity of the deliberations of the Board of Directors.

Article 18 – Powers of the Board of Directors

The Board of Directors sets the business policy of the Company and ensures that this is implemented.

Save for the powers expressly reserved to the meetings of shareholders and within the scope of the corporate object, the Board of Directors considers any matter relating to the proper operation of the Company and through its deliberations, deals with matters affecting it.

In its relations with third parties, the Company is obligated even for acts of the Chief Executive that do not fall within the scope of the corporate object, unless it can prove that the third party was aware that the act exceeded that scope, or must have been aware, given the circumstances, although the simple publication of the Articles of Association will not suffice as proof.

The Board of Directors will proceed with the controls and verification that it deems appropriate.

Each Director must receive the information necessary to perform his duties and may obtain from the general management all documents he considers useful.

The Board of Directors may decide to set up working groups to look into matters that the Board or its Chairman may refer to them.

Article 19 – General management – Delegation of powers

I. Organizational principles

In accordance with the legal provisions, the general management of the Company is undertaken, on behalf of the Company, either by the Chairman of the Board of Directors or by another natural person appointed by the Board of Directors and bearing the title of Chief Executive.

The choice between the two methods of exercising general management is made by the Board of Directors, which must inform the shareholders and third parties subject to the regulatory requirements.

The decision of the Board concerning the choice of the method of exercising general management is taken by a majority vote of the directors present or represented, subject to the specific provisions of Article 17-III where directors attend the meeting by video-conference or other means of telecommunication.

A change in the method for undertaking general management does not result in a change to the Articles of Association.

Where general management of the Company is undertaken by the Chairman of the Board of Directors, the following provisions relating to the Chief Executive are applicable to him.

II. General Management

Chief Executive

Dependent on the choice made by the Board of Directors in accordance with the provisions of the above paragraph, the general management of the Company is exercised by the Chairman of the Board of Directors, or by a natural person, who may or may not be a director, who is appointed by the Board of Directors and bears the title of Chief Executive.

Where the Board of Directors chooses to separate the functions of Chairman and Chief Executive, it will proceed to appoint the Chief Executive, define his term of office, determine his remuneration and, as necessary, the limits to his powers.

A person over the age of eighty-five (85) years may not be appointed as Chief Executive. On the other hand, if a Chief Executive in post passes this age he is deemed to have officially resigned.

The Chief Executive may be removed from office at any time by the Board of Directors. Where the Chief Executive does not perform the role of Chairman of the Board of Directors, his removal may be subject to payment of compensation if this takes place without good cause.

The Chief Executive is invested with the widest powers to act in all circumstances on behalf of the Company. He exercises these powers within the scope of the corporate purpose, save for those which the law expressly reserves to the meetings of shareholders and to the Board of Directors.

He represents the Company in its relations with third parties. The Company is obligated even for acts of the Chief Executive that do not fall within the scope of the corporate object, unless it can prove that the third party was aware that the act exceeded that scope, or must have been aware, given the circumstances, although the simple publication of the Articles of Association will not suffice as proof.

In respect of the shareholders and without this restriction being binding upon third parties, the Chief Executive may not take any decision on behalf of the Company in the following areas without the prior authorization of the Board of Directors:

- the securing of loans or advances in order to acquire shares or securities of any subsidiary, except where such subsidiary is wholly-owned;
- the furnishing of guarantees on behalf of a subsidiary or to guarantee bank accounts;
- all investments in excess of €250,000;
- all commitments in excess of €100,000 and not provided for in the annual budget;
- hiring, laying off and amending the contracts of employment of employees at management level;
- a change in the normal business of the Company and in its development strategy;
- the disposal, transfer, licensing or pledging of any industrial or intellectual property or of any substantial asset;
- approval of the budget and the strategic plan.

The Chief Executive may not, without a prior decision of the Board of Directors by a qualified majority of three quarters of the directors making up the Board as at the date that the decision is taken:

- take any decision to proceed with the transfer of any substantial asset or any intellectual/industrial property belonging to the Company;
- take any decision to acquire a holding in a listed or unlisted company.

Deputy Chief Executives

At the proposal of the Chief Executive that this function be assumed by the Chairman of the Board of Directors or by another person, the Board of Directors may appoint one or more actual persons, known as Deputy Chief Executives, who may or may not be chosen from among the directors and shareholders, who are charged with assisting the Chief Executive. The number of Deputy Chief Executives may not exceed five. If the Deputy Chief Executive is a director, his term of office may not exceed that of his term of office as a director.

A person over the age of eighty-five (85) years may not be appointed as Deputy Chief Executive. On the other hand, if a Deputy Chief Executive in post passes this age he is deemed to have officially resigned.

Deputy Chief Executives may be removed at any time by the Board of Directors at the proposal of the Chief Executive. Removal without just cause may give rise to damages.

By agreement with the Chief Executive, the Board of Directors decides on the scope and the duration of the powers granted to the Deputy Chief Executives. The Deputy Chief Executives have the same powers in respect of third parties as the Chief Executive.

Where the Chief Executive ceases or is prevented from performing his duties, the Deputy Chief Executives will retain their functions and powers until the new Chief Executive is appointed, unless otherwise decided by the Board.

The Board of Directors decides on the remuneration of the Deputy Chief Executives.
III. Delegation of powers

The Board of Directors may entrust to its agents, who may or may not be directors, the permanent or temporary duties it decides upon, delegate powers to them and set the remuneration it considers appropriate.

Article 20 – Directors' remuneration

The General Meeting may allocate to the directors, to compensate them for their work, by way of directors' fees, a fixed annual sum defined by the meeting, without being bound by previous decisions. The amount is posted to the operating expenses.

The Board of Directors freely distributes among its members the total amounts allocated to the directors as directors' fees; it may in particular allocate a higher share to those directors who are members of working groups than that allocated to the other directors.

The Board of Directors may award exceptional remuneration for the duties or mandates entrusted to directors.

The Board of Directors may authorize the reimbursement of travel and subsistence costs and expenses incurred by the directors in the interests of the Company.

Article 21 – Agreements between the Company and a director, the Chief Executive or a Deputy Chief Executive

I. Agreements subject to authorization

Except for those relating to day to day operations and entered into under normal conditions, any agreement that is made, directly or through a nominee, between the Company and one of its directors, Chief Executives and Deputy Chief Executives, or a shareholder holding more than 10% of the voting rights in the Company, or if a shareholding company or the controlling company according to Article L.233-3 of the Commercial Code is involved, must be referred for prior authorization by the Board of Directors.

The same applies to agreements in which one of the persons referred to in the above paragraph has an indirect interest.

Agreements entered into by the Company and an enterprise are also subject to prior authorization if they are with an enterprise where the Chief Executive, one of the Deputy Chief Executives or one of the directors of the Company, is the owner, partner with unlimited liability, manager, director, member of the supervisory committee or, generally speaking, an executive of the enterprise.

Such agreements must be authorized and approved in accordance with the statutory provisions.

II. Prohibited agreements

It is prohibited, on pain of nullity of the contract, for directors other than those who are legal entities, to contract for loans of whatever kind with the Company, to have an overdraft granted by it, on a current or other account, or to have it act as guarantor or stand surety for undertakings by them to third parties.

The same prohibition applies to the Chief Executive, Deputy Chief Executives and permanent representatives of directors in the form of legal entities. It also applies to the spouses, ascendants and descendants of the persons mentioned in this article and to any nominee.

III. Current agreements

Agreements relating to day to day operations and entered into under normal conditions are not subject to the legal process of authorization and approval. However, these agreements, unless as a result of their subject-matter or their financial implications they are not significant for any of the parties, must be notified by the interested party to the Chairman of the Board of Directors. A list and subject-matter of such agreements are notified by the Chairman to the members of the Board of Directors and to the Auditors at the latest on the day of the meeting of the Board to approve the financial statements for the year just closed.
Shareholders may also be sent the list and subject-matter of these agreements.

21.2.3 Rights, privileges and restrictions attaching to shares (Articles of Association Nos 9 to 14)

Article 9 – Depreciation of the share capital

The share capital may be depreciated in accordance with the provisions of Article L.225-198 et seq. of the Commercial Code.

Article 10 – Settlement of shares

At the time of any increase in capital, cash shares are settled, upon subscription, for at least a quarter of their face value and, as appropriate, the full issue premium.

Settlement of the balance must take place on one or more occasions at the call of the Board of Directors and within five years of the date when the transaction becomes definitive in the case of an increase in capital.

