

Space Tourism

SPACEPORT AMERICA

ESA's View on Private
Suborbital Spaceflights





Artist's impression of a commercial spaceport (Virgin Galactic)

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Suborbital spaceflights offering opportunities to 'touch' space and experience 'weightlessness' are creating substantial public interest. These developments are closely related to ESA's core business, and we are observing them with interest.

What Do We Mean by 'Space Tourism'?

There are different possible definitions of 'space tourism'. Here we use the term to mean suborbital flights by privately funded and/or privately operated vehicles and the associated technology development driven by the space tourism market.

Current Context

Activities linked to space tourism have been gaining momentum and we have seen some remarkable achievements during the last few years, such as the flight of *SpaceShipOne*. There is large public interest in human suborbital flights, and the figures of prospective paying customers quoted in recent market surveys show that space tourism offers the potential for sustained progress similar to what happened in the



Today, students and scientists can experience 'weightlessness' while flying on modified aircraft for microgravity research

early days of aviation. Suborbital flight vehicles, designed for use over and over again, could gradually bring down the costs, as the technology and the operational approach become more mature.

The cost for individuals to fly on a manned suborbital spaceflight was initially projected at about US\$ 200 000 with over 200 private persons having made an advance payment to fly on *SpaceShipTwo* in the case of Virgin Galactic. This is expected subsequently to drop to about US\$ 50 000 with roughly 16 000 passengers interested to fly in 2021, according to the 'Space Tourism Market Study' conducted in 2002 by FUTRON, a US-based space consultancy firm.

These developments might have deep and significant implications for space activities as a whole. Being at the heart of Europe's space activities, ESA is expected to have a position on space tourism, and needs to have a coordinated and corporate approach with respect to these activities.

A Position on Space Tourism

To provide a better understanding of

this emerging industry, several assessments have been carried out by ESA over the last four years. For instance, ESA has coordinated and participated in a European Commission FP-6 funded study on the development of commercial high-altitude flight. On 7 November 2007, ESA's General Studies Programme presented the results

of its 'Study of European privately funded vehicles for commercial human spaceflight' at ESTEC in The Netherlands; the study was aimed to understand the dynamics of specific European space tourism ventures.

As a follow-up, an internal ESA Working Group was set up with the goal of making recommendations based on

SpaceShipOne seen making its historic suborbital flight in June 2004 (Virgin Galactic)





A publicity poster concept for Spaceport Sweden, a company that plans to make Kiruna the primary European spaceport for personal suborbital spaceflight and space tourism. It is a cooperation between the Swedish Space Corporation, the Jukkasjärvi Icehotel, LFV Group and Kiruna's business-development company Progressum (Spaceport Sweden)

these studies; their work was endorsed by all ESA Directors on 14 April. The International Academy of Astronautics' 'First Symposium on Private Human Access to Space' in May 2008 provided the opportunity to present these conclusions to a wider external audience.

Different Dimensions of Space Tourism Relating to ESA Activities

There are many different aspects linked to space tourism that may have an impact on ESA. The major features of such relationships are:

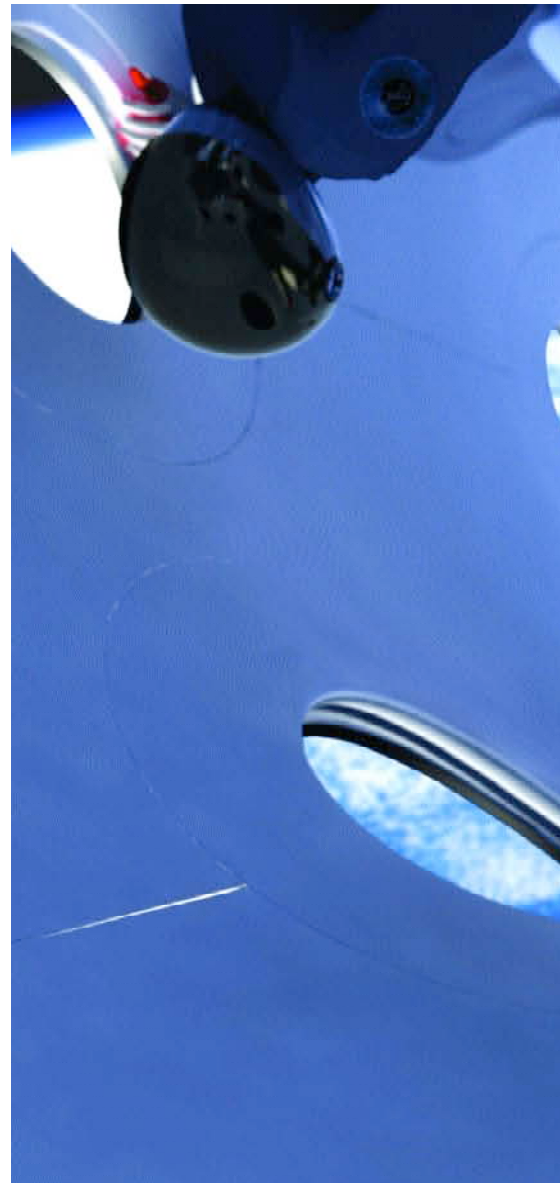
Technology and operations

The growth of space tourism would encompass significant new developments in aerospace technologies, and bring an aeronautics perspective to space technology development and operations, in particular concerning the aspects of reusability and routine processes associated to the high flight rates. So far, it has been demonstrated that suborbital flight at around 100 km can be successfully carried out a few times in a row with a prototype vehicle. The real challenge will be to have a vehicle that allows flying many missions, with associated operations, in a

profitable way. This achievement would have a significant impact in the space sector. In the aeronautics sector, if successful, such development could lead in the long term to high-speed vehicle concepts, with the potential to reduce drastically the duration of long-distance flights.

