

Aircraft Description

The Systems Engineering Directorate (SED) of the NASA Langley Research Center desires to fly a “suite” of similar generic Unmanned Aircraft Systems (UAS) aircraft at the 31VA Aberdeen Airfield of Smithfield, Virginia. This project activity is provided to the NASA Aviation Safety Program (AvSP) Office request for developing an Airborne Subscale Transport Aircraft Research (AirSTAR) generic transport aircraft test bed for conducting experiments. AirSTAR UAS will be flown at Aberdeen Airfield in support of the Control Upset Prevention and Recovery (CUPR) element of the AvSP. The typical flight agenda at 31VA Aberdeen Airfield will consist of takeoff, traffic pattern maneuvers, and landing. All flight operations will be conducted in day and VFR “see and avoid” conditions within the confines of the airfield property.

The AirSTAR Project UAS physical characteristics are grouped according to phases within the project. Each phase describes project development and training levels. All UAS vehicles are based on commercially available airborne and ground station uplink control sport equipment operating on 72MHz radio frequencies. The vehicles in the first phase are balsa wood constructed, propeller driven (internal combustion or electric power). These vehicles are trainers as shown in figure 2-1. The vehicles in the second group, as shown in Figure 2-2 are high performance trainers, turbine powered, aerobatic, and sport aircraft of fiberglass mold with Kevlar reinforced construction. The vehicles in the third phase are scaled trainers, designed by NASA, specifically for the AvSP test bed program, as shown in Figure 2-3. All vehicles weigh less than 100 pounds. All vehicles have excellent aerodynamic stability and control characteristics.



PHASE I – *Ultra Stick 120*



- Prop driven, medium speed trainers
- Fully aerobatic
- Off-the-shelf kit
- 1 additional model with electric engine and spin recovery mechanism
- 300+ flights completed including similar models

Specifications
Large wing span – 76 in
Length – 60.625 in
Wing loading – 27.68 oz/ft²
Moderate weight – 14 lbs
Engine – 1.6 in³
Max speed ~ 85 mph

Figure 2-1: Typical Phase I AirSTAR Project UAS Pilot Trainers



PHASE II - *L1011*



- Kit produced and built by PCM
- Span: 85", Length: 86"
- Weight: 32.1 dry, 37.8 wet
- Wing Loading ~ 85 oz/ft²
- Engine: AMT 180SP, 20 lbs thrust
- Fuel: K1 kerosene & turbine oil, 20:1, 104 oz capacity
- Flying time: ~ 12 minutes
- Stall speed: 37 mph
- Take-off distance: ~ 200 ft
- 250+ flights completed including similar models

- Max speed ~ 130 mph (k.e. ~ 16930 ft-lbs)
- Test speed ~ 85 mph (k.e. ~ 7240 ft-lbs)

Figure 2-2: Typical Phase II AirSTAR Project UAS High Performance Pilot Trainers



PHASE III - *GTM – T1*



- Designed and built by LaRC
- Span: 82.2", Length: 102.5"
- Weight: 40 lbs dry, 51 lbs wet
- Wing Loading ~ 144 oz/ft²
- Engine: dual AMT 180SP, 20 lbs thrust each
- Fuel: K1 kerosene & turbine oil, 20:1, 1.8 gal capacity
- Flying time: ~ 10 minutes
- Stall speed: 52 mph
- Take-off distance: ~ 200 ft
- Test speed: ~ 85 mph
- Taxi tests completed
- Zero flights completed

Figure 2-3: Typical Phase III AirSTAR Project UAS Pilot Scaled Pilot Trainers