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Agenda Item 2: Timely and safe use of new technologies

2.2: Addressing safety risks related to evolving aviation technologies

THE EXPERIENCE OF SPAIN WITH A PROTOCOL FOR SPACE ALERTS

(Presented by Spain)

EXECUTIVE SUMMARY

This paper describes the benefits for Spain of having a Space Alert Protocol for uncontrolled re-entry of space vehicles and space debris in terms of national safety and security, coordination and public confidence. In addition, it presents potential benefits that could be potentially useful and taken into consideration for a coordinated approach regarding such protocols at a regional and global level.

1. INTRODUCTION

1.1 In November 2022, the Spanish airspace was partially closed as a precautionary measure due to the uncontrolled re-entry of a rocket, whose core stage weighed approximately 23 tons (around 50 000 pounds). The rocket was launched on 31 October 2022.

1.2 The core stage of the specific rocket used is known for its large size and mass, making its re-entry a significant event due to the potential risks posed by falling debris. Unlike other rockets that typically have controlled re-entry or burn up entirely upon re-entry, this type of rocket's core stage returns to Earth in an uncontrolled manner, creating uncertainty about where the debris might land.

1.3 To ensure safety, Spanish authorities, according to the data provided by the European Union Space Surveillance and Tracking (EU SST) network and other international bodies, decided to temporarily close parts of the Spanish airspace. This measure affected a large number of flights, causing delays and reroutes to avoid any potential risk from falling debris.

1.4 The European Union Aviation Safety Agency (EASA) issued a Safety Information Bulletin (SIB) to provide specific guidance on safe distances to protect aircraft from potential debris. The EASA SIB recommended the following measures:

- a) **Avoidance Radius:** Aircraft should avoid flying within a radius of 200 kilometres (approximately 108 nautical miles) from the predicted re-entry path of the rocket

¹ English and Spanish versions provided by Spain.

debris. This safety distance was determined to minimize the risk to aviation from any falling fragments of the rocket.

- b) **Enhanced Awareness:** Air traffic management and operators were advised to maintain heightened awareness and readiness to implement contingency plans.
- c) **Communication:** Continuous communication and updates from the relevant space surveillance and tracking organizations were crucial for timely adjustments to flight operations and safety measures.

1.5 The incident emphasized the importance of having established State-level protocols for managing space debris threats, such as the Space Alert Protocol document. The proactive measures taken by Spain highlight the potential benefits of enhancing cooperation at the regional and global level and preparedness for space-related incidents, ensuring the safety of both the public and aviation operations.

2. DISCUSSION

2.1 PART 1: BENEFITS OF THE SPACE ALERT PROTOCOL

2.1.1 The Spanish Space Alert Protocol² provides a comprehensive framework for managing space-related threats, particularly focusing on uncontrolled re-entries of space debris. The protocol not only enhances national safety and security but also could be considered as an example of best practices. This paper outlines the five primary benefits of having such protocol.

2.1.2 Enhanced national safety and security

2.1.2.1 Early warning and preparation: The protocol ensures that Spain can detect and respond to space debris threats promptly. Early warnings enable authorities to prepare and implement necessary measures to protect people, property and critical infrastructure.

2.1.2.2 Structured response mechanism: With clearly defined phases (0, 1 and 2), the protocol provides a structured and scalable response mechanism that can adapt to varying levels of threat, ensuring that all relevant entities are informed and ready to act.

2.1.3 Improved coordination and communication

2.1.3.1 Interagency collaboration: The protocol mandates the involvement of multiple ministries and agencies, with clearly defined points of contact, fostering a collaborative environment where information is shared efficiently, and actions are coordinated effectively.

2.1.3.2 Dedicated coordination cell: The establishment of a national coordination cell ensures that there is a dedicated team responsible for integrating and analysing information, facilitating seamless coordination among all stakeholders.

