

## **Fast and Wide VS Narrow and Deep: A Look at Options for Ground-Based Optical SSA**

Mark R. Ackermann, Sandia National Laboratories

Colonel Rex R. Kiziah, USAF Academy

Celeste A. Drewien, Sandia National Laboratories

Peter C. Zimmer, John T. McGraw, J.T. McGraw & Associates

### **Abstract:**

Since the launch of Sputnik and attempts to optically track that and similar satellites from the ground, two basic approaches have emerged. The first approach is fast and wide. This is to search wide swaths of sky in short periods of time to find relatively bright objects, with the definition of “relatively bright” changing over time with improvements in technology. The second approach is to use larger telescopes with more narrow fields of view to observe a given patch of sky for a longer period of time. This narrow and deep approach results in the ability to detect and track more faint objects, but without the ability to observe the sky fast enough to know that all objects are being detected. In recent years, systems that observe wide portions of the sky continuously have emerged but have an instantaneous sensitivity even less than the fast and wide search approach.

Government-sponsored satellite tracking facilities have pursued all three approaches while commercial interests have been deploying systems with the fast and wide approach and, to a lesser extent, some experimentation with the continuous observation approach. The US fielded a single instrument that provides simultaneously fast, wide and deep observations, but this system was expensive and might prove difficult to replication for global deployment.

What is the optimum approach for ground-based optical SSA collection? In this paper, we explore the options and the trades in cost and performance.

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