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# The Tiangong Re-entry Event

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## Résumé

The uncontrolled re-entry of the Chinese Tiangong-1 space station in early April 2018 represented a unique opportunity for testing our ability to monitor the space debris environment and react to a potentially hazardous event. Ground infrastructures such as power plants, nuclear waste repositories, telecommunication lines, hydrogeological resources are more and more likely to provide large-scale consequences when hit. As for the citizens, a knowledge of the space threats and of some basic mitigation rules is essential in order to make crisis management effective. Furthermore the increasing predictability of space hazards must be analyzed also from the point of view of the liability of damages.

The Chinese Space Station consisted of a cylindrical section, 10.5 m in length and 3.4 m in (maximum) diameter, with two rectangular solar panels of 3 m x 7 m. The mass was estimated to be around 7500 kg. Ground control was lost in March 2016, precluding the planned de-orbiting in the South Pacific Ocean Unpopulated Area (*SPOUA*). However, the autonomous on-board attitude control system remained operational.

Technical coordination at a national and international level and operational procedures have been then activated. In particular The Italian Space Agency (ASI) has worked side by side with the Italian Civil Protection Department. A joint Tiangong-1 re-entry campaign was organized involving research and governmental institutions and a technical board was timely set up for analysing the possible threats (e.g. critical infrastructures on the ground, air traffic control, safety procedures etc.). A timeline for managing operations was agreed for triggering actions such as tasking different kind of sensors (e.g. optical vs radar) or evaluating the geographical distribution of the level of alert. Critical milestones were identified and the committee became permanently operational during the Tiangong-1 critical passes over Italy. Communicating with the media turned out also to be a sensitive task because of the widespread interest raised in the news by the re-entry of such a peculiar object.

Lessons learned from the Tiangong-1 re-entry range from highlighting the role played by internal communication (e.g. customizing technical/scientific information to standard civil protection operational procedures) to setting up proper interfaces at international level (e.g. IADC, EUSST), and to realize to which extent the knowledge of the space threats and of some basic mitigation rules is essential in order to make crisis management effective.

As such they can be fruitfully transferred to the NEO hazard, which has necessarily relied so-far on the organization of fictitious impact exercises.

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