SPACE OPERATIONS SYMPOSIUM (B6)
New Operations Concepts, Advanced Systems and Commercial Space Operations (2)

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RULES OF ENGAGEMENT IN SPACE OPERATIONS

Abstract

This paper explores courses of action for space traffic management when communication is not feasible and there is no warning of conflicts. These are true "rules of the road," such as automobiles giving way unmarked intersections and ships on collision course both steering to pass port to port relative to their direction of travel. The term "giving way" is important. No vessel has "right of way." All are bound to avoid collisions as much as possible. Several principles from maritime navigation may be directly applicable.

"Look-out: Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.

Safe speed: Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision. In determining a safe speed the following factors shall be among those taken into account: the traffic density, the maneuverability of the vessel with special reference to stopping distance, and turning ability in the prevailing conditions;

Vessels must use all available means to determine the risk of a collision, including the use of radar (if available) to get early warning of the risk of collision by radar plotting or equivalent systematic observation of detected objects. (e.g. ARPA, AIS)."

The burden of avoidance rests with those who operate satellites and ultimately with the launching State. JSPOC warnings are one of several means for "look-out." There are several governmental and private sources of information, such as the International Scientific Observation Network. Every satellite operator – even a university cubesat team – is responsible for such vigilance. The manner in which vigilance is maintained must be clearly delineated and executed.

Safe speed refers to orbit characteristics and maneuverability. Very low Earth orbit is very dangerous for satellites that cannot maneuver because orbit speed is very high, and energy requirements for avoidance can be large. Orbit lifetime might be short, but while in orbit there are collision risks.

The paper will examine how these automatic rules of engagement affect dense satellite traffic using current stellite close approach data and the consequences of maneuvers executed under these autonomous rules.

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