

II. READINESS FACTORS: INPUTS TO THE SPACE ECONOMY

3. Human capital

The space sector comprises a myriad of specialised jobs, ranging from engineer to marketing specialists, although the majority of people working in the space sector have a science, mathematics, engineering or information technology background. Although estimates vary, existing data already provide some pointers as to the size of the workforce in the space sector, but not in the much wider space economy which includes more providers of space-related products and services. Overall, the space sector is traditionally not a very large employer. Less than 170 000 people work in space manufacturing in the United States, some 31 000 people in Europe and 50 000 in China. This is also a very concentrated industry, as for example, four large industrial holdings are directly responsible for more than 70% of total European space industry employment.

The dominant job categories in the space sector comprise engineers and technicians involved in designing, manufacturing and operating space and ground segments, but also information technology specialists. Scientists develop and test instruments that fly on satellites and probes, using the results in their various specialised fields (e.g. astronomy, astrophysics, astrobiology, atmospheric physics). There are also scientific-related jobs in applicative areas which use satellite data, for example in pollution monitoring and land mapping. Finally, administrative functions (accounting, legal, marketing) support institutional and commercial space programmes. Gender-wise, the proportion of women choosing science and technology (S&T) studies still remains below 40% in most OECD countries and this is reflected in the space industry. The choice of discipline is highly gender-dependant, and fields such as engineering or computing sciences remain largely male-dominated (OECD, 2008). Increasing the number of female students appears to be the most obvious way to increase the overall number of S&T students.

Methodological notes

Despite efforts to harmonise statistical information on education and employment at the international level, current data sets can still lead to conflicting interpretations. Key issues for the space sector include:

- *Sector of activity:* Statistics on space activities are usually embedded in larger aerospace and defence categories, making it challenging to separate the different activities. Statistics concerning defence personnel are especially challenging to obtain, particularly in non-OECD countries.
- *Counting time or people?* Countries may report employment in Full-time equivalents (FTEs) (counting shifts, not individuals) or numbers of persons employed.
- *Data sources:* Official employment statistics on the space sector, when they exist, often lack in quality and detail. To some extent, the gaps can be filled by non-official statistics, mainly from industry associations, which often focus on the space manufacturing industry while the larger services sector (e.g. professionals in satellite telecommunications) is not included, although increasingly private surveys try to cover the larger field of space applications.

Sources

Eurospace (2010), *The European Space Industry in 2009, Facts and Figures*, 14th Edition, Paris, August.

NASA (2010), *NASA Occupations*, Washington DC, <http://nasajobs.nasa.gov/jobs/>.

OECD (2008), *Encouraging Student Interest in Science and Technology Studies*, OECD Global Science Forum, Paris.

Further reading

British National Space Centre (BNSC) (2007), *Careers in Space: Opportunities in Space Science and Industry*, British National Space Centre, Department of Trade and Industry, London, March.

What is a space engineer?

There are many conflicting definitions of the engineering profession. Different statistical survey groups have adopted their own engineering classifications nationally and internationally. In the United States, the *National Center for Education Statistics* reports the total US engineering bachelor's degrees granted in 2004 to be 63 558. This number differs from the American Society of Engineering Education's 2004 statistic of 72 893, which has its own classification and categories for engineering graduates (Gereffi and Wadhwa, 2005). In China, the word "engineer" translates differently into various Chinese dialects and has no standard definition. Furthermore, Chinese provinces do not count degrees in a consistent way, as statistics may include degrees related to different disciplines (information technology and specialised fields such as shipbuilding). A motor mechanic or an IT technician could be considered an engineer, for example.

3.1 Employment in space manufacturing in Europe

Full-time equivalent



Source: Eurospace (2010).

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3.2 Examples of employment occupations at NASA

Category (% of NASA's positions)	Types of occupations
Professional, engineering and scientific (60%)	Occupations in this category require knowledge in a specialised field such as science, math, engineering, law or accounting (depending on the specific position). These positions generally require a bachelor's degree or higher degree with major study in a specialised field. This group covers positions such as: Accounting, Aerospace Engineering, Biology, Computer Engineering, Computer Science, General Engineering, Meteorology.
Administrative and management (24%)	Occupations in this category require knowledge of principles, concepts, and practices associated with organisations, administration or management. While these positions do not require specialised education (except for contracting positions), they do involve the type of skills (analytical, research, writing, judgment) typically gained through a college level education, or through progressively responsible experience. This group covers positions such as: Administrative Specialist, Budget Analyst, Contract Specialist, Information Technology Specialist, Public Affairs Specialist.
Technical and medical support (9%)	Occupations in this category support professional or administrative work. Duties require practical knowledge of techniques and equipment, gained through experience and/or specific training less than that represented by college graduation. This group covers positions such as: Electronics Technician, Engineering Technician, Meteorological Technician.
Clerical and administrative support (7%)	Occupations in this category provide general office or programme support duties such as preparing, receiving, reviewing, and verifying documents, processing transactions, maintaining office records, or locating and compiling data or information from files. This group covers positions such as: Accounting Technician, Clerk-Typist, Management Assistant, Office Automation Clerk, Procurement Clerk, Secretary.
Trades and labour (< 1%)	Occupations in this category include trades or crafts positions, including skilled mechanical and electrical crafts, and unskilled, semi-skilled, or skilled manual-labour occupations. This group covers positions such as: High Voltage Electrician, Instrument Maker, Model Making, Utility Systems Repair.

Source: NASA (2010).



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