Commercialisation and partnership development

Space tourism efforts are also related to the ultimate goals of human spaceflight programmes, i.e. enabling routine human access to space and the preparation of the long-term, sustained



Subordinal Flight is an EADS Astrium concept for a takeoff and one-stage journey into space for up to five people. Beginning with a 45-minute cruise to an altitude of 12 km, rocket propulsion takes over from the jet engines and the space plane is boosted in almost vertical attitude for 80 seconds to ascend to over 100 km (EADS)

human exploration of the Solar System. In this sense there is also a link between space tourism activities and exploration programmes, even if the end-objectives and requirements are completely different.

There is thus an interest in supporting the emergence of private business in the context of human spaceflight. In the longer term, and based on technologies developed in the frame of institutional programmes, privately developed and operated infrastructure elements derived

from space tourism undertakings could one day become building blocks of a open space exploration scenario.

Legal aspects and regulatory framework

The challenges for space tourism are not only technical ones. Especially in the European context, there are important aspects to be addressed from a legal standpoint.

Space tourism will be carried out substantially in the airspace of a given country and therefore, it will be subject

to the local legal framework – which might be different from country to country. It is therefore essential that the civil aviation regulatory authorities of the countries concerned and the competent agencies of the European Union are at the forefront of the setting up of a regulatory framework for space tourism adapted to the European scenario.

ESA must also consider other legal matters. Space tourism will certainly have a significant influence on aerospace



Artist's impression of future space travellers enjoying the 'weightless' environment (Virgin Galactic)

industry, in view of the opportunities it may create, but also of the competition it may foster. In order to support the emergence of new European capabilities without distorting such competition, ESA should carefully define the boundaries of any space tourism support activities in line with the ESA Convention.

Finally, since in the longer term space tourism should involve traveling in space, some rules of space law may also find application for space tourism; in

particular, the notion of 'launching state(s)', through its administrative national agency designated for carrying out space activities, will have a role to play in exercising jurisdiction and control over that activity.

Communication aspects and visibility of space activities

The development of a larger space tourism market and potentially a larger number of citizens experiencing spaceflight will have an impact on the

visibility and perception of human spaceflight/exploration in the general public. ESA will have to consider such development in its communication strategy. On one hand, the aim should be to take advantage of such additional outreach activity for the benefit of the space sector; on the other, ESA should use its communication tools to explain the differences in technical complexity, requirements and ambitions of space tourism and those of 'classical' human spaceflight and exploration activities.

Guidelines of ESA's Position on Space Tourism

Considering the balance between the potential advantages of space tourism (high visibility of space, additional development efforts of space technologies, increased appeal for science and technology education, creation of new commercial markets, etc.) and its potential risks or drawbacks (environmental aspects, safety issues, exclusiveness of an activity aimed initially at a small minority of the population), ESA is taking a position of cautious interest and informed support, with the following guidelines:

1. ESA should monitor the relevant technology activities and assess whether spin-ins and spin-offs could be envisaged for/from European space programmes.
2. While avoiding interfering in the development of a fully competitive market, ESA should further reflect on possible partnership with European ventures or support actions, based on mutual interest and demonstrated technical and commercial maturity, without nevertheless exposing ESA to any liabilities related to business exploitation. To this end, legal schemes should be defined to allow for such activities, as allowed within the principles laid out in the ESA Convention.
3. Provision of services by ESA in the domain of human spaceflight, in particular 'astronaut training', i.e. provision of expertise for developing dedicated training programmes and/or facilities for specific tourist flight opportunities, and 'space medicine', i.e. provision of expertise to develop dedicated medical preparation programmes of space tourists, should also be explored for mutual benefit, making available ESA's competences under conditions to be defined.
4. ESA should contribute in the development of a regulatory frame for space tourism in Europe, involving both civil aviation

regulatory authorities and competent bodies from the EC, aiming also at a 'more level playing field' for all parties around the world, and supporting the interests of European industry.

5. ESA should facilitate the free flow of ideas among all interested European parties, e.g. by establishing a platform for voluntary information exchange.

Summary

ESA recognises the private sector's efforts both in the achievement of suborbital flights and in the associated technological development. We intend to show this recognition by helping provide the necessary environment for this industry to flourish, for example by assisting in the setting up of legal frameworks for operation across Europe, involving civil aviation authorities and other relevant bodies in debate.

Private developers of space tourism could also gain by collaborating with ESA on areas of recognised ESA expertise such as astronaut training and space medicine, as part of their efforts to ensure thorough preparation programmes for space tourists and safe flight experiences.

These areas of expertise should be considered on top of the vast wealth of already developed and maturing technology, plus ideas that are still undergoing investigation and experiment. In order to facilitate the free flow of ideas among all interested European players, ESA intends to help establish a platform for voluntary information exchange and interdisciplinary discussion. Some pilot experiences and intense debates taking place in the frame of the GSP study last year were already very positive and inspiring.

While ESA must be careful not to interfere in a fully competitive market, its experience, achievements to date, eye for opportunity and bold vision of space utilisation should make a valuable contribution to this exciting new phase of human endeavour.



Artist impression of a futuristic commercial spaceport (Virgin Galactic)