Calls for funds are notified to the subscribers and shareholders at least fifteen days prior to the date set for payment by individual recorded delivery letter with acknowledgment of receipt.

A shareholder who does not make the required payments for shares on the due dates will be liable to pay the Company, automatically and without prior warning, delay interest calculated on a daily basis from the due date at the legal rate for commercial court matters plus three points.

In order to obtain payment of these sums the Company is entitled to take the enforcement action and apply the sanctions provided for by Article L.228-27 et seq. of the Commercial Code.

Article 11 – Form of shares

Shares may be registered or bearer shares, at the option of the shareholder. They may not take the form of bearer shares until they have been fully paid up.

The Company is authorized to identify holders of bearer shares by simple request, to the body in charge of the clearing of securities, of the name or company name, nationality, year of birth or establishment, shareholders' addresses or number of shares held by each of them.

21.2.3.1 Article 12 – Transfer of shares – Rights and obligations associated with shares – Exceeding of limits

12.1 - Transfer of shares

Shares may be freely traded once issued in accordance with the procedures set out by law.

They remain negotiable following the winding up of the Company and until liquidation is complete.

They give rise to a book entry and are transferred by a movement between accounts under the conditions and according to the procedures set out in the law and the rules in force.

The provisions of this Article are generally applicable to all securities issued by the Company.

12.2 - Rights and obligations attaching to shares

Each share gives an entitlement to a share in the Company profits in proportion to the percentage of the capital represented by it. It also gives an entitlement to participate, under the conditions set by law and by these Articles of Association, in the General Meetings and in votes on resolutions.

Ownership of a share entails unreserved compliance with the Articles of Association and decisions of the General Meeting of the Company.

Shareholders are liable for the Company's debts only to the limit of their contributions.

The rights and obligations attaching to a share follow the security whoever is the owner.

When it is necessary to own more than one share in order to exercise a particular right, in the event of an exchange, grouping, allocation of shares, increase or reduction in capital, merger or any Company operation, the owners of isolated securities or of a number less than that required, may only exercise such right on condition that they personally arrange a grouping and, if necessary that they buy or sell the necessary number of securities.

12.3 – Exceeding of limits

Any actual person or legal entity acting alone or together with others who comes to possess a number of shares representing a percentage of the capital or the voting rights in excess of the limits set by law, will inform the Company within the statutory period, counting from when the holding limit is reached, of the total number of shares or voting rights held.

This information is also provided within the same time frames when the holding of share capital or voting rights drops below the limits mentioned in this paragraph.

A person required to provide this information will state the number of securities held giving access to capital and the voting rights attaching to these.

If required by the rules of a securities market other than a regulated market on which the securities of the Company are admitted for trading, this person will also inform the Financial Markets Authority within a time frame and according to the arrangements set by the general regulations of the latter, with effect from when the limit to the holding is passed. If necessary, this information is made public under the conditions laid down by the general regulations of the Financial Markets Authority.

Failure to make a due declaration under the above conditions will result in the shares exceeding the fraction that should have been declared by law having their voting right removed for any meeting of shareholders held within a period expiring two years after the date that the notification is dealt with.

Similarly, voting rights attaching to these shares and which are not duly declared may not be exercised or delegated by the defaulting shareholder.

The commercial court having jurisdiction for the registered office, at the request of the Chairman of the Company, a shareholder or the Financial Markets Authority, holds sole jurisdiction to pronounce a total or partial suspension, for a period not to exceed five years, of the voting rights of any shareholder who has not made the required declarations.

21.2.3.2 Article 13 – Indivisibility of shares – Bare ownership - Usufruct

1 – Shares are indivisible with respect to the Company.

Co-owners of undivided shares are represented at General Meetings by one of these or by a single proxy. In the event of disagreement, the proxy is appointed by a court at the application of the most diligent co-owner.

2 – The voting right belongs to the usufructuary at Ordinary General Meetings and to the bare owner at Extraordinary General Meetings. However, shareholders may agree any other distribution of the voting right at General Meetings. The agreement is notified by registered letter to the Company, which will be required to apply this agreement at any meeting that takes place following expiry of a period of one month after such letter is sent.

The voting right is exercised by the owner where securities are pledged.

21.2.3.3 Article 14 – Double voting right

The voting right attaching to capital or dividend shares is proportional to the percentage of the capital that they represent. Each share gives an entitlement to one vote.

However, a voting right that is double that conferred on other shares, having regard to the percentage of the capital that they represent, is attributed to all shares that are fully paid up, and which can be shown to have been registered to the same shareholder for at least two (2) years. This right is exercised subject to the provisions of No 12.3 (3) of the Articles of Association.

This double voting right is also conferred from the time they are issued, in the event of an increase in capital through capitalization of reserves, profits or issue premiums, upon registered shares in a scrip issue to a shareholder based on previous shares providing such an entitlement.

The transfer of a share as a result of succession, liquidation of community of property between spouses or donation between living persons to a spouse or a parent entitled to inherit, does not result in loss of the right acquired and does not interrupt the periods provided for above.

The transfer of a share by an FCPR (Mutual Fund for Risk Investment) or an FCPI (Mutual Fund for Investment in Innovation) to any FCPR or FCPI that manages the management company, and to any FCPR or FCPI managed by a management company within the group of companies to which this management company belongs, and if it is a company, to any company within the group to which it belongs (for the purposes of Article L.511-7 (3) of the Monetary and Financial Code), does not result in loss of the right acquired and does not interrupt the periods provided for above.

A share transfer by the management company to holders of shares following the liquidation of an FCPR does not result in loss of the right acquired and does not interrupt the periods provided for above.

21.2.4 Conditions for changing shareholders' rights

The Articles of Association of the Company do not make any special provision that derogates from general company law.

21.2.5 General Meetings of shareholders (Articles of Association Nos 24 to 31)

Article 24 – Quorum and majority

General Meetings deliberate under the conditions set by law.

The Ordinary General Meeting takes all decisions other than those reserved to the Extraordinary General Meeting by law and by these Articles of Association. It may not validly deliberate at the first calling unless the shareholders present or represented hold at least one fifth of shares with voting rights. At the second calling no quorum is required. It acts by a majority of the votes cast by the shareholders present or represented.

The Extraordinary General Meeting alone has the power to modify any of the provisions of the Articles of Association. It may not validly deliberate unless the shareholders present or represented hold at least one quarter of shares with voting rights at the first calling and one fifth of the shares at the second calling. In the absence of the latter quorum, the second meeting may be postponed to a later date not more than two months after that when it was originally called. It acts by a two-thirds majority of the votes cast by the shareholders who are present or represented.

Where videoconferencing or other means of telecommunication permitted by law is used under the conditions set out in Article 25 below, shareholders are deemed present for the purposes of calculating a quorum or majority where they take part by such videoconferencing or other means of telecommunications.

Article 25 – Calling of General Meetings

General Meetings are called either by the Board of Directors, or by the Auditors, or by a proxy appointed by a court under the conditions and arrangements laid down by law.

They take place at the head office or at any other location specified in the notice of the meeting.

Where shares in the Company are not traded on a regulated market or if all its shares are not registered shares, the Company is required to publish in the Bulletin des Annonces Légales Obligatoires (BALO - French Mandatory Legal Announcements Bulletin), at least thirty-five (35) days before the meeting, a notice of such meeting containing the information required by the current regulations in force.

General Meetings are called by publication in a journal authorized to carry legal notices in the department where the head office is based and also in the Bulletin des Annonces Légales et Obligatoires (BALO).

However, the publications referred to in the above paragraph may be replaced by a call made, at the cost of the Company, by normal or registered letter sent to each shareholder. Such a call may also be sent by electronic means of telecommunication employed under the regulatory conditions.

If this is decided by the Board at the time the meeting is called, any shareholder may also take part and vote in meetings by video-conference or by any other means of telecommunication allowing them to be identified, under the following conditions and according to the arrangements provided for by law and decree.

Any meeting not duly called may be canceled. However, cancellation may not take place if all shareholders are present or represented.

Article 26 – Meeting agenda

The agenda is set by whoever issues the notice of the meeting.

However, one or more shareholders representing at least 5% of the capital (or an association of shareholders meeting the legal conditions) are empowered to request, under the conditions laid down by law, the inclusion in the agenda of draft resolutions. Such a request must be accompanied by the text of the draft resolutions which may be accompanied by a brief outline of the reasoning.

