WISM Twin Otter Mission Statement of Work

Background:

The NASA Goddard Space Flight Center (GSFC) is seeking flight operation support from a NASA-Approved Operator of a Twin Otter aircraft to conduct a scientific campaign in September - October 2015 and March 2017 in the Grand Mesa area of Colorado for the WISM (Wideband Instrument for Snow Measurement) Instrument Suite, which includes the WISM Radar-Radiometer payload, and the Mini-ATM Lidar. An optional science campaign in March 2016 may be requested. The dates specified may shift but up to a month due to external factors.

Twin Otter aircraft

Requirements:

Operator/Aircraft Baseline Requirements -

- The operator shall supply a Twin Otter Aircraft with a nadir viewing port of sufficient size and cargo door to accommodate science instruments and the associated antennas.
- The aircraft shall be capable of flying safely with the cargo door open when the antenna is deployed.
- The aircraft/operator shall have flight planning software that accepts science waypoints.
- Instrument/commercial rating.
- The operator shall have experience flying science missions including previous projects with NASA and other government agencies, e.g. USFS and NOAA.
- Power requirements: The System requires 30 amps of 28 VDC power at start-up to supply a circuit to power the science instruments.
- The vendor's pilots shall demonstrate capability and willingness to fly the planes at low altitude in remote areas: Previous flights, and flights planned for this study, will take the aircraft and occupants over remote areas at ~300 - 500m AGL.

October 2015 **Flight Operations –**

- The vendor shall perform all necessary engineering, manufacturing, and installation work to install the instrument suite consisting of the GSFC WISM and Mini-ATM Lidar instruments and the additional Boise State radar in a Twin Otter aircraft in accordance with Federal Aviation Administration (FAA) regulations.
- The vendor shall install the GSFC WISM Instrument Suite in a Twin Otter aircraft at the vendor's facility.

- The vendor shall conduct up to 12 hours of science flights between 09/28/2015 and 10/09/2015 around the Grand Mesa area of Colorado. All flight operations shall be conducted from Grand Junction, Colorado. Should additional flight hours be required then a separate request for additional flight hours will be made at that time.
- The GSFC Principal Investigators (PI) will supply flight line(s) and mission profiles 48 hours prior to flight. The vendor shall complete all flight planning required to support the science flights.
- The vendor shall provide accommodations for 2-3 science personnel to fly on the aircraft during science flights.
- The vendor shall provide 2-3 science racks for use of mounting the WISM Instrument Suite in the aircraft cabin.
- Upon successful completion of the Grand Mesa area flights the vendor shall remove the WISM Instrument Suite from the aircraft. GSFC personnel will be at the vendor's facility to assist with de-integration and to pack and return the instrument to the GSFC.
- The vendor shall supply an area at its facility to support a seven person GSFC instrument teams operations (benches, internet access, power, chairs, etc.)
- The vendor shall acquire all necessary FAA approvals (engineering and flight operations) to conduct the WISM science campaign.

March 2017 **Flight Operations –**

- The vendor shall re-install the WISM Instrument Suite in a Twin Otter aircraft at the vendor's facility in accordance with FAA regulations.
- The vendor shall conduct up to 12 hours of science flights over a two week period in March 2017 around the Grand Mesa area of Colorado. All flight operations shall be conducted from Grand Junction, Colorado. Should additional flight hours be required then a separate request for additional flight hours will be made at that time.
- The GSFC PI will supply flight line(s) and mission profiles to the vendor 48 hours before the flight. The vendor shall complete all flight planning required to support the science flights.
- The vendor shall provide accommodations for 2-3 science personnel to fly on the aircraft during science flights.
- The vendor shall provide 2-3 science racks for use of mounting the WISM Instrument Suite in the aircraft cabin.
- Upon successful completion of the Grand Mesa area flights the vendor shall remove the WISM Instrument Suite from the aircraft. GSFC personnel will be at the vendor's facility to assist with de-integration and to pack and return the instrument to the GSFC.
- The vendor shall supply an area at its facility to support a seven person GSFC instrument teams operations (benches, internet access, power, chairs, etc.)
- The vendor shall acquire all necessary FAA approvals (engineering and flight operations) to conduct the WISM science campaign.

