

54th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE  
ACTIVITIES (D5)

Cybersecurity in space systems, risks and countermeasures (4)

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CYBERSECURITY TRENDS AND NEW CHALLENGES FOR THE SPACE SECTOR

**Abstract**

Referring to the definition provided by the International Telecommunication Union, cybersecurity is the collection of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, actions, training, best practices, assurance and technologies that can be used to protect the cyber environment and organisation and user's assets. Having such a large collection defining cybersecurity justifies the large variety and heterogeneity of competences, going from technical skills (e.g. threat intelligence, malware analysis, security operations, etc.) to non-technical skills (e.g. cyber risk management, governance, education, etc.), required to be prepared against cyber threats. With the increasing number of connected satellite networks, information security has become a top priority for government regulators and companies in the space industry. The lack of specific cybersecurity requirements for the space assets needs to be addressed in order to reduce the potential vulnerability of space-based infrastructures. The growing concern requiring the identification and deployment of relevant cybersecurity measures and solutions in the space sector, is also reflected in the new release of the ESA Technology Tree (v 4.0 - April 2020), which has included new technological areas, such as Machine Learning Techniques and Artificial Intelligence (AI) in On-board Data Subsystems, and AI and Data Security in the Space System Software domain. Furthermore, the 'Quantum Technologies' have now been detailed in a dedicated technological group. In our paper, we examine the above-mentioned complexity of cybersecurity in the space sector, by reviewing both the scientific literature and the worldwide patents. We combined the ESA Technology Tree, with state-of-the-art in cybersecurity taxonomies (e.g. JRC, ENISA, etc.), developed to facilitate the categorization of cybersecurity competencies. By using specific keywords, we analysed patent and scientific publication data for the period 2010 - 2020. We identified the global trends, the International Patent Classifications (IPC), the country distributions, top assignees and funding sponsors, etc. Patent and literature indicators, integrated with market information, provided a clear evaluation of the related technology trends and readiness levels of cybersecurity in the space domain.