These draft resolutions, which must be brought to the attention of the shareholders, are included in the agenda and put to a vote of the meeting.

The meeting may not deliberate on a matter that is not included in the agenda.

However, it may under any circumstances remove one or more directors and proceed with their replacement.

The agenda may not be changed if the meeting has to be called a second time.

Where the meeting is called upon to deliberate on changes to the economic or legal organization of the Company,

regarding which the works council has been consulted by application of Article L.2323-6 of the Labor Code, notice of this is sent to the latter.

Article 27 – Admission to meetings

Any shareholder may participate personally, by proxy, or by correspondence in General Meetings, of whatever kind.

A legal right of participation in General Meetings exists:
- for registered shares, as a result of the entry of these in the books of registered shares kept by the Company at midnight at the start of the third working day prior to the meeting, Paris time;
- for bearer shares, as a result of the entry of these in the books of bearer shares kept by the authorized intermediary, at midnight at the start of the third working day prior to the meeting, Paris time.

The entry or registration of securities in the books of bearer shares kept by the authorized intermediary is acknowledged by a shareholding certificate issued by the latter.

However, the Board of Directors may reduce or remove these timings, provided that it is in the interests of shareholders.

Shareholders who have not settled their shares by making the payments due are not admitted to meetings.

Article 28 – Representation of shareholders and postal voting

I. Representation of shareholders

A shareholder may be represented by another shareholder or by their spouse.

Any shareholder may be empowered by other shareholders to represent them at a meeting, without any restriction other than those resulting from the legal provisions setting the maximum number of votes that the same person may hold in their own name and as a proxy.

II. Postal voting

Once the meeting has been called, a postal voting form and attachments will be sent, at the cost of the Company, to any shareholder who makes a written request for this.

The Company must comply with any request filed or received at the head office at the latest six days prior to the date of the meeting.

Article 29 – Officers for the meeting

Shareholder meetings are chaired by the Chairman of the Board of Directors or, in his absence, by a director delegated for this purpose by the Board. Failing this, the meeting elects a chairman itself.

Where a meeting is called by the auditors, a court-appointed proxy or by the liquidators, the meeting is chaired by whichever of these has called it.

The two attendees at such meeting holding the largest number of shares and accepting this function will act as vote tellers.

The officers for the meeting will appoint a secretary, who need not be a shareholder.

Article 30 - Minutes of deliberations

The deliberations of shareholder meetings are recorded in minutes drawn up by the meeting officers and signed by them.

These will state the date and place of the meeting, how it was called, the agenda, the composition of the group of meeting officials, the number of shares participating in the voting and the quorum achieved, the documents and reports submitted to the meeting, a summary of the proceedings, the text of the resolutions voted upon and the outcome of these votes.

The minutes are recorded in a special register kept at the head office under the conditions laid down in the regulations.

If, in the absence of a quorum, a meeting is unable to deliberate properly, minutes to that effect are drawn up by the officers of said meeting.

Article 31 – Shareholders' right of information and control

Before each meeting, the Board of Directors must make available to shareholders the documents necessary to allow them to speak in full knowledge of the facts and to come to an informed judgment on the functioning of the

Company.

Upon receipt of the communication referred to above, any shareholder will be entitled to submit written questions, to which the Board of Directors will be required to respond during the meeting.

At any time, any shareholder has an entitlement to receive the documents that the Board of Directors is required, as the case may be, to keep available at the head office, or to send them, in accordance with the legislative and regulatory provisions in force.

21.2.6 Provisions of the articles of association, a charter or regulations of the Company that may have the effect of delaying, deferring or preventing a change in its control

The Articles of Association of the Company do not make any special provision that derogates from general company law.

21.2.7 Passing of statutory limits (Articles of Association No 12.3)

Any natural person or legal entity, acting alone or together with others, for the purposes of Article L.233-10 of the Commercial Code, who acquires or ceases to own a number of shares representing a fraction equal to 5%, 10%, 15%, 20%, 25%, 33.33%, 50%, 66.66%, 90% or 95% of the share capital or of the voting rights, is required to inform the Company at the latest prior to the close of the fourth stock market trading day after the above-mentioned holding limit is reached, stating the number of shares and votes held. A person or entity required to provide the above-mentioned information will state the number of securities held giving access to capital and the voting rights attached thereto.

Furthermore, any actual person or legal entity, acting alone or together with others, who acquires or ceases to own a number of shares representing a fraction equal to 50% or 95% of the share capital or of the voting rights, is required to inform the French Financial Markets Authority at the latest prior to the close of the fourth stock market trading day after the above-mentioned holding limit is reached, under the conditions laid down in the general regulations of the French Financial Markets Authority.

Failure to declare the surplus shares subject to the above conditions will result in the votes attaching to the fraction that should have been declared being removed, in accordance with the provisions of the Commercial Code.

21.2.8 Changes to the common stock (Articles of Association No 8)

1 – The capital stock may be increased by any process and under any arrangements provided for by law.

Only an Extraordinary General Meeting is competent to decide on an increase in capital based on a report from the Board of Directors.

Shareholders have a preferential right, in proportion to the number of shares they hold, to subscribe to cash shares issued in order to increase the capital, and may waive this on an individual basis. The Extraordinary Meeting may decide to withdraw this preferential right of subscription in accordance with the statutory provisions.

2 – A reduction in capital is authorized or decided upon by the Extraordinary General Meeting and may in no case adversely affect the equality of shareholders.

A reduction in capital to below the legal minimum may only be decided subject to the condition precedent of an increase in capital intended to bring this up to at least the legal minimum, unless the Company converts into another form of company that does not require capital in excess of the common stock after it has been reduced.

Failing this, any interested party make seek a legal order to wind up the Company. This may not be issued if, on the day on which the court rules on the merits of the case, the situation has been regularized.

22 IMPORTANT CONTRACTS

The important contracts to which the Company is a party are as follows:

- A Royalties Agreement signed on June 24, 2008 and amended by an addendum of February 5, 2010, between CARMAT, Professor Alain Carpentier and Matra Défense (an EADS Group subsidiary): please refer to paragraph 19.1 "Royalties Agreement".
- An exclusive license agreement with the Pierre and Marie Curie University relating to patent no 8800381: please refer to paragraph 11.2.2 "Exclusive license agreements".
- An exclusive license agreement with the Centre Technique des Industries Mécanique relating to patent no 2760973: please refer to paragraph 11.2.2 "Exclusive license agreements".
- A framework aid agreement for the CARMAT industrial Strategic Innovation project and a contract in support of the CARMAT project entered into on July 24, 2009 for a total sum granted by OSEO Innovation of €33,006,398.

22.1 FRAMEWORK AID AGREEMENT WITH OSEO

22.1.1 Initial conditions of the agreement

A framework aid agreement for the CARMAT industrial Strategic Innovation project and a contract in support of the CARMAT project, was entered into on July 24, 2009 for a total sum granted by OSEO Innovation of €33,006,398, made up of €18,499,074 in subsidies and €14,507,324 of repayable advances.

The Company acts as leader in the project and as a result receives all the repayable advances and €17,442,639 in subsidies, with the balance being received by the other four partners involved in the project (DEDIENNE SANTE, PAXITECH, VIGNAL ARTRU INDUSTRIE and IREIS (formerly HEF R&D)).

22.1.2 Relationships with the Partners

- PAXITECH is responsible for the work relating to development of a portable fuel cell. This agreement was entered into for a term of 2 years with effect from July 7, 2009. If PAXITECH wishes to use the results in any area outside the medical domain, it will have to obtain the prior authorization of CARMAT, which may not be refused without good reason.

  It is worth noting that, at the end of the aforementioned agreement, a new agreement was reached between CARMAT and PAXITECH, outside of the OSEO framework, on September 13, 2011, in light of the progress realized in the first two years that allowed for the possibility of creating the first industrial prototypes.

- DEDIENNE SANTE is responsible for the work relating to manufacture of parts in implantable PEEK. This agreement was entered into for a term of 4 years with effect from July 7, 2009. If DEDIENNE SANTE wishes to use the results in any area outside the medical domain, it will have to obtain the prior authorization of CARMAT, which may not be refused without good reason.
- IREIS (formerly HEF R&D) is responsible for the work relating to qualification of the motor pump set. This agreement was entered into for a term of 6 years with effect from July 7, 2009. In return for ownership of the results of the work which will be claimed by CARMAT, the latter undertakes to grant HEF R&D an exclusive and transferable usage right, free of charge and without time limit, to these results, for application outside of the medical devices domain.
- VIGNAL ARTRU INDUSTRIES (VAI – Pack'Aero Group) is responsible for the work relating to construction of the motor pump set. This agreement was entered into for a term of 4 years with effect from July 7, 2009. If VIGNAL ARTRU INDUSTRIE wishes to use the results in any area outside the medical domain, it will have to obtain the prior authorization of CARMAT, which may not be refused without good reason.

