Man Made Star-Chart for Complex, Dynamic and Extra-orbital Space Operations

Historically, space operations – and the catalogs of space objects – have been largely focused on satellite activity around the earth. The picture was only dynamic to the extent that new objects would be added (and occasionally updated), and retired objects would disappear. With each new discovery and better capabilities to spot smaller debris objects, the picture of debris would expand.

Even at that level of space activity, the dynamics are complex. With the addition of extra-orbital activity, constellations with autonomous formation management, maneuvers and rendezvous, short-lived cube sats, and daily space tourist flights, the things to be tracked in space will become unimaginably dynamic.

What must be known, and how can decision science and knowledge management be leveraged to create the catalog of the future? We review the types of interactions and behaviors that will require monitoring and decisions, using the knowledge of decisions under uncertainty to shape what we must know and what the exchange must contain to represent these more complex statements of intent.

A more dynamic catalog will also need to understand the relationships between objects and the function of objects in terms of transmission and maneuver. Adding dynamics and relationships will transform the catalog from a static record to a playbook that will allow collaboration on changing operations across all classes of operations and performance in orbit and beyond.

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