Acta Astronautica 80 (2012) 1–7

Contents lists available at SciVerse ScienceDirect

Acta Astronautica

journal homepage: www.elsevier.com/locate/actaastro

# ESA space spin-offs benefits for the health sector ☆

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ARTICLE INFO

*Article history:*
Received 8 February 2012
Received in revised form
13 May 2012
Accepted 15 May 2012
Available online 12 June 2012

*Keywords:*
Spin-off
Technology transfer
Health
Space benefit

ABSTRACT

Humanity will be faced with an important number of future challenges, including an expansion of the lifespan, a considerable increase of the population (estimated 9 billion by 2050) and a depletion of resources. These factors could trigger an increase of chronic diseases and various other health concerns that would bear a heavy weight on finances worldwide. Scientific advances can play an important role in solving a number of these problems, space technology; in general, can propose a panoply of possible solutions and applications that can make life on Earth easier and better for everyone. Satellites, Earth Observation, the International Space Station (ISS) and the European Space Agency (ESA) may not be the first tools that come to mind when thinking of improving health, yet there are many ways in which ESA and its programmes contribute to the health care arena. The research focuses on quantifying two ESA spin-offs to provide an initial view on how space can contribute to worldwide health. This quantification is part of the present strategy not only to show macroeconomic return factors for space in general, but also to identify and describe samples of 'best practice' type of examples close to the general public's interest. For each of the 'best practices' the methodology takes into account the cost of the space hardware/software, a number of tangible and intangible benefits, as well as some logical assumptions in order to determine the potential overall returns. Some of the hindering factors for a precise quantification are also highlighted. In conclusion, the study recommends a way in which ESA's spin-offs can be taken into account early on in the development process of space programmes in order to generate higher awareness with the general public and also to provide measurable returns.



## 1. Background

In today's economic situation, governments need to have clear justification for their budget spending, and the space industry has to be able to show its added value, and thus quantify the benefits it brings. On the long-term, the success of the space industries' spin-offs can be measured in terms of the economic impact, the income generated, the number of jobs created, and the perceived and actual benefits to society [1].

Furthermore, the revenues generated by the space industry spin-offs can be defined in terms of economic return for the different players in the value chain: the space company having initially developed the technology, the company receiving the technology transfer, the intermediary firm that helps the transfer, the space agency that has funded the development of space technology, the technology transfer office which supports it, and finally the users of the products or services based on the technology transferred [2].

As part of its technology transfer programme the European Space Agency (ESA) has published a number of spin-off success stories, but they rarely have quantitative assessment associated to them.

☆ This paper was presented during the 62nd IAC in Cape Town.

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http://dx.doi.org/10.1016/j.actaastro.2012.05.015

The current document makes an analysis of two qualitative spin-off stories presented on ESA's website and expresses them, to the extent possible, in quantitative/financial figures.

The solutions analyzed have been selected with relation to the implications they might have in the health sector and the potential to impact human well-being and reduce the risk of disease and/or death and included: AirinSpace Plasmer™—the air decontamination system for prevention of nosocomial diseases and ESquad Jeans—the protective trousers for motorcyclists.

## 2. Definition of spin-off and technology transfer

A spin-off is commonly referred to as a technology transferred from one mother domain to other industries for which it was not initially intended. Space spin-offs are considered to be indirect benefits of space activities. A space spin-off can, therefore be defined, as something that has been learned or changed during "space activities", which is then used or transferred in other contexts allowing creating economic value [2].

In the context of ESA, the focus is on transferring the technology developed as part of the space programmes, so as to create new non-space related applications. ESA identified the elements included as being mainly the transfer of software, hardware, know-how, but also the commercial applications of satellite systems [1]. In order for technology transfer to occur there must be an intentional move from a well-defined economic unit (firm, laboratory, sector, etc.) to another well-defined economic unit [2].