Under the OSEO Innovation framework agreement, each of the partners has undertaken to provide the resources necessary to complete the development project for the total artificial heart and its components. In return, OSEO Innovation will pay its subsidies and repayable advances as certain phases and milestones described below are executed.

22.1.3 Milestones of the project, associated deliverables and specific conditions for continuation of the project:

Milestone	Provisional date	Name of the determining deliverable	Specific conditions for continuation of the project
EC1	T0 + 6 months	Documentation defining prosthesis D1 Mechanical and biological Preliminary definition documentation Electronics and software	
EC2	T0 + 12 months	Prototypes acceptance report (2 non-clinical)	Presentation of a document certifying a contribution in equity* and in cash at least equal to the payments by OSEO at milestones EC2 and EC3
EC3	T0 + 23 months	Functional trials documentation	
EC4**	T0 + 29 months	*In vitro* pre-clinical trials documentation	Conditional authorization from the AFSSAPS (ANSM) and the CPP to progress to clinical trials in humans Presentation of a document certifying a contribution in equity* and in cash at least equal to the payments by OSEO at milestone EC4
EC5	T0 + 39 months	Clinical prototypes acceptance report Clinical trials monitoring report	Presentation of a document certifying a contribution in equity* and in cash at least equal to the payments by OSEO up until the end of the R&D project
EC6**	T0 + 49 months	System design documentation	Conditional authorization from the AFSSAPS (ANSM) and the CPP for the second series of clinical trials and consideration of the results.
EC7	T0 + 54 months	CE mark documentation	

T0: effective start date of the project = June 1, 2009.

* In the form of capital, convertible bonds, issue premiums or current accounts of associates grouped together by the corresponding tranche of the R&D program. Payments under industrial agreements with no immediate consideration may be acceptable.

** However, as regards milestones 4 and 6, and although the Company can obtain the CE mark without having obtained the agreement of ANSM to permit it to undertake clinical trials on humans in France, as soon as the Company has undertaken conclusive clinical tests on humans in other countries, this agreement must be obtained, under the terms of the contract as it currently stands, before it can receive the subsidies and repayable advances associated with these stages. No equivalent specific conditions exist for milestones 5 and 7.

22.2 MAXIMUM INITIAL PAYMENTS BY TYPE OF AID, BY PARTNER AND BY MILESTONE (IN €) OF THE INITIAL AGREEMENT

22.2.1.1 Subsidies (initial contract)

Maximum subsidy payment schedule for IR (Industrial Research)

(€)	Initial payment	Maximum payment per milestone*							Total payments
		EC1	EC2	EC3	EC4	EC5	EC6	EC7**	
CARMAT	4,072,638	3,193,168	3,519,904	3,624,136	2,873,627	159,166	0	0	17,442,639
IREIS	177,700	235,275	170,175	5,032	34,413	59,725	29,381	0	711,700
VAI	0	0	0	0	0	0	0	0	0
Paxitech	0	15,734	19,717	2,534	0	0	0	0	37,985
Dedienne	0	0	0	0	0	0	0	0	0

Maximum subsidy payment schedule for ED (Experimental Development)

(€)	Initial payment	Maximum payment per milestone*							Total payments
		EC1	EC2	EC3	EC4	EC5	EC6	EC7**	
CARMAT	0	0	0	0	0	0	0	0	0
IREIS	0	0	0	0	0	0	0	0	0
VAI	118,750	68,750	4,500	4,500	9,000	9,000	0	0	214,500
Paxitech	0	0	0	0	0	0	0	0	0
Dedienne	19,406	10,406	10,406	10,406	20,813	20,813	0	0	92,250

* Maximum amount paid for the milestone - ** Balance

22.2.1.2 *Repayable Advances (initial agreement)*

(€)	Initial payment	Maximum payment per milestone*							Total payments
		EC1	EC2	EC3	EC4	EC5	EC6	EC7**	
CARMAT	546,304	760,022	712,565	1,724,264	3,771,913	5,251,038	290,486	1,450,732	14,507,324

* Maximum amount paid for the milestone - ** Balance

22.2.1.3 *Accounting and financial conditions*

The subsidies accrue to the Company as of right and so will not be repayable in the event of success of the project.

Accordingly, these are accounted for in the "Subsidies" line of the income statement.

Repayable advances will have to be repaid by CARMAT according to the arrangement set out in the paragraph below. Repayable advances are therefore accounted for on the liabilities side of the balance sheet under the "Other equity – Conditional advances" line.

The corresponding interest is shown on the liabilities side of the balance sheet under the "Sundry loans and financial debts" line.

Once cumulative sales of €38 M have been realized from marketing the orthotopic artificial heart under the project, CARMAT will have to pay OSEO Innovation the financial returns shown in the following schedule:

- 0.5% of its turnover for two years;
- thereafter 1% of its turnover for two years;
- thereafter 2% of its turnover for two years;
- thereafter 2.5% of its turnover for one year, making a total of 7 years of financial returns or maximum cumulative financial returns of €50 M if these are reached in less than 7 years.

22.2.2 Addendum to the framework agreement and the OSEO-ISI support contract dated June 15, 2011

In order to take account of results achieved and changes in the regulatory context following discussions with the AFSSAPS resulting in a requirement to arrive at a definition of the implantable part of the prosthesis before proceeding to initial clinical trials, CARMAT asked OSEO Innovation if modifications could be made to the CARMAT Industrial Strategic Innovation Agreement.

As a result, in a letter of December 29, 2010, OSEO Innovation issued a favorable opinion on the following modifications to the said agreement:

- the level D2 prosthesis will proceed directly to human trial (no implantation of prosthesis D1);
- the other systems (excluding the prosthesis) involved in supplying the electrical power to the prosthesis and patient monitoring will be external, initially at the hospital only, and then in a portable equipment version for use at home;
- amendment to the agreement moving the activities associated with the D2 prosthesis to the period EC3-EC4.

As a result, there have been modifications to the cost profile and planning of the project, with no effect on the value of the aid or on the project end date.

These modifications take account of changing conditions and ensure continuity of the project without distorting its purpose.

These modifications have been the subject of addenda dated June 15, 2011 to the CARMAT Industrial Strategic Innovation Agreement and to the contract in support of the CARMAT project.

The principal elements of the addenda relate to the individual milestones and payment of the subsidies and repayable advances.

22.2.3 Dates and content of the milestones

Milestone	Date*	Deliverables
EC1	*December 1, 2009*	*Prosthesis, mechanical and biological definition documentation* *Preliminary, electronic and software definition documentation*
EC2	*November 1, 2010*	*Prototypes acceptance report (2 non-clinical)*
EC3	*May 1, 2011*	*Functional test report*
EC4*	1st half of 2013	*In vitro* pre-clinical trials documentation (and conditional authorization by ANSM to proceed with the clinical trials)
EC5*	2nd half of 2013	Clinical trials monitoring report
EC6*	2nd half of 2013	System design documentation
EC7*	1st half of 2014	CE mark certificate

The stages achieved on the registration date of this document appear in italics

* Dates in the future are provisional and correspond to the estimated completion date of the stages and not to payment of the corresponding amounts, which will take place between a few weeks and several months later, after review by the experts and administrative processing.

It must be noted that completion of milestones 4 and 6 requires the agreement of ANSM to proceed with clinical trials on humans in France. No equivalent specific conditions exist for milestones 5 and 7 (please refer to 22.1.3).