March 2016 **Flight Operations (Optional) –**

- The vendor shall re-install the WISM Instrument Suite in a Twin Otter aircraft at the vendor's facility in accordance with FAA regulations.
- The vendor shall conduct up to 12 hours of science flights over a two week period in March 2017 around the Grand Mesa area of Colorado. All flight operations shall be conducted from Grand Junction, Colorado. Should additional flight hours be required then a separate request for additional flight hours will be made at that time.
- The GSFC PI will supply flight line(s) and mission profiles to the vendor 48 hours before the flight. The vendor shall complete all flight planning required to support the science flights.

- The vendor shall provide accommodations for 2-3 science personnel to fly on the aircraft during science flights.
- The vendor shall provide 2-3 science racks for use of mounting the WISM Instrument Suite in the aircraft cabin.
- Upon successful completion of the Grand Mesa area flights the vendor shall remove the WISM Instrument Suite from the aircraft. GSFC personnel will be at the vendor's facility to assist with de-integration and to pack and return the instrument to the GSFC.
- The vendor shall supply an area at its facility to support a five person GSFC instrument teams operations (benches, internet access, power, chairs, etc.)
- The vendor shall acquire all necessary FAA approvals (engineering and flight operations) to conduct the WISM science campaign.

Reviews -

- After award of contract, and prior to the test flight(s) of each flight campaign, the vendor shall provide the NASA Engineering and Risk Analysis Panel (ERAP) the following items to complete the airworthiness review (in vendor format, .pdf file type):
    - Updated Contract Aircraft Questionnaire and requested documentation required by the questionnaire for items that have changed since the NASA Safety Review.
    - Configuration drawing of the aircraft showing the location of the instrument, racks, seats, etc. to support the WISM science campaign.
    - Proof of a successful electrical load analysis.
    - Proof of a successful electromagnetic interference test.
    - Signed FAA Form 8110 and/or Form 337 showing FAA approval for the installation of all instruments comprising the WISM Instrument Suite on the aircraft.
    - Weight and balance approximations.
- Any actions items resulting from the NASA ERAP review shall be complied by the vendor.
- Following the successful completion of the ERAP airworthiness review the vendor and GSFC PI shall present to NASA a Flight Readiness Review (FRR) (no later than 5 days prior to start of flight operations) to include the following items (in vendor format, .pdf file type):
    - Flight operations procedures
    - Operational Go/No-Go criteria
    - Pilot qualifications, flight operations training, and flight manuals
    - Aircraft configuration
    - Aircraft maintenance
    - Payload combinations
    - Special weather conditions
    - Pre-accident and/or incident plan
    - Aircraft separation/coordination
    - Communication plan
    - Ground operations procedures dealing with hazardous systems
    - Schedule timeline
    - Roles and responsibilities
    - Deployment and logistical needs
    - Liability coverage
- Any actions items resulting from the NASA FRR shall be complied by the vendor.

- Once a successful FRR is completed NASA will issue a Safety of Flight Release, Certificate of Airworthiness, and Approval to Proceed. Flight operations shall not commence until these three documents have been signed and approved by NASA.

NASA Documentation:

The vendor shall comply with the following NASA documents:

- NPR 7900.3 Aircraft Operations Management Manual
- 830-FOM-0001 NASA Wallops Flight Facility Flight Operations Manual
- 800-PG-1060.2.2 Airworthiness Review Process

Items provided by NASA:

NASA will provide the following items in support of the flight campaigns:

- All available WISM Instrument Suite technical documentation available to assist in the installation of the instrument to the aircraft.
- WISM Instrument Suite and shipping of instrument suite to and from vendor's facility
- Flight line(s)
- Experiment team to operate the instrument suite
- Mission project management with the exception of flight operation planning
- Anomaly and mishap investigation support

Deliverables:

Any associated documentation, science data, hardware, etc. collected; generated or manufactured/purchased in the execution of this SOW shall be the sole property of NASA Goddard Space Flight Center at the conclusion of the contract.

Final Closeout:

This SOW will be considered completed when the WISM instrument has been removed from the aircraft and all deliverables have been provided to NASA.