

IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)  
 Advances in Space-based Navigation Systems, Services, and Applications (7)

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AN EXAMINATION OF DIFFERENT MODELS FOR PROVIDING LUNAR PNT SERVICES

**Abstract**

With the goal of establishing a sustained human presence on the Moon, the Lunar Surface Innovation Consortium (LSIC) has begun gathering input from the community to define requirements and expectations for NASA's lunar program. LSIC is leveraging expertise from commercial entities, academia, and enthusiasts around the country and the world. Recognizing that position, navigation, and timing (PNT) are fundamental enabling technologies for future lunar exploration and development, the LSIC Extreme Access (EA) focus group has been exploring the development of this trade space. With the trend in lunar exploration toward using commercial service providers, the LSIC EA group and PNT subgroup are examining three different models for lunar PNT:

- 1) Government model: a government develops, maintains, and operates the service.
- 2) Anchor model: a major space agency assists with asset development and serves as a guaranteed long-term customer.
- 3) Standards model: a major space agency defines the interoperability standards required for commercial providers.

The first model has proven terrestrial success, while the second and third models are new ways of providing PNT services. In this presentation, we will examine the trade-offs of each model for PNT consumers and providers, by exploring questions such as: Who pays for PNT services? Who is likely to be a "provider?" Is the model equipped to handle a wide variety of mission-based PNT needs? What influence is the type of model likely to have on availability, accuracy, precision, and reliability of navigation and timing services? Decisions pertaining to lunar PNT will have lasting economic impact that can heavily influence future mission feasibility and cost. Examining this trade space will enable us to better understand the repercussions associated with the new paradigm.