² Official publication of the Spanish Space Alert Protocol: <https://www.boe.es/buscar/act.php?id=BOE-A-2022-18336>

2.1.4 Utilization of advanced surveillance and tracking

2.1.4.1 Integration with EU SST and United States Space Command (USSPACECOM): By leveraging international space surveillance networks, the protocol benefits from advanced tracking and risk assessment capabilities, providing accurate and timely data on space debris.

2.1.4.2 National surveillance capabilities: The use of national resources like the Spanish Space Surveillance and Tracking Operations Center (S3TOC) and the military's Space Surveillance Operations Center (COVE) ensures that Spain has robust internal capabilities to monitor and respond to threats.

2.1.5 Public safety and risk mitigation

2.1.5.1 Risk assessment and mitigation: By categorizing risk levels (minor, medium, major), the protocol allows for precise risk assessment and tailored mitigation strategies, minimizing potential harm to the public and infrastructure.

2.1.5.2 Public communication: The protocol includes a communication plan to keep the public informed about potential threats and safety measures, thereby enhancing public trust and ensuring community preparedness.

2.1.6 Legal and regulatory framework

2.1.6.1 Compliance and liability: The protocol ensures compliance with national and international regulations, providing a legal framework for actions taken during space debris events. This helps in maintaining liability and transparency in the response process.

2.2 PART 2: POTENTIAL BENEFITS FOR AN ASSESSMENT OF A REGIONAL/GLOBAL PROTOCOL

2.2.1 Common threats require unified responses

2.2.1.1 Shared space environment: Space debris poses a threat to all countries, and European States share the same orbital environment. A unified approach ensures that debris tracking and mitigation efforts are coordinated, reducing the risk of collision and enhancing overall space safety.

2.2.1.2 Regional cooperation: Developing protocols for managing space debris threats across Europe and other regions facilitates cooperation, enabling States to assist each other with resources, data and expertise during space debris events.

2.2.2 Strengthening safety, security and resilience

2.2.2.1 Collective safety and security: A coordinated approach to space threats strengthens the collective safety and security of States. By adopting protocols for managing space debris threats, resilience against space-related threats could be enhanced, aiming at contributing to the overall stability, safety and security of the regions.

2.2.2.2 Resource sharing: Protocols that are harmonized across regions allow for the sharing of surveillance data, technical resources and best practices, leading to more efficient use of resources and improved threat response capabilities.

2.2.3 **Economic and infrastructural protection**

2.2.3.1 Protecting critical infrastructure: Space debris can potentially damage satellites and other critical infrastructure. A unified protocol helps protect these assets, which are vital for communication, navigation and other essential services, thereby safeguarding economic interests.

2.2.3.2 Insurance and liability: Clear protocols and risk assessments can reduce insurance premiums and liability costs by demonstrating that States have effective measures in place to manage and mitigate space debris risks.

2.2.4 **Compliance with international standards**

2.2.4.1 Alignment with ICAO and United Nations (UN) guidelines: Developing national protocols in line with international standards set by organizations like ICAO and the UN ensures compliance with global best practices, enhancing international cooperation and support.

2.2.5 **Public safety and confidence**

2.2.5.1 Ensuring public safety: Similar protocols ensure that all citizens are equally protected from the dangers of space debris, regardless of their location. This uniformity in safety measures can build public confidence in national and regional space policies.

2.2.5.2 Transparency and communication: Clear communication strategies included in the protocols help keep the public informed and engaged, fostering a sense of safety and confidence in the authorities' ability to handle space-related threats.

3. **CONCLUSIONS**

3.1 The implementation of the Space Alert Protocol in Spain demonstrates significant benefits in terms of national safety and security, coordination and public confidence.

3.2 This protocol provides a structured approach to managing space debris threats, ensuring that all relevant entities are informed and ready to act.

3.3 The measures taken by Spain could be considered as an example of best practices which could contribute towards a regional and global cooperation approach and preparedness for space-related incidents.

3.4 The four key points are:

- a) unified and proactive approach;
- b) enhanced regional cooperation;
- c) blueprint of best practices; and
- d) strengthening collective safety and security.