SPACE POLICY AND LAW COURSE 2019

REMARKS ON CURRENT AND FUTURE DEVELOPMENTS

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1. A CHANGING WORLD

We live in interesting times. The world, including the space sector, is changing rapidly and at an increasing pace.

Major contributing factors are:

- pertinence of the digital world in our daily lives;
- steadily progressing digitalisation that makes knowledge readily accessible to everyone; We are at a point when universities' knowledge transfer function has lost some of its relevance, while their knowledge creation function has received increasing attention;
- strong focus on statistics instead of rationales;
- fixation on achieving short-term targets rather than taking long-term perspectives; and
- significance of being the fastest instead of the strongest on a given (economic, technical, scientific, etc.) development issue.

Overall, the space sector plays a considerable role in the development and functioning of the modern digital world. For example, satellites enable real-time global connectivity. Satellites are also the only legal tool to collect and distribute data worldwide (subject to certain national restrictions).

2. NEWSPACE

Major drivers for the development of the so-called NewSpace field are:

- The high demand for new data and its redistribution. In particular, there is an increasing data demand by individual customers. Previously, such demand was mainly governmental;
- Technological advancements like
  - The miniaturisation of space-related technologies. They can reduce costs for space mission development and launches;
  - The establishment of the CubeSat standard that like other industry standards can reduce production costs. Also, the adoption of this standard has led to more universities engaging in hands-on learning activities in satellite development;
  - The increasing capability to update or change the software on already deployed spacecraft to improve its usability throughout its lifetime, including for different purposes or customers (software payloads);
- The entrance of new wealthy actors (e.g., Elon Musk, Jeff Bezos) into the space sector. While being interested in the sector's data creation and redistribution potential, these actors have
  - Stimulated the sector's development through additional investment;
  - Set new standards for (acceptable) costs and time scales for space undertakings;

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    - Led to increased acceptance of risk-taking and failures. However, in general, people accept risk-taking and failures of private actors differently than those of public actors:
        - Public investment in space is often linked to risk-averse approaches. Public decision-makers do not want to be perceived as money wasters if something goes wrong; and
        - Private investors that encounter some failures in the pursuit of their space endeavours are often perceived as daring;
- The emergence of strong industry bottom-up approach to the traditional government-driven top-down approach.

NewSpace and traditional space actors need to actively co-operate because their main competitors might ultimately be ground-based actors covering related activity fields, e.g. telecommunications.

3. Major Obstacles to Future Space Missions

There are four major obstacles to current and future space missions that need to be resolved:

Three of these obstacles relate to

- Transport:
    - So far, all hardware for space missions have needed to be brought along from Earth;
- Energy sources:
    - It is still necessary to bring all the required fuel for space missions along from Earth. This is difficult and expensive; and
- Life support:
    - At present, life support material like oxygen and hydrogen, relevant for human spaceflight endeavours need to be brought along from Earth.

Arguably, the development of capabilities for in-situ use of space resources (In-situ Resource Utilisation, ISRU), including via commercial NewSpace engagement, has a considerable potential to allow overcoming these obstacles. ISRU could enable the creation of space hubs.

The fourth major obstacle is the increasing congestion of space with space debris and the consequent risk for fatal collisions of spacecraft with such debris. It constitutes the biggest human-made threat to the space sector. The deployment of the various planned small satellite mega-constellations could accelerate the growth of orbital space debris. Also, it should not be forgotten that space debris can be a threat to people on the ground if it crashes back to Earth without burning up in the atmosphere.

To tackle this obstacle, activities like ESA's Clean Space initiative are essential. On the regulatory side, one potential solution can be the establishment of global rules addressing the space debris issue. Moreover, a joint attempt of the USA and China to regulate and deal with space debris can be a real game-changer.
Development of practical regulations for space resources and space debris should take place with a view to the activities at hand and involve engineers.

4. Europe and the Space Sector

Compared to the USA and the Soviet Union, Europe was a late-comer to the space sector. Nowadays, it is also a late entrant to the NewSpace field. Europe needs to catch up. Thankfully, it has the potential to do so.

Modern Europe and the space sector originated around the same time and share some similarities:

- Europe: Signature of the Treaty of Rome that established the European Economic Community in March 1957;

  Space Sector: launch of the first artificial satellite (Sputnik) in October 1957;

- Europe: Established as a reaction to the 2nd World War to strengthen and ensure peace among European states;

  Space Sector: modern rocket technology is based on missile development during the 2nd World War. Also, international space agreements refer to the use of outer space for peaceful purposes;

- Europe is difficult;

  Space is difficult;

- Europe has a heavy focus on cooperation;

  International Space Sector has a strong focus on cooperation.

ESA (and thus Europe) established itself as a premier league member in the space sector with the successful landing of a probe on Titan. Another mission that underlined this status was Rosetta. Current impressive undertakings include the Galileo and Copernicus programmes.

Overall, ESA is quite different from other space agencies:

- It prioritises cooperation, which is not easy. Cooperation takes time because the decision-making process among the member states can be slow and complex. There needs to be a willingness to understand each other.

- Also, in contrast to the USA and the Soviet Union that focussed on defence and human spaceflight at the beginning, Europe concentrated on science and services.

Regarding the NewSpace field, Europe needs to understand that private investors go to the place that has the most money as well as the best market access and technologies available.

To increase space-related private investment in Europe, Europe needs to increase its public investment and become a customer of products offered by private actors. Arguably, public investment can trigger private investment. Private investment can benefit from market access and technologies established through public investment. Also, space agencies as anchor customers can encourage private investment. Naturally, public space actors can, in turn, benefit from the development of new space products by private investment.

One option to increase public investment in the European space sector is the persuasion of European governments to engage fully in space-related defence activities. This can bring significant funding to the table. A great example is the US Department of Defence's space-related investment.

Additionally, Europe needs to highlight its fantastic assets that can benefit the NewSpace field:

- Europe has an excellent culture of transnational cooperation;

- While the European space sector is complex, such complexity leads to a competition of ideas and interests that can foster innovation. Notably, Europe has established the world's first commercial launch service provider with Arianespace. It has also established world-renowned operators for communications and meteorology.

- Europe has a strong and competition-versed industrial base. Its industry has experience in leading technological progress. An example is the automobile industry. Cars nowadays have computers on board that tell the mechanic what is wrong with them.

Overall, Europe must not just follow the impressive NewSpace engagements in, e.g., China and become the number two of today's NewSpace endeavours. Instead, Europe should take a long-term perspective and work towards becoming the first in future endeavours.