

# AirSTAR Project

GTMP-2033

## Airworthiness Certification for AirSTAR Subscale Aircraft

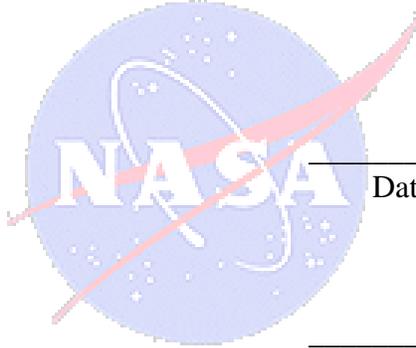


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# Airworthiness Certification for AirSTAR Subscale Aircraft

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## **APPLICABILITY**

All subscale aircraft flown under the AirSTAR Project shall follow the process described in this document prior to being certified as airworthy. No subscale aircraft shall be flown for pilot training, electronic testing and/or research flight until this process is complete. Subscale aircraft that have completed the certification process but require changes or repairs to; structural components, electrical systems, control systems and/or data systems may require complete or partial recertification based on magnitude of changes made.

## **Updating of Procedures**

This document shall be updated when lessons learned or experience demonstrates the need for change. Other reasons include but are not limited to meeting mandatory rules and regulations that govern the operation of subscale aircraft.

## **Purpose**

The purpose of this plan is to set guidelines and instructions that cover subscale aircraft airworthiness certification. Providing a set by set process of checks and inspections structured to ensure the vehicle is structurally, mechanically and electrically ready for flight. To provide the Airworthiness Safety Review Board with the necessary information for issuing a Flight Safety Release.

## **1.0 Fabrication Complete and Inspected**

### **1.1 Fabrication**

When the subscale aircraft is structurally complete the fabrication team shall notify the Chief Engineer that fabrication is complete and ready for inspection. If the subscale aircraft is purchased complete the fabrication team will unpack and examine the vehicle for damage during shipping. If any repairs or changes are required the fabrication team will send the vehicle back for repairs or make the repairs and changes. Once the fabrication team determines the purchased subscale aircraft is complete they shall notify the Chief Engineer.

### **1.2 Chief Engineer Inspection**

The Chief Engineer shall conduct a final structural inspection prior to the outfitting of the subscale aircraft with electronic and fuel systems. The Chief Engineer may review the fabrication process on a weekly (or daily) basis for vehicle fabricated at NASA Langley Research Center (LaRC). When the Chief Engineer is satisfied the subscale aircraft is structurally sound, an approval is issued for outfitting.

### **1.3 Systems Installation**

The subscale aircraft shall be outfitted with control systems, air system, fuel system, engine system and electronic systems as required for its intended use.

### **1.4 Control Surface Calibration**

Control surfaces shall be calibrated to ensure all requirements are met. This includes flaps, ailerons, spoilers, elevators, rudder, split surfaces or other controls that may be added. When all surfaces are calibrated and meet requirements the Chief Pilot shall be notified.

### **1.5 Chief Pilot Checkout**

The Chief Pilot shall check and/or test all the control systems using the transmitter and program designated for the subscale aircraft. This shall include flaps, ailerons, spoilers, elevators, rudder, split surfaces, engine starting, engine throttle/thrust, steering system, landing gear system, brakes and data systems where required.

### **1.6 Stress Analysis or Load Test**

The Chief Engineer shall provide a stress analysis or conduct a load test to verify required load carrying capabilities of the subscale aircraft. The Chief Engineer shall note all limitations based on the results of testing or analysis.

The analysis shall be started when a preliminary weight is determined and adjusted when the final weight has been verified.

### **1.7 Chief Engineering Approval**

The Chief Engineer shall perform a final inspection of the subscale aircraft and sign off using project form GTMP-2022. This signed document certifies that the Chief Engineer believes the subscale aircraft is ready for Preflight Tests.

## **2.0 Preflight Tests**

Preflight tests shall begin after the Chief Engineer has approved the subscale aircraft by signing form GTMP-2022. No flight testing can take place until all Preflight Tests are complete.

### **2.1 Extended Radio Test**

An extended radio test shall be conducted using project document GTMP-6012.

### **2.2 Preflight Checklist**

A preflight checklist shall be developed for each different type of subscale aircraft. This checklist shall be followed in preparation for preflight inspection, radio check, taxi test, future flight tests, engine shut down, and securing of the subscale aircraft after each test or flight.

### **2.3 Taxi Test**

Taxi testing shall be completed prior to Flight Testing

#### **2.3.a Engine Run-up Test**

An engine run-up test shall be conducted to test throttle and engine response. Vehicles with dual engines shall be tested for asymmetrical thrust issues.

#### **2.3.b Low Speed Taxi Test**

A low speed taxi test shall be conducted to verify steering and control.

#### **2.3.c High Speed Taxi Test**

A high speed taxi test shall be conducted to verify steering and control. Vehicle configuration and speed shall not allow it to become airborne.

#### **2.3.d Inspection**

An inspection of the subscale aircraft after the taxi test shall be conducted to verify that no damage occurred during the taxi test and all components remain secure.

### **3.0 Airworthiness Safety Review Board (ASRB)**

The ASRB must approve all aircraft flown under the AirSTAR Project.

#### **3.1 Notification and Presentation**

The AirSTAR project shall notify the ASRB of its desire to operate each new subscale aircraft prior to flight operations. Based on its characteristics the ASRB shall determine what type of presentation or documentation is required. The project shall meet all requirements and request a flight safety release for each vehicle.

#### **3.2 Flight Safety Release**

Prior to flight testing the project must receive a Flight Safety Release (FSR) from the ASRB. The FSR shall have an expiration date (generally one year). The project is required to update the FSR through the ASRB on or before the expiration date for each subscale vehicle if the vehicle is to be flown.

### **4.0 Flight Testing**

The Preflight Checklist shall be followed in preparation for all flights.

#### **4.1 First Flight**

The objectives of the first flight shall be to take off, fly oval patterns while trimming the subscale aircraft and evaluating its control/ handling characteristics. The pilot shall make one or more passes as necessary in preparation for landing and land the vehicle. Flight time will be approximately 3-6 minutes.

#### **4.2 Inspection**

An inspection of the subscale aircraft after the first flight shall be conducted to verify that no damage occurred during the test flight, all components remain secure, there are no cracks in the structure and remaining fuel approximates the expected volume.

### **4.3 Second Flight**

The objectives of the second flight shall be to take off, fly oval patterns, check trim settings, continue evaluating control/handling characteristics, fly target speeds and any preplanned maneuvers. The pilot shall make one or more passes as necessary in preparation for landing and land the vehicle. Flight time will be approximately the duration of planned future flights (generally 10-12 minutes).

### **4.4 Inspection**

An inspection of the subscale aircraft after the second flight shall be conducted to verify that no damage occurred during the test flight, all components remain secure, there are no cracks in the structure and remaining fuel approximates the expected volume.

## **5.0 Certification**

When items in sections 1-4.4 are completed the subscale aircraft has completed the requirements for airworthiness certification. The Project Safety Officer or Systems Engineer shall complete the documentation process.

### **5.1 Signatures**

All appropriate documentation was completed and signed.

### **5.2 Certification Number Assigned**

A certification number will then be assigned to the subscale aircraft.

### **5.3 Documentation Filed**

All documentation shall be stored or archived in a project file.

## **6.0 Requirements for Re-Certification**

As changes, modifications or repairs are made to certified subscale aircraft the Chief Pilot, Chief Engineer or Systems Engineer shall discuss and decide what steps in the certification process must be repeated before the vehicle is airworthy and ready for flight.