22.2.4 Revised maximum payments under the addendum, by type of aid and milestone (in €):

22.2.4.1 Subsidies (addendum)

(€)	Initial payment	Maximum payment per milestone*							Total payments
		EC1 received**	EC2 received**	EC3 received**	EC4	EC5	EC6	EC7***	
Date		12/1/2009	11/1/2010	5/1/2011	1st half of 2013	2nd half of 2013	2nd half of 2013	1st half of 2014	
CARMAT	4,072,638	3,193,168	3,519,904	3,624,136	2,873,627	159,166	0	0	17,442,639

* Maximum amount paid for the milestone
** Stages already reached at the date of registration of this "Document de Référence"; the following dates are provisional
*** Balance

22.2.4.2 Repayable advances (addendum)

(€)	Initial payment	Maximum payment per milestone*							Total payments
		EC1 received**	EC2 received**	EC3 received**	EC4	EC5	EC6	EC7***	
Date		12/1/2009	11/1/2010	5/1/2011	1st half of 2013	2nd half of 2013	2nd half of 2013	1st half of 2014	
CARMAT	546,304	760,022	712,565	1,724,264	3,771,913	5,251,038	290,486	1,450,732	14,507,324

* Maximum amount paid for the milestone
** Stages already reached at the date of registration of this "Document de Référence"; the following dates are provisional
*** Balance

22.2.5 Scientific and financial timetable revised by the addendum

22.2.5.1 Stages reached

The first milestone of the OSEO Innovation agreement, milestone 1, was reached on January 1, 2010, with a delay of one month for the administrative and accounting formalities associated with the approval of the financial statements as at December 31, 2009. In this context, CARMAT received repayable advances of €760,022.93 and subsidies of €3,193,166.93 on March 22, 2010.

The second milestone of the OSEO agreement, milestone 2, was reached on November 1, 2010, with the manufacture of the first two artificial hearts. In this context, CARMAT received a repayable advance of €712,565 on December 31, 2010 and a subsidy of €3,519,904 on January 3, 2011, €1,207,587 of which is shown on the assets side as accrued income as at December 31, 2010. The payment of the OSEO Innovation subsidy for milestone 2 is slightly less than the amount appearing in the contract, since the system design expenditure was lower than expected.

The third milestone of the OSEO agreement, milestone 3, was reached on May 1, 2011, on the basis of the functional trials report. On September 13, 2011, CARMAT received a refundable advance of €1,724,264 and an operating expenses subsidy of €3,624,136.

The documentation to be delivered for milestone 4 of the OSEO agreement, in particular the *in vitro* pre-clinical trials documentation, was sent to OSEO in 2012. Formal attainment of this milestone remains conditional solely on obtaining the conditional authorization of the ANSM to progress to clinical trials in humans.

22.2.5.2 Amounts received and still to be received

Therefore, following validation of the first three milestones, CARMAT received the following in connection with the OSEO-ISI project at the registration date of this "Document de Référence":

- subsidies of €4,072,638 shown under income for the 2009 financial year;
- net subsidies of €4,297,697 shown under income for the 2010 financial year (€1,207,587 of which are shown under assets as accrued income as at December 31, 2010), thus making a net total for subsidies collected of €10,785,710 as at the date of registration of this "Document de Référence", €2,415,374 of which remain to be entered under income for the 2011 financial year;
- total refundable advances of €2,018,892 for the 2010 financial year.
- total refundable advances of €1,724,249 and subsidy for operating expenses of €6,039,510 for the 2011 financial year.

In summary, on the registration date of this "Document de Référence", it received €14.4 million in subsidies and €3.7 million in refundable advances for reaching stages milestones 1 to 3.

No subsidy or refundable advance was received in 2012, since the conditional approval of ANSM is required for reaching the next milestone (milestone 4) and milestone 6, in order to proceed to clinical trials on humans in France. No equivalent specific conditions exist for milestones 5 and 7 (please refer to 22.1.3).

Subsidies of €3.0 million and refundable advances of €10.8 million remain to be received when milestones 4 to 7 are reached.

MILESTONES STILL TO BE REACHED AND AMOUNTS STILL TO BE RECEIVED

	1st half of 2013	2nd half of 2013	2nd half of 2013	1st half of 2014	TOTAL
Milestone	EC 4	EC 5	EC 6	EC 7	
Contents	In vitro pre-clinical files documentation	Clinical trials monitoring report	System design documentation	CE mark certificate	
Subsidies	€2,873,627	€159,166	-	-	€3,032,793
Refundable advances	€3,771,913	€5,251,038	€290,486	€1,450,732	€10,764,169

22.3 OTHER IMPORTANT CONTRACTS

22.3.1 Edwards Lifesciences

An agreement with an initial term of one year, automatically renewable for one year at a time, was entered into in the final quarter of 2010 by CARMAT and EDWARDS LIFESCIENCES, the world leader in the heart valves sector and in hemodynamic monitoring, for the use and supply of Carpentier-Edwards biological heart valves for the CARMAT total artificial heart.

22.3.2 Invibio Limited

An agreement with a term of 12 years was concluded during the 3rd quarter of 2012 between CARMAT and INVIBIO Limited, for the supply and use of PEEK-OPTIMA® polymer material. This material is used by CARMAT owing to its biocompatibility characteristics, its certified long-term implantability and its mechanical properties. The structural sub-assemblies of the prosthesis are manufactured out of this material.

23 INFORMATION FROM THIRD PARTIES, DECLARATIONS BY EXPERTS AND DECLARATIONS OF INTEREST

None.

24 PUBLICLY ACCESSIBLE DOCUMENTS

Copies of this "Document de Référence" are available free of charge from the Company and from the Company's website (www.carmatsa.com) and from the website of the French Financial Markets Authority [AMF] (www.amf-france.org).

Throughout the period of validity of this reference document, the following documents, or a copy of such documents, may be consulted:

- the memorandum and Articles of Association of CARMAT;
- all reports, letters and other documents, historical financial information, assessments and declarations prepared by experts at the request of CARMAT, and which are included in part or referred to in this "Document de Référence";
- the historical financial information of CARMAT for the financial year prior to the publication of this "Document de Référence".

All such legal and financial documents relating to the company, and which must be made available to shareholders in accordance with the applicable regulations, in force may be consulted at the company’s head office at 36 avenue de l’Europe – 78140 Vélizy Villacoublay.

In accordance with Article 221-3 of the General Regulations of the AMF, all the regulatory information, as defined in Article 221-1 of the General Regulations of the AMF, is available on the Company's website.

25 INFORMATION ON HOLDINGS

As at the date of the stamp on this reference document, the company did not have any holdings in the share capital of other companies.

26 GLOSSARY OF TERMS

Actuator	A device that controls the movement of a fluid or a solid.
Acute heart failure	Sudden incapacity of the heart to ensure a sufficient blood flow to meet the oxygen needs of the various organs. The symptoms are severe at the outset. It occurs either following a heart attack (see myocardial infarction) which caused damage to a region of the heart, or following a sudden inability of the body to compensate for a chronic cardiac failure (see Decompensation).
AFSSAPS	Agence Française de Sécurité Sanitaire des Aliments et Produits de Santé (French Agency for the Safety of Health Products). This agency evaluates and oversees the safe use of health products, examines their quality in the laboratory and inspects the manufacturing, distribution and trial sites, and also produces information campaigns regarding the correct usage of health products. It was replaced by the ANSM (see corresponding entry) by law No.2011-2012 of 29 December 2011.
Angiotensin--converting-enzyme inhibitors (ACE)	Drug reducing vascular resistance
Annuloplasty	Intervention aiming to correct mitral insufficiency linked to a dilatation of the mitral annulus.
ANSM	Agence nationale de sécurité du médicament et des produits de santé (French national agency for medicines and health products safety) (ANSM). It is a French public institution whose aim is to assess the health risks of health products destined for use in humans. It has authority over the regulatory field of biomedical research.
Anticoagulant	Drug limiting the coagulation of blood in order to avoid the formation of clots and acting on clotting factors other than platelets (see preceding entry). Their dosage is complicated: too much, risks a hemorrhage; not enough, a thromboembolic accident. Their use at high doses is necessary for all implantable devices made out of metal or plastic which are not hemocompatible and are the source of numerous complications.
Aorta	The aorta is the largest artery in the body and allows oxygenated blood to be carried to all parts of the body from the left ventricle.
Atrium	One of the two small upper chambers of the heart that receive blood before it is passed into the corresponding ventricle. Each atrium communicates with the corresponding ventricle by an atrioventricular valve, the tricuspid valve on the right, the mitral valve on the left.
Betablockers	Drug which reduces the cardiac rhythm and output to decrease blood pressure
Bioprosthetic (valve) or bioprosthesis	Artificial valve manufactured from animal tissue in order to replace an inadequate cardiac valve. By extension a medical device containing biological components.
Cardiogenic shock	Failure of the myocardial pump to generate a sufficient blood flow for the peripheral organs
CE Mark	Declaration made by the manufacturer certifying that the product meets the applicable legal provisions and the European Directives (compliance with a certain number of conditions relating to safety, therapeutic value, production traceability and so on).

