Space Situational Awareness (SSA) is the ability to create knowledge (i.e., understand and predict) the current and future state of natural and manmade objects in orbit around the Earth. SSA has become a prominent concern for both military and commercial systems, largely due to increasing military reliance on a range of space assets. The objective of SSA is not the knowledge as an end in itself, but the application of such knowledge in managing controllable behavior to create desired outcomes. Recent and projected advances in available sensor capabilities mean that the raw information of what, where, and when is now available, making SSA a realistic possibility. Likewise, recent and projected advances in the behavior capabilities of manmade objects means that it is possible to make meaningful responses to observed states, at an object level, which can significantly influence future states of the overall system toward desired outcomes.

However, the availability of information and accessibility of controlling behavior does not an operational system make. The challenges in leveraging that information and control to create desired outcomes for the space environment will require advancements in systems engineering. First, the system is a “system of systems” with dynamic composition exercising variable levels of cooperation, whose creation and operation few systems engineering techniques provide useful leverage. Second, the system depends on information of variant quality, because the range of sensors and inherent uncertainties in their information, but again, systems engineering at present does not possess tools for easily managing systems with wide variants in information uncertainty. Third, the volume of information that must be observed, oriented, decided, and acted on demands a quality of human computer interface that this is much beyond the state of the practice today. This seminar will briefly examine these three challenges in the context of SSA and propose a research program to create the required advances.

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