2011

NASA Range Safety Annual Report

E. Langley Research Center (LaRC)

1. LaRC Small Unmanned Aircraft Systems (sUAS) Facilities

In January 2011, the sUAS Range Safety Office initiated a sUAS Working Group which meets monthly. The purpose of the sUAS Working Group is to implement and coordinate consolidation activities in terms of sharing common recourses, to provide pilot and observer training, and to integrate operations policy requirements from Headquarters, the Center, and funded projects. Figure 22 shows the Technology Development and Operations Model that provides the matrix support and program funding sources. Key elements include the airworthiness, concept of operations (CONOPS), and mission approval where governing policies, processes, procedures, and reviews are interfaced and integrated for sUAS work to be safely accomplished at the Center.

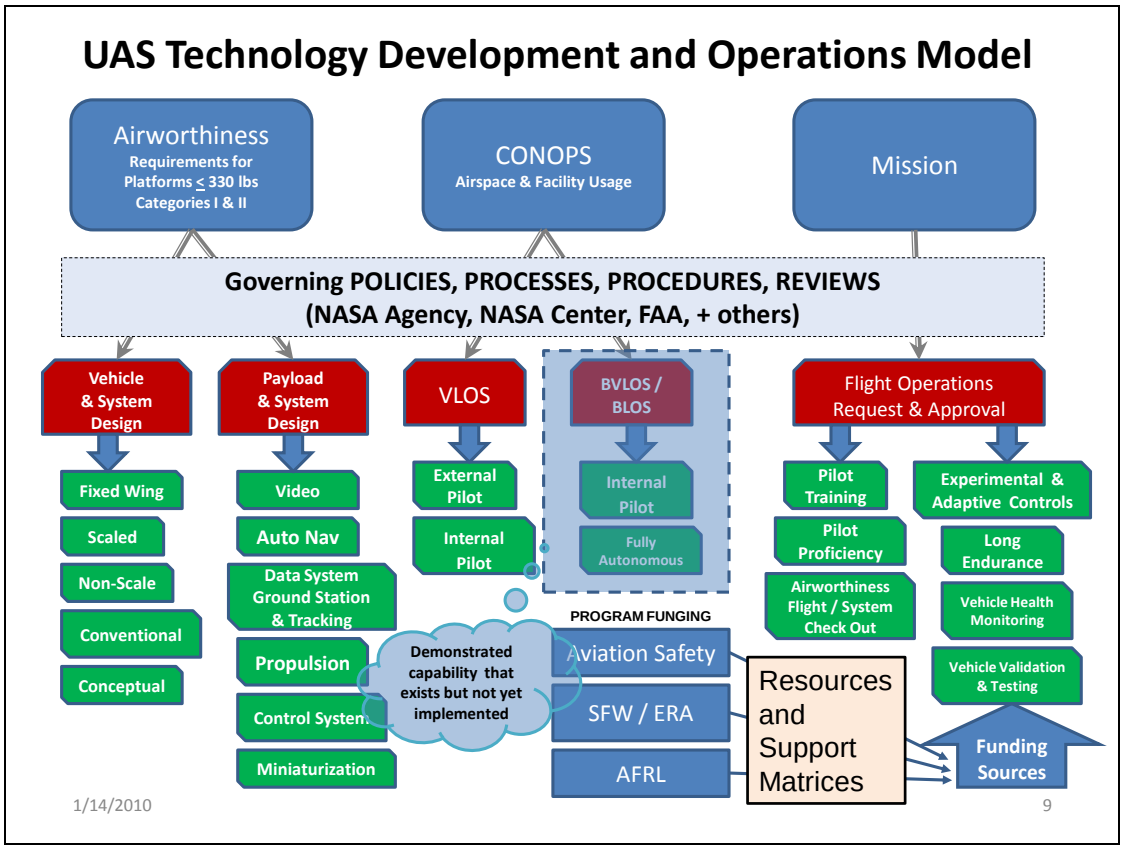

FIGURE 22: SUAS WORKING GROUP TECHNOLOGY DEVELOPMENT AND OPERATIONS MODEL

2. LaRC Range Safety and sUAS Operation Oversight

During FY2011, the LaRC Range Safety Office provided oversight for sUAS fight operations in both the National Air Space (NAS) and in Restricted Air Space. NASA LaRC Range Safety continued to work closely with the FAA UAS Program Office and with the respective organizations that manage Restricted Air Space. The primary goal of this effort was twofold: 1) To maintain safety of flight for the public, public property, and test personnel, and 2) To ensure that NASA Range Safety requirements were in alignment with NPR 8715.5, NASA

Range Flight Safety Program. LaRC currently maintains Certificate of Authorizations (COAs) to fly in the NAS at Allen C. Parkinson Fort Pickett Army Airfield, Blackstone, Virginia (BKT) and at 31VA Aberdeen, Smithfield, Virginia. Operations in Restricted Air Space include Finnegan UAS Air Field at Fort A. P. Hill, Virginia; Wallops Fight Facility on Wallops Island, Virginia; and at the UA Navy Webster Air Field, Maryland. A total of 73 deployment days were logged across these facilities that included requirements for UAS pilot flight training / proficiency and for programmatic experimental flight research support.

3. FY 2011 sUAS Flight Projects

a. AirSTAR