Cerebrovascular accident (CVA)	Sudden neurological deficit of vascular origin caused by a heart attack or a hemorrhage in the brain.
Chemically treated animal pericardium	Double walled sac found in animals (cows, pigs or horses) that contains the heart and roots of large blood vessels treated with a sterilized fixative, glutaraldehyde. It is known as the least thrombogenic biomaterial and does not cause rejection.
Chronic cardiac insufficiency	The incapacity of the heart to provide sufficient blood flow to deal with the oxygen needs of the various organs. The main causes of chronic cardiac insufficiency are angina and myocardial infarction, arterial hypertension, valvular diseases and degenerative diseases of the myocardium. In all cases, the result is a progressive destruction of the cardiac muscle linked to a loss of its contractile force.
Clean room	Room or series of rooms where the particulate concentration is controlled in order to minimize the introduction, generation, retention of particles inside, generally for a specific industrial or research purpose. Parameters such as temperature, humidity and relative pressure are also maintained at a specific level.
Clinical Trial Authorization (CTA)	Authorization granted by the ANSM. It is one of two authorizations required in France to carry out biomedical research on humans, the other being that granted by the Comité de Protection des Personnes (CPP: see corresponding entry)
Coagulation (blood)	Phenomenon of blood clot formation. It is the normal reaction of the body to stop a hemorrhage. Nevertheless, when these clots form in the heart, in a vessel or a device, it can obstruct a blood vessel and cause a pulmonary embolism or a cerebrovascular accident (stroke).
Comité de Protection des Personnes (CPP)	Ethical research committee whose role is to assure that all biomedical research projects on humans carried out in France respect various considerations (medical, ethical, and legal) aiming to ensure the protection of the people that participate in that research
Compliance	In medicine, the ability of an organic cavity to change volume under the influence of changes in pressure.
Coronary heart disease	Decrease in the capacity of one or more arteries of the heart (or coronary arteries) and leads to angina and myocardial infarction (or heart attack).
Decompensation (cardiac)	Sudden aggravation of heart failure, requiring immediate hospitalization.
Destination therapy	Permanent implementation Destination Therapy, as opposed to being on a transplant waiting list.
Diastole	Relaxation phase of the muscle of a cardiac cavity that allows it to be filled.
Diuretic	Drug which eliminates excess fluids and, in this way, lightens the load on the heart and prevents pulmonary edema
Etiology	Medical field that studies and analyzes the causes of diseases.
Ex vivo	Refers to tests that take place on cadavers (see In vivo)

FDA	Food and Drug Administration, US agency that authorizes the marketing approval for drugs and medical devices in the USA.
French Order of Physicians	Professional, administrative and legal body for the defense and regulation of the medical profession.
Fuel cell	Cell in which electricity is generated by means of the oxidation of an electrode of a reducing fuel (for example hydrogen) coupled with the reduction on another electrode of an oxidant, such as oxygen in the air.
Graft	Name of the organ or tissue taken from a donor for a transplant.
Hematids	Red blood corpuscle.
Hemocompatibility	Quality of the biological compatibility of non-living materials, used in a medical device, in contact with blood and other biological organs.
Hemolysis	Destruction of red blood cells releasing hemoglobin into the blood plasma, thus reducing their ability to transport oxygen.
High blood pressure	Cardiovascular disease characterized by an arterial pressure superior to normal and resulting in an increase in the volume of the left ventricle
Hyperlipidemia	Pathology showing dysfunctions caused by a high level of fat in the blood.
Hypertrophy	Excessive enlargement of an organ or element of the body.
IDE (Investigational Device Exemption)	Acronym allowing a device used in the framework of research to be also used in a clinical study in order to generate the data necessary to obtain a Premarket Approval (PMA) in a safe and effective manner.
Immunosuppressant	Agent restricting immune responses of the body in order to reduce the risk of rejection following organ transplantation. The most well-known is cyclosporin.
In silico	Refers to tests that are performed on computers and/or by digital simulation.
In vitro	Refers to tests performed outside of the organism, in the laboratory or on a test bench. Originally these tests were performed in test tubes.
In vivo	Refers to tests performed in a living organism. (also see ex vivo)
Incidence	Number of new cases of a disease observed during a given period and for a defined population. It is different from prevalence which counts all cases (new or not) at a given time.
Inotrope	The dependancy on inotropes signals end-stage heart failure.
Ischemia	Decrease in the arterial blood supply to an organ.
ISO standard	Standard created by the International Organization for Standardization (ISO) in order to ensure reliable, good quality products and services.
Mitral (valve)	Cardiac valve that separates the left atrium from the left ventricle
Myocardial infarction	Necrosis (death) of a part of the cardiac muscle. In ordinary language, heart

	attack. It occurs when one or more coronary arteries become blocked. The myocardial cells (the muscle making up the heart) supplied with blood by this (or these) artery(ies) are no longer oxygenated, which causes their suffering (pain experienced) and can lead to their death.
New York Heart Association (NYHA)	A scale used to quantify and monitor the functional impact (on activity) of heart failure in an individual.
Orthotopic	Transplantation of an organ to its normal anatomical location.
OSEO Innovation	Program run by the publicly owned OSEO organization aimed at promoting innovation through financial guarantees and partnerships.
Platelet anti-aggregate	Drug preventing blood platelets, partly responsible for the phenomenon of blood coagulation (see corresponding entry), from aggregating and forming the start of a clot. The most well-known is aspirin.
Polyetheretherketone (PEEK)	A high performance plastic with a unique combination of properties, used for its strength in the medical, aeronautical, automobile, electronics, food and industrial sectors.
Polyurethane	Plastic material used in varnishes, paints, synthetic rubbers, obtained by polymerization.
Prevalence	Measurement of the state of health of a population at a given time; can be expressed as a percentage. For a given pathology, the prevalence is obtained by dividing the number of sufferers at a given time by the size of the total population.
Product Lifecycle Management (PLM)	Literally the “management of the product lifecycle”, software dealing with the creation and maintenance of product definitions throughout their lifecycle, from the creation of the initial offer to the end of life. PLM covers the management of the definition of products, including configuration management, development management and project management.
Proteic	Concerning proteins.
Pulmonary artery	Arteries that transport blood from the heart to the lungs.
Pulmonary edema	Invasion of the pulmonary alveoli by blood plasma that has passed through the wall of the capillaries (small vessels). APE (acute pulmonary edema) is an absolute emergency and a frequent result of cardiac decompensation.
Pulmonary Embolism	Situation where a blood clot blocks a pulmonary artery.
Pulsating	Pulsed animation to the rhythm of the heart beat.
Research Tax Credit (RTI)	Tax incentive created to encourage businesses to undertake research and development.
Septicemia	Serious generalized infection of the body due to the discharges of pathogenic bacteria in the blood.
Simulator HIL	Real time simulator allowing the computers used to believe that they drive the real system (principal of the Hardware In The Loop test).

Stasis	In medicine the term refers to the abnormal stagnation of blood in the organ.
Systole	Phase of contraction of the muscle of a cardiac cavity allowing ejection of the blood it contains.
Telemetry	Means of following certain biological parameters, in particular cardio-respiratory or technical parameters, from a distance.
Thromboembolic	Disease characterized by the formation of coagulated blood clots (thrombus) in the veins that, when detached, risk provoking embolisms (sudden obstruction of a blood vessel).
Thrombogenic, thrombogenicity	Refers to the cause of a thrombus (blood clot).
Thrombosis	Obstruction, by the formation of a clot (thrombus), of a blood vessel, artery or vein, or a cardiac cavity (embolism). The blood no longer flows and the organs are no longer irrigated.
Total Artificial Heart	Artificial cardiac prosthesis (or Total Artificial Heart - TAH)) aiming to totally replace the native heart. It is distinct from ventricular assistance which functions in parallel with the diseased heart.
Total human blood	This is blood with all its constituents, in particular plasma, red corpuscles, white corpuscles and platelets.
Transplantation	Surgical operation consisting of replacing a diseased organ with a healthy one
Vasodilator	Drug that relaxes the blood vessels to increase the flow of blood and oxygen to the heart without increasing its effort