Moreover, it is often difficult to distinguish between what is a spin-off and what is a satellite application, as the borders can be ambiguous. For the purposes of this study, space technology and space activities have been used as a generic term incorporating any elements be it at component, sub-system or system level that were adopted into a new technology domain as a space spin-off.

## 3. ESA spin-off strategy

ESA has been supporting organizations that are interested in transferring space technology into other industries by means of funding for feasibility studies, market analyses and prototypes creations. For start-up companies support is available via the business incubators as well as the "incentives" (or seed funding). The organism created for this purpose is the ESA Technology Transfer Programme Office (TTPO).

ESA TTPO usually provides an initial incentive amounting up to 50k EUR for each start-up company for specifically defined tasks including a market study, feasibility study, etc. Moreover, the incubatees may have the possibility of acceding to another 50k EUR loan under very favourable payback conditions. The TTPO plays a role also in connecting the companies with venture capitalists, such as Triangle Ventures, and it may provide further funding via the Open Sky technologies fund [3].

As far as the intellectual property rights are concerned, ESA used to invest very little in the development of its own Intellectual Property (IP) [4], ESA's focus being on developing an industry IP. Therefore, the main role of the TTPO was to help space industry to spin-off their IP (developed via ESA projects or not) to other sectors. Nevertheless, in recent years ESA has moved on to commercializing its own IP, and the TTPO is tasked to market the Agency's own IP to the non-space industry in order to make sure they are exploited to their full potential [21].

The Euroconsult study highlighted that the TTPO is very efficient towards start-up companies, as the incubators create a very favourable business environment for companies to develop. Nevertheless, the lack of clear processes when delivering its support services and the equal financial support given to all candidates are identified as weaknesses [4], on the other hand start-ups also have difficulties to specify their technology support need, which makes the agency's technology transfer task much more complex.

The results provided by the ESA business incubators for 2009 [5] showed that the major domains, into which space technology has been transferred from ESA programmes, are lifestyle and software solutions, closely followed by environment and health. Fig. 1 illustrates the different categories and their individual weight.

Fig. 2 gives an overview of the origin of spin-offs, by space discipline, that have emerged as part of the BIC programme since its beginning until 2006 (1990–2006). It can be noted that the highest number of technology transfers originated in the space sciences and launchers

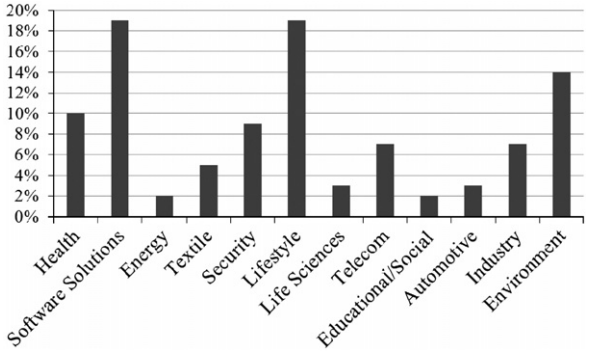


**Fig. 1.** Spin-offs distribution by industry area; *Credit*: Built using data from ESA Business Incubation Centres (BIC) alumni report 2009.

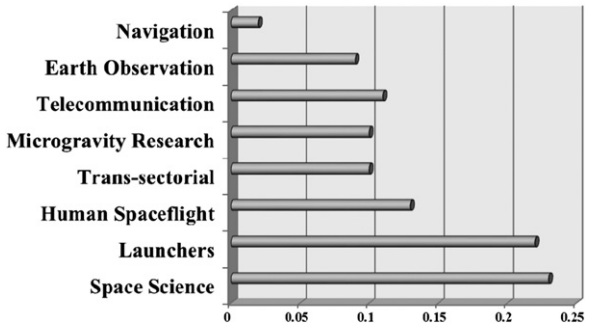


**Fig. 2.** Space disciplines creating spin-offs; *Credit*: Built using data from ESA BICs alumni report 2009.