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Space Security and Emerging Technologies in Small Space Nations: The Swiss Experience

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SYNOPSIS

The diplomatic battle between the People's Republic of China and Taiwan has been recently intensified in Latin America and the Caribbean which is Taiwan's crucial frontline comprising more than half of its remaining diplomatic allies. Beijing has accelerated its effort to woo away the friends and supporters of Taiwan since 2016 when Tsai Ing-wen led her Democratic Progressive Party (DPP) to electoral victory and declined to commit herself to the 1992 Consensus, a precondition set by China for engaging in cross-strait dialogue. The Chinese move has been devastating for Taiwan's diplomatic ties with other states but Taiwan is evolving its counter strategies and it is now taking advantage of the US-China rivalry in Latin America and the Caribbean.

COMMENTARY

For small space nations such as Switzerland, international cooperation is key and a unique opportunity to develop competences. Switzerland's contribution to the European Space Agency (ESA) allows its companies, universities and research and technology organisations to access all the important space missions by contributing usually at component and sub-system levels. This has enabled the development of niche products positioning some of the Swiss actors as leaders in their domain; for instance, Orolia Switzerland for atomic clocks, Schurter for space-grade electronic fuses, RUAG space for payload fairings. This has brought to the ecosystem a protected market to develop their business and a strong international recognition.

This situation has developed over the past 50 years, eventually leading to position Switzerland as an attractive place for private investment and new business

development. In 2019, Switzerland was ranked number 2 with the highest amount of deals but also the largest investment with [10 deals reaching almost €40 million private investment](#) in new space companies among the European countries.

The case of Switzerland as a small space nation

Switzerland is a founding Member State (MS) of the European Space Agency. In 2021, the Swiss contribution to ESA budget amounted to €170 million. With this financial support, Switzerland was ranked at the seventh position behind France, Germany, Italy, UK, Belgium and Spain over the 22 MS of ESA. This position within the Agency, coupled with the reputation of excellence attributed to Swiss entities (industry and academia), makes Switzerland a reliable and privileged partner in the international space business landscape. To strengthen the current position and support the development of new niches, the Swiss delegation at ESA, part of the Swiss federal administration, decided in 2010 to implement national activities to foster space technology innovation.



The flags of the 22 member states of the European Space Agency. *The appearance of ESA visual information does not imply or constitute endorsement of or by ESA.*

Of the total of 55 projects undertaken between 2010 and 2020, only 3 were stopped, mainly due to technical reasons. Of the remaining 52 projects which were pursued, 8 (16%) are considered as a product (mainly in the software domain), 22 were funded internally by the respective entities, and the last 22 were funded externally (16 through ESA and 6 through other funding such as the Framework Programme of the European Commission).

However, while national funding and ESA technology development programs are important vectors to push innovation and R&D within companies, a survey carried out in the spring of 2020 by Space Innovation, a network of government, educational and private sector actors involved in Switzerland's space programme, provided interesting results. The survey, involving the senior leaders of the principal Swiss industrial companies, was conducted to assess their respective development orientation and needs. The results showed that more than 70% of the product developments had received less than 50% of their funding from direct government contracts. The remaining amounts were derived from either internal funding directly, or through commercial customers. The reason for relying less on government contracts? Interviewees pointed to the lack of flexibility in government funding regulations, but also market pressures and opportunities that are often near term: more than 70% of Swiss products are on the market within 3-4 years, but this time frame would be impossible if development was based solely on government grants and institutional programmes.

Multidomain approach as enabler of space resiliency

Over the past ten years, apart from the continuous development of technologies — in particular miniaturisation, energy efficiency, portable/integrated devices and artificial intelligence — new space actors have also emerged, and proved it was possible to consider space as an interesting commercial market for several applications. With the increase of the offer in several domains, end-users (individuals, companies, institutions, governments) benefit from a large choice of services and providers. These new civilian applications build on the new opportunities brought by the new space, which also bring benefits to aspects of national security by increasing the resiliency of systems.

As a small space nation, Switzerland did not invest in its own telecommunication satellite. This situation may evolve with the implementation of large constellations in low-Earth orbit which are opening a completely new range of applications, for ground telecommunication at an affordable price, and easy-to-integrate antenna systems. Once in place with a reliable system, we can definitively imagine this way of ensuring telecommunication will be integrated at any levels of armed forces from the soldiers to the general staff.

This will be the same trend for optical imagery, radar imagery, positioning, navigation and timing in the near future where multidomain applications will be integrated in the acquisition of a comprehensive and global situational awareness.

Conclusions and recommendations

Although strongly dependent on government funding, most of the Swiss companies count mainly on internal funding sources to advance their strategic projects, in particular those that need to have a market entry below 3 years. Collaboration with academic laboratories is mandatory in a lot of cases as this allows to lower the entrepreneurial risk and assess the full implication of investing in a new technology. Moreover, the innovation ecosystem built around the two Swiss federal institutes of technology (ETH Zürich and EPFL) promoting the technology transfer and spin-off

from laboratories, plays an important role in the dynamism of the country regarding seed investment and start-up creation. This reflects also to the space sector.

In conclusion, taking the example of Switzerland and extrapolating it to other small space nations, governments have to increase their internal support to the space sector in order to maintain competitiveness as well as attractiveness for foreign investors. As it is difficult to reach a significant business volume in self-reliance mode, their economic trade conditions must allow for simplified collaboration with outside players. The participation in an intergovernmental organisation such as the European Space Agency is a key enabler in the current success of Swiss entities on the international scene.

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