27 TABLE OF REFERENCES

Reference	Page	Source
1	12	French Law n° 2011-2012 of 29 December 2011 regarding the reinforcement of health security for drugs and health products, and Decree No. 2012-597 of 27 April 2012 specify the organization of the National Security Agency of Drugs and Health Products (ANSM) that the legislature has established in place of the French Agency for Health Products (AFSSAPS). In this document, the acronym AFSSAPS is therefore used only when referring to events prior to the decree.
2	18	Proposed revision to Directive 2007/47/EEC : http://ec.europa.eu/health/medical-devices/files/revision_docs/citizen_summary_20120926_en.pdf
3	18	FDA Safety and Innovation Act : http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/Overview/ucm310927.htm
4	34	Carpentier A. Cardiac valve surgery--the "French correction". J Thorac Cardiovasc Surg. 1983 Sep;86(3):323-37.
5	35	Voelkel NF et al. Right Ventricular Function and Failure : Report of a National Heart, Lung, and Blood Institute Working Group on Cellular and Molecular Mechanisms of Right Heart Failure. Circulation. 2006;114:1883-1891
6	35	Dang NC, et al. Right heart failure after left ventricular assist device implantation in patients with chronic congestive heart failure. J Heart Lung Transplant 2006;25:1-6.
7	35	Boyle AJ, et al. Predictors of poor RV function following LVAD implantation. J Heart Lung Transplant 2003;22:S205
8	35	Blackledge HM et al. Prognosis for patients newly admitted to hospital with heart failure: survival trends in 12 220 index admissions in Leicestershire 1993–2001. Heart 2003; 89:615–620.
9	35	Stewart S et al. . More ‘malignant’ than cancer? Five-year survival following a first admission for heart failure. Eur J Heart Fail 2001;3:315–322.
10	36	Launois R et al. Coût de la sévérité de la maladie; le cas de l’insuffisance cardiaque. Journal d’Économie Médicale, 1990, T. 8, n° 7-8, p. 395-412.
11	36	Kulbertus HE et al. What has long-term medical treatment to offer and what does it cost. Eur Heart J 1987 (suppl F) 26-28
12	36	Agence Nationale d’Accréditation et d’Évaluation en Santé – Évaluation de l’assistance ventriculaire en attente ou en alternative à la transplantation cardiaque – Avril 2001.
13	36	Gorodeski, Chu, Reese, et al. Prognosis on chronic dobutamine or milrinone infusions for stage D heart failure.Circ Heart Fail. 2:320-24, 2009.
14	36	Cowie MR, et al. The epidemiology of heart failure. Eur Heart J 1997;18:208–225.
15	36	Davies MK et al. Prevalence of left ventricular systolic dysfunction and heart failure in the Echographic Heart of England Screening Study: a population based study. Lancet 2001;358:439–444.
16	36	Remme WJ et al. Public awareness of heart failure in Europe: first results from SHAPE. Eur Heart J 2005; 26:2413–2421.
17	36	McMurray JJ et al. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012. Eur Heart J 2012;33:1787–1847 (nombre incluant les 51 pays adhérents de la Société Européenne de Cardiologie).
18	36	Saudubray T et al. Prévalence et prise en charge de l’insuffisance cardiaque en France : enquête nationale auprès des médecins généralistes du réseau Sentinelles La revue de médecine interne 26 (2005) 845–850
19	36	Heidenreich PA et al. Forecasting the future of cardiovascular disease in the United States: a policy statement from the American Heart Association. Circulation. 2011 Mar 1;123(8):933-44
20	36	Évaluation de l’assistance ventriculaire en attente ou en alternative à la transplantation cardiaque. Rapport de l’ANAES (Agence Nationale d’Accréditation et d’Évaluation de Santé) – Avril 2001 – E.
21	37	Heart Disease and Stroke Statistics – American Heart Association 2012.
22	37	Hunt SA et al. ACC/AHA 2005 Guideline Update for the Diagnosis and Management of

Reference	Page	Source
		Chronic Heart Failure in the Adult : A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Circulation. 2005;112:e154-e235
23	37	Heart Disease and Stroke Statistics – American Heart Association 2010
24	37	Régime général de l'Assurance Maladie – Mis à jour en 2012 http://www.ameli.fr/l-assurance-maladie/statistiques-et-publications/donnees-statistiques/affection-de-longue-duree-ald/prevalence/frequence-des-ald-au-31-12-2011.php - http://www.ameli.fr/l-assurance-maladie/statistiques-et-publications/donnees-statistiques/affection-de-longue-duree-ald/cout/cout-des-ald-en-2009.php
25	37	McMurray JJ, Stewart S. Epidemiology, aetiology, and prognosis of heart failure. Heart 2000;83:596–602
26	37	Clegg AJ et al. The clinical and cost-effectiveness of left ventricular assist devices for end-stage heart failure: a systematic review and economic evaluation– Health Technology Assessment NHS – 2005.
27	37	American Heart Association – Heart Failure Medications - http://www.heart.org/HEARTORG/Conditions/HeartFailure/ PreventionTreatmentofHeartFailure/ Heart-Failure-Medications_UCM_306342_Article.jsp
28	37	Benner JS, et al. Long-term persistence in use of statin therapy in elderly patients. JAMA. 2002;288:455-61.
29	38	Strickberger SA et al. Patient Selection for Cardiac Resynchronization Therapy, Circulation. 2005; 111: 2146-2150
30	38	Marwick TH. Restrictive Annuloplasty for Ischemic Mitral Regurgitation Too Little or Too Much. J Am Coll Cardiol. 2008;51(17):1702-1703.
31	38	Hershberger RE et al. Care processes and clinical outcomes of continuous outpatient support with inotropes (COSI) in patients with refractory endstage heart failure. J Card Fail. 2003;9(3):180–7.
32	38	Stehlik J et al. The Registry of the International Society for Heart and Lung Transplantation: Twenty-eighth Adult Heart Transplant Report. J Heart Lung Transplant 2011;30:1078-1094.
33	38	Latrémouille C., Jouan J. Transplantation cardiaque. EMC - ©Elsevier, Techniques chirurgicales - Thorax, 42-748, 2006.
34	38	Agence de Biomédecine - Synthèse nationale de prélèvement et de greffe 2010 et annexe au bilan 2010.
35	38	Mehra MR et al. Listing Criteria for Heart Transplantation: International Society for Heart and Lung Transplantation Guidelines for the Care of Cardiac Transplant Candidates. J Heart Lung Transplant 2006;25:1024 – 42
36	39	Lindenfeld JA et al. Drug Therapy in the Heart Transplant Recipient. Circulation.2005; 111: 113-117
37	39	Milliman Report 2011 - Table 2 : Estimated U.S Average 2011 Billed Charges Per Transplant
38	39	Agence de Biomédecine 2011 – Modalités de financement des activités de procréation, embryologie et génétique humaine, et de prélèvement et greffe d'organes.
39	41	Shareholder Newsletter no.3 – January 2013 http://www.carmatsa.com/images/stories/pdf/LAA/03/Lettre_aux_actionnaires_FR_VF_N3.pdf
40	43	Ayegnon KG, et la. A 25-year experience with Carpentier-Edwards Perimount in the mitral position. Asian Cardiovasc Thorac Ann. 2011 Feb;19(1):14-9
41	43	Aupart MR et al. Perimount pericardial bioprosthesis for aortic calcified stenosis: 18-year experience with 1133 patients. J Heart Valve Dis. 2006 Nov;15(6):768-75; discussion 775-6.
42	44	Jansen P, van Oeveren W, Capel A, Carpentier A. In vitro haemocompatibility of a novel bioprosthetic total artificial heart. Eur J Cardiothorac Surg. 2012 Jun;41(6):e166-72.
43	45	Information presented at the 64th Congress of the French Society for Thoracic and Cardiovascular Surgery at Lyon, May 26 and 27 2011.
44	46	Zierer A. Late-onset driveline infections: the Achilles' heel of prolonged left ventricular assist device support. Ann Thorac Surg. 2007 Aug;84(2):515-20.
45	49	Golomb et al. The role of glutaraldehyde-induced cross-links in calcification of bovine

