Methodology for the Study of Autonomous VTOL Scalable Logistics

ANDREW KEITH
Sikorsky Aircraft Corporation

Substantial and promising results have been obtained by Sikorsky Aircraft during a NIAC Phase I study of an Autonomous VTOL Scalable Logistics Architecture (AVSLA). AVSLA is envisioned to be a future cargo delivery "system-of-systems" that provides cheaper, more efficient, and more effective service to the nation's consumers. Related VTOL vehicles for military heavy-lift purposes are also likely to benefit from AVSLA technology. The stated goal of the NIAC Phase II program is to provide a sound basis for NASA to use in considering advanced concepts for future missions. Thus, this Phase II proposal focuses on specific, critical research areas identified for AVSLA. The overall technical objective is to develop a system-of-systems model of the AVSLA design space, complete with supporting analyses in key areas that, when combined with advanced feasibility/viability determination methods, can establish a solid basis for a full-scale research program at NASA. In addition, a successful research program could be leveraged by Sikorsky Aircraft to obtain other funding in support of the development of an AVSLA.

Several areas critical to transforming AVSLA from an idea to reality were identified in Phase I. These technology areas include on-board vehicle computing functions (including communication, navigation, and safety), reliable autonomous control, air traffic management (ATM) system integration, and transportation architecture scalability. The Phase II effort proposed here provides the framework and steps for examining feasibility and viability of alternative AVSLA concepts and identification and assessment of the necessary new technologies in these areas. Research of these technology areas requires much more effort than possible in the NIAC Phase II. Thus, with the likely benefits of a deployable, efficient AVSLA established, these areas could form the basis of NASA research programs aimed at support for future systems. Missions enabled by AVSLA, including efficient, cost-effective package delivery and unique military tasks, are extremely important to the nation from economic, environmental, and national security points-of-view.

The Sikorsky-led Phase II team (a pairing of Sikorsky with the Georgia Institute of Technology) brings unique scientific and technical capabilities required to properly characterize the AVSLA system-of-systems design space. These unique capabilities lie in three critical areas: 1) system design methodologies, focused on future concept development and the probabilistic evaluation of new technologies and overall affordability, 2) systems dynamics and VTOL vehicle modeling, and 3) access to key expertise across the relevant disciplines and domains.