Paper ID: 82720
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IISL COLLOQUIUM ON THE LAW OF OUTER SPACE (E7)
Launching into Outer Space (4)

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THE UNCONTROLLED REENTRY OF ROCKET STAGES AND THE RISKS FOR COUNTRIES ON THE EQUATORIAL LINE OF THE GLOBE

Abstract

The uncontrolled re-entry of launch vehicle stages into space is a growing problem that poses significant risks to the globe's equatorial line. Rocket stages are large, heavy components that are discarded after spacecraft propulsion, and can reach speeds of up to 20,000 km/h during reentry. When they re-enter the atmosphere unchecked, they can land anywhere, posing a risk to people, property and infrastructure. There are several factors that can lead to uncontrolled reentry of these parts of space vehicles. Variables such as the failure of a control motor or lack of fuel can generate the problem. In some cases, uncontrolled reentry can be caused by a collision with other objects in Earth orbit. The equatorial strip of the globe is a delicate region for the reentry of rocket stages, as the atmosphere is thinner than at the poles, what means the launch stages re-enter the atmosphere at higher speeds, which increases the risk of damage. Add this to the fact that the population is denser along the equatorial line, increasing the risk of people, properties and infrastructure on Earth being hit by debris. The international airline sector is also susceptible to the issue, as if rocket debris hits an aircraft, the number of causalities would be enormous. Developing countries, generally with more restricted budgets for space programs, are particularly vulnerable to this problem. Although controlled entry technologies already exist, which can help direct rocket stages to safe areas, they make the space artifact more expensive and for this reason are often ignored by them. Furthermore, the lack of centralized and assertive supervision makes it more difficult to control the use of reentry technologies by all countries that already have space capabilities. The question asked is whether the rules that currently exist to regulate the sector are sufficient? This work proposes the regulation of passage rights for launching and reentry of space objects, considering fundamental principles of space law as well as the international practice. Despite the interest of public and private entities of different nationalities in more frequent and lower-cost space launches, the implementation of more stringent rules and regulations for rocket launches requiring rocket operators to take measures to reduce the risk of uncontrolled re-entry would represent a possibility of achieving greater security for the entire Earth population.