Reference	Page	Source
		pericardium used in cardiac valve bioprostheses. Am J Pathol. 1987 Apr;127(1):122-30.
46	49	Seyfert et al. In vitro hemocompatibility testing of biomaterials according to the ISO 10993-4. Biomol Eng. 2002 Aug; 19(2-6):91-6.
47	49	Jansen P, van Oeveren W, Capel A, Carpentier A. In vitro haemocompatibility of a novel bioprosthetic total artificial heart. Eur J Cardiothorac Surg. 2012 Jun;41(6):e166-72).
48	49	Bluestein D. Research approaches for studying flow-induced thromboembolic complications in blood recirculating devices, Department of Biomedical Engineering, New York University at Stony Brook, 2004 Sep;1(1):65-80.
49	55	FDA Panel review Summary of Safety and Probable Benefit - H040006 - AbioCor® Implantable Replacement Heart.
50	55	Acker MA et al . Statement regarding the pre and post market assessment of durable, implantable ventricular assist devices in the United StatesJ Heart Lung Transplant 2012; 31: 1241–52
51	56	Sub-Acute Animal Implantation of a Novel Bioprosthethic Artificial Heart. Latremouille C. et al, The Journal of Heart and Lung Transplantation Vol. 32, Issue 4, Supplement, Pages S174-S175
52	60	ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2008. European Heart Journal (2008) 29, 2388–2442 (sur les 900 millions d'habitants des 51 pays adhérents de la Société Européenne de Cardiologie)
53	60	Heart Disease and Stroke Statistics – 2010 Update at a glance – American Heart Association and American Stroke Association
54	60	Jhund PS et al. Long-term trends in first hospitalization for heart failure and subsequent survival between 1986 and 2003: a population study of 5.1 million people. Circulation 2009;119:515–523.
55	60	Purshouse K et al. Is There a Crisis in Heart Transplantation? Reflection over 10 Years. Open Journal of Organ Transplant Surgery, 2012, 2, 1-4
56	63	Baumwol J. Right heart failure and "failure to thrive" after left ventricular assist device: clinical predictors and outcomes. J Heart Lung Transplant. 2011 Aug;30(8):888-95. Epub 2011 Apr 29.
57	60	ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012 - European Heart Journal (2012) 33, 1787–1847
58	60	Website of the Haute Autorité de la Santé - La HAS s'attaque à l'infarctus du myocarde – Mai 2007.
59	63	Heart Disease and Stroke Statistics – 2010 Update at a glance – American Heart Association and American Stroke Association.
60	60	Yeh RW et al. Population Trends in the Incidence and Outcomes of Acute Myocardial Infarction. N Engl J Med 2010; 362:2155-2165
61	60	Perspectives de la population mondiale – 2006 revised edition, United Nations Department of Economic and Social Affairs, 2007.
62	60	Roger VL. Epidemiology of myocardial infarction. Med Clin North Am. 2007 July; 91(4): 537–ix
63	61	Division for Heart Disease and Stroke Prevention - 2010 Atlas of Heart Disease Hospitalizations Among Medicare Beneficiaries - http://www.cdc.gov/dhdsp/atlas/2010_heart_atlas/docs/Executive_Summary.pdf - page 16
64	61	Yeh RW et al. Population Trends in the Incidence and Outcomes of Acute Myocardial Infarction. N Engl J Med 2010; 362:2155-2165
65	61	Division for Heart Disease and Stroke Prevention - 2010 Atlas of Heart Disease Hospitalizations Among Medicare Beneficiaries - http://www.cdc.gov/dhdsp/atlas/2010_heart_atlas/docs/Executive_Summary.pdf - page 16
66	61	Roger VL. Epidemiology of myocardial infarction. Med Clin North Am. 2007 July; 91(4): 537–ix
67	61	Lundblad D et al. Gender differences in trends of acute myocardial infarction events: The Northern Sweden MONICA study 1985 – 2004. BMC Cardiovascular Disorders 2008, 8:17
68	61	Vaccarino V et al. Sex Differences in Mortality After Acute Myocardial Infarction Changes From 1994 to 2006. Arch Intern Med. 2009;169(19):1767-1774.
69	62	Europe being defined as the 51 member countries of the European Society of Cardiology, including Eastern Europe, Russia and the Gulf States.

Reference	Page	Source
70	63	Kirklin JK et al. The Fourth INTERMACS Annual Report. J Heart Lung Transplant 2012;31:117–26 (Registre nord-américain, le registre EUROMACS est en cours de création).
71	64	Potapov EV, et al. Tricuspid incompetence and geometry of the right ventricle as predictors of right ventricular function after implantation of a left ventricular assist device. J Heart Lung Transplant 2008;27:1275–81.
		Dang NC, et al. Right heart failure after left ventricular assist device implantation in patients with chronic congestive heart failure. J Heart Lung Transplant 2006;25:1-6.
		Klotz S, et al. Pre-operative prediction of post–VAD implant mortality using easily accessible clinical parameters. J Heart Lung Transplant 2010;29:45-52.
		Boyle AJ, et al. Predictors of poor RV function following LVAD implantation. J Heart Lung Transplant 2003;22:S205.
72	64	Fitzpatrick JR, et al. Risk score derived from pre-operative data analysis predicts the need for biventricular mechanical circulatory support. J Heart Lung Transplant 2008;27:1286–92.
		Fitzpatrick JR, et al. Early planned institution of biventricular mechanical circulatory support results in improved outcomes compared with delayed conversion of a left ventricular assist device to a biventricular assist device. J Thorac Cardiovasc Surg 2009;137:971-977.
73	64	HeartWare® Stockholder Update January 2010 - http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MjYyMjF8Q2hpbGRJRD0tMXxUeXBlPTM=&t=1
74	65	Hetzer R et al. Long-term biventricular support with the HeartWare implantable continuous flow pump. J Heart Lung Transplant 2010;29:822-4.
		Loforte A et al. Biventricular support with the HeartWare implantable continuous flow pump: An additional contribution. J Heart Lung Transplant 2010;29:1443-4.
75	65	Meyer AL et al. Biventricular Implantation of the HeartWare HVAD in an Animal Study. 2011 Annual Meeting and Scientific Sessions, The International Society for Heart and Lung Transplantation
76	65	Zierer A. Late-onset driveline infections: the Achilles' heel of prolonged left ventricular assist device support. Ann Thorac Surg. 2007 Aug;84(2):515-20.
77	65	Toda K et al. Late aortic insufficiency related to poor prognosis during left ventricular assist device support Ann Thorac Surg. 2011 Sep;92(3):929-34.
78	65	Brenyo A et al. Risk of mortality for ventricular arrhythmia in ambulatory LVAD patients. J Cardiovasc Electrophysiol. 2012 May;23(5):515-20.
79	66	Backes D et al. Cerebrovascular complications of left ventricular assist devices. Eur J Cardiothorac Surg (2012). doi: 10.1093/ ejcts/ezs320.
80	66	Rossi M et al. What is the optimal anticoagulation in patients with a left ventricular assist device? Interact CardioVasc Thorac Surg(2012)doi: 10.1093/icvts/ivs297.
81	66	www.syncardia.com - Website of Syncardia.
82	66	Kirklin JK et al. The Fourth INTERMACS Annual Report. J Heart Lung Transplant 2012;31:117–26 (North American Register; the EUROMACS register is under construction).
83	67	FDA (2004) – Summary of Safety and Effectiveness Data – PO30011 – disponible sur le site de la société ou sur celui de la FDA.
84	67	Adapté de Strüber M et al. The Current Status of Heart Transplantation and the Development of “Artificial Heart Systems”. Dtsch Arztebl Int 2009; 106(28–29): 471–7
85	67	www.abiomed.com – Internet site of Abiomed®
86	68	Adapted from : European Heart Network – Cardiovascular statistics 2008 - http://www.ehnheart.org/cvd-statistics.html
87	68	Translated from Strüber M et al. The current status of heart transplantation and the development of "artificial heart systems". Dtsch Arztebl Int. 2009;106(28-29):471–477.
88	68	Eurotransplant (registre des dons d’organes et transplantations pour l’Allemagne, la Belgique, les Pays-Bas, l’Autriche, la Croatie et la Slovénie).
89	68	Activité de prélèvement et de greffe : organes, tissus et cellules. Synthèse nationale 2010 - Edition octobre 2011 - Extraction des données mars 2011 – Site de l’Agence de Biomédecine.

Reference	Page	Source
90	68	Komoda T et al. Influence of new Eurotransplant heart allocation policy on outcome of heart transplant J Heart Lung Transplant. 2008 Oct;27(10):1108-14.
91	68	Beyersdorf F. Heart Transplant and Artificial Heart Systems. Dtsch Arztebl Int. 2009 July; 106(28-29): 469–470.