The Airborne Subscale Transport Aircraft Research (AirSTAR) project completed all its phase IV major milestones via deployments to Allen C. Parkinson, Fort Pickett Army Airfield, Blackstone, Virginia in September 2010 and is now planning Phase V for the project. The AirSTAR sUAS consists of a Mobile Operations Station (MOS) and a dynamically scaled, fully instrumented 5.5 percent scale Generic Transport Model (GTM) as shown in Figure 23. The Phase V CONOPS will transition from visual line-of-sight with an external safety pilot (EP) who monitors nominal flight conditions as research fight tests are performed by an internal research pilot (IP) stationed inside the MOS to beyond visual line-of-sight. Should an off nominal event occur, the Range Safety Officer will have Flight Termination Authority in the event that the on-board autopilot fails to return the vehicle to a “home waypoint.” The RSO is working with the project to help define and implement failsafe and Flight Termination System (FTS) requirements.

FIGURE 23: AIRSTAR MOS GENERIC TEST VEHICLE T2

b. J-FliC

The Jet Flying Controls Testbed (J-FLiC) lab provides low cost sUAS for experimental flight control testing with small aircraft like the one shown in Figure 24, below. The flight campaigns include evaluation of various commercial off-the-shelf (COTS) UAS autopilot systems with the capability to operate in either manual or the full autonomous flight modes of operation.

The flight operations took place at the US Navy Webster Field, Maryland and at Fort A.P. Hill, Virginia. Both manual and autonomous flights were performed for pilot training and proficiency. Safety of flight and air space management was conducted through the interface of the respective Navy Range Safety and Army Range Safety Operations Offices and coordinated through the NASA RSO flight operation.

FIGURE 24: JET TURBINE POWERED (J-FLIC)

c. Rapid Evaluation Concept (REC)

A Rapid Evaluation Concept (REC) vehicle designed to test a suite of integrated instrument and data gathering packages sustained fire damage during radio range testing (Figure 25). The incident was a slow burning fire that resulted from an overheated electronic speed controller on one of the two electric motor systems. Damage assessment was limited to the forward motor mount along with limited corrosion damage from the fire retardant used for fire suppression. Potential causes included motor system wire damage during cowling installation prior to the radio range test or new ground wires installed for avionics noise suppression. Corrective actions included the design of a new avionics grounding system to prevent ground loops. The RSO worked with the REC lab to investigate the incident and then reviewed the corrective actions and final airworthiness of the vehicle prior to its return to flight.

FIGURE 25: FIRE DAMAGE OF A RAPID EVALUATION CONCEPT (REC) OF A LOW COST INSTRUMENTED SUAS