

III. IMPACTS: BRINGING SPACE DOWN TO EARTH

22. The spin-offs from space investments

Technologies are usually developed to respond to specific needs, but once they are created, they may have multiple uses. Over the years, space agencies have been facilitating the exploitation of space technologies to non-space applications.

As of 2012, based on its database, NASA has documented nearly 1 800 spin-off technologies to sectors as varied as health and medicine, transportation, manufacturing practices and materials, or computer technologies (NASA, 2014). In Europe, documented applications of space technology transfers to these sectors include for instance air purification systems in hospital intensive care wards, radar surveying of tunnel rock to improve the safety of miners, and enhanced materials for a wide variety of sporting products from racing yachts to running shoes (ESA, 2014). In France, ultrasound probes were tested by universities during the first French human spaceflights in the early 1980s. Based on these, innovative echocardiography probes were developed and commercialised by a still very active spin-off firm, with cumulated sales representing around EUR 200 million since 1984 (CNES, 2014). In the United States, a cardiac imaging system was developed commercially by the medical industry in 1990, derived from camera technologies onboard NASA earth resources survey satellites. The benefit was at the time a significantly improved real-time medical imaging, with the ability to employ image enhancement techniques to bring out added details while using a cordless control unit (NASA spin-off reference JPL-SO-68). It remains that for some technologies, the target market is so specialised or the product is so advanced that it takes a long time to be commercialised (NASA, 2014). For example, rotating cellular bioreactors have taken nearly twenty years to reach commercial maturity, as their application in cellular-level biological research is more advanced than current state-of-the-art technology. Some medical technologies also require regulatory certification or clearance nationally and in different countries before they are used publicly, thus taking even longer to reach market. At the other end of the spectrum, some technologies have been rapidly commercialized. One US

company, for example, licensed in a few months an electrolyte-based rehydration beverage developed at the NASA Ames Research Center (NASA, 2014).

Methodological notes

Definitions differ when examining “spin-offs” and technology transfers of space technologies. For NASA, a spin-off is a technology, originally developed to meet NASA mission needs that has been transferred to other uses and now provides benefits as a commercial product or service. These spin-offs are transferred to the public through various NASA partnerships including licensing, funding agreements, assistance from NASA experts, the use of NASA facilities, and other collaborations between the Agency, private industry, other government agencies, and academia. Rather than using the word spin-off, ESA and other national agencies in Europe (e.g. CNES, DLR) use the expression “technology transfer” to share the benefits of European research and development, making space sector technologies available to the larger industry. In ESA, the Agency's Technology Transfer Programme Office identifies industrial needs then maps them to suitable space technologies, as a way of enabling new applications and business opportunities.

Sources

CNES (2013), “Transfert technologique de l'innovation technologique au marché”, *CNES Mag*, December. www.cnes.fr.

ESA (2014), ESA Technology Transfer Programme, www.esa.int/Our_Activities/Technology/TTP2.

NASA (2014), Office of the Chief Technologist, NASA Spin-offs, www.spinoff.nasa.gov.

22.1. NASA spin-offs in different economic sectors



Source: OECD calculations based on NASA spin-offs database (2014).



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