



Maritime Law as a Model for Space Traffic Management

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Introduction

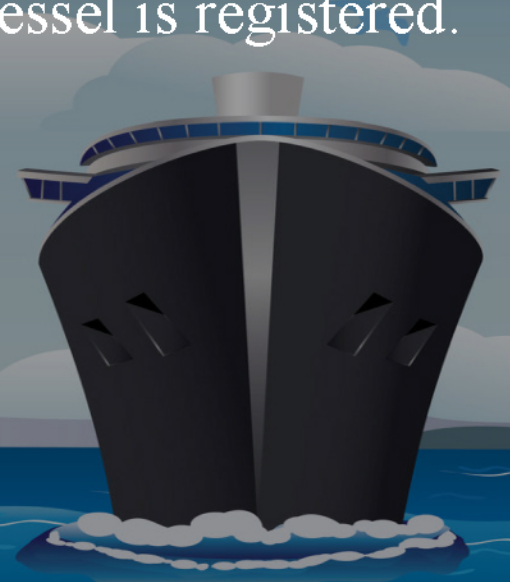
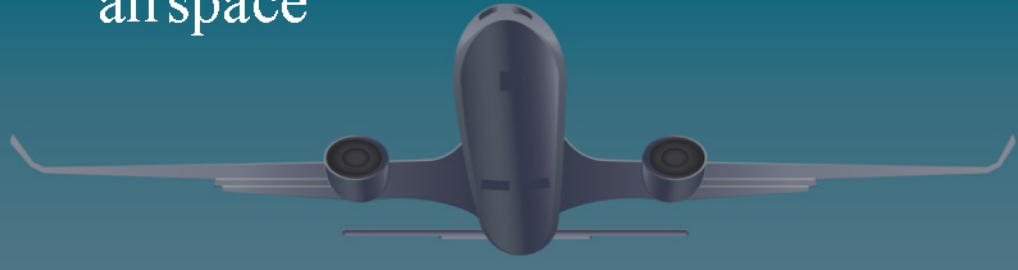
Global governance models for space, and for Space Traffic Management (STM) in particular, are constrained by the principles of the Outer Space Treaty. The provisions of Article II, stating, “Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means” is often cited as a limiting factor in the regulation of a safe and sustainable orbital environment. However, the recognition of space as an international domain invites comparison to the regulation of other international domains.

Space, as an international domain, is distinct from international waters (maritime) and international airspace (aviation) from a treaty perspective. Both aviation and maritime domains had well established commercial operations at the point of international agreement. The concepts for the regulation of international airspace were built upon the existing standards for international waters and the high seas. Aviation treaties refer to “high seas airspace” as a defining term. In contrast, the Outer Space treaty was developed not to facilitate safe commercial use, but as a “non-armament” treaty built on the principles of the Antarctica treaty. The purpose of the space treaty was to promote peaceful use and scientific discovery, while the underlying principles of the maritime and aviation agreements were to facilitate safe use for commercial transportation. This creates a structural challenge in trying to model space traffic management on other modes of transport as the underlying treaties are based on different and in certain ways, conflicting, assumptions.

If we are to develop a space traffic management regime for the purposes of preserving a safe and sustainable orbital environment, an evolution from a non-armament construct to one that facilitates safe and accessible commercial use is needed. While the technology of space operations may be more similar to aviation, from a policy perspective, international maritime agreements may provide the more instructive model. The international space community may look to the existing standards and practices in maritime operations for registry, oversight, right-of-way, and salvage as models for the development of space traffic management practices. This approach uses a globally accepted construct for maintaining safety and establishing regulatory oversight for operations in a domain where no claims of sovereignty can be made and the concept of free access is well established.

Regulation vs. Control

For aviation, the safe, orderly, and expeditious flow of aircraft through international airspace is achieved through the concept of air traffic management. Under this concept, an appropriate Air Traffic Services Authority is responsible for preventing collisions between aircraft in a designated volume of airspace. For airspace over the high seas, where no state can exert a claim of sovereignty, a contracting state to the United Nation’s International Civil Aviation Organization, assumes the authority through a regional air navigation agreement approved by the ICAO Council. Air traffic services are provided in accordance with ICAO standards and recommended practices by a state with exclusive authority, but not sovereign control. The distinction is that the enforcement authority of the rules of the air remains with the state of registry for aircraft operating in high seas airspace.

MARITIME: Multiple authorities operating in shared domain Control – Prevention of collisions between vessels through action and judgement of operator of the vessel. Regulation – Enforcement of Law of the Sea and related standards subject to the authority of the Flag State where the vessel is registered.  Standards – Collaborative process under UN Specialized Agency, International Maritime Organization (IMO).	AVIATION: Single authority over designated volume of airspace  Control – Prevention of collisions between aircraft through appropriate ATS authority with jurisdiction over a designated volume of airspace. Regulation – Enforcement of Rules of the Air subject to the authority of the State of Registry. Standards – Collaborative process under UN Specialized Agency, International Civil Aviation Organization (ICAO).
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IMO Mission Statement

"The mission of the International Maritime Organization (IMO) as a United Nations specialized agency is to promote safe, secure, environmentally sound, efficient and sustainable shipping through cooperation. This will be accomplished by adopting the highest practicable standards of maritime safety and security, efficiency of navigation and prevention and control of pollution from ships, as well as through consideration of the related legal matters and effective implementation of IMO's instruments with a view to their universal and uniform application."

ICAO Mission Statement

"To serve as the global forum of States for international civil aviation. ICAO develops policies and Standards, undertakes compliance audits, performs studies and analyses, provides assistance and builds aviation capacity through many other activities and the cooperation of its Member States and stakeholders."

Components of STM

The tactical elements of collision avoidance in both aviation and maritime domains are similar and can be extrapolated to the space domain:

Space Situational Awareness (SSA) - the detection, collection and dissemination of information on the location and trajectory of natural and manmade objects in orbit around the Earth;

Conjunction Assessment and Alerting (CAA) – the evaluation of natural and manmade objects in Earth’s orbit to identify potential collisions and notification of operators to determine if avoidance maneuvers are necessary, and;



Regulation – enforcement by the State of Registry/Launch under Outer Space Treaty obligation of “Continuing Supervision.”

However, the sustainment and protection of the orbital domain includes issues that go beyond tactical collision avoidance and have additional parallels to international maritime operations. Debris, contamination, and salvage affect both space and maritime law in a way that is not mirrored in aviation.

From a governance perspective, maritime law evolved over centuries, but global standards development became institutionalized with the advent of the United Nations. For aviation, the umbrella Chicago Convention is updated through amendment to a series of annexes, while the IMO uses a series of topic specific independent conventions that can be amended as needed. The IMO approach may prove to be more agile to accommodate technical innovation and market changes in space operations.

Debris – Space Debris is a particular risk that is not present in the aviation domain. The debris risk can be divided onto two categories from a policy perspective. One, mitigating the risk of collision with debris (hazards) and two, to minimize debris generating behaviors (pollution). Similar issues are addressed in several IMO conventions, including:

*Nairobi International Convention on the Removal of Wrecks
Convention on the International Regulations for Preventing Collisions at Sea
International Convention for the Prevention of Pollution from Ships
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter
International Convention on Salvage*

Conclusions

While Air Traffic Management can provide certain concepts to facilitate the development of an international Space Traffic Management regime, maritime law may serve as a more appropriate model. Rather than seeking to control the operations within a designated volume of space, the maritime model allows multiple regulators to exercise oversight over individual operators in a shared domain. In addition, issue specific international agreements may provide an evolutionary approach to global standards of behavior in orbit.

Bibliography

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