

NASA/ Dryden Flight Research Center

# Aircraft Operations Support

Statement of Work, dated August 18, 2011

**DRAFT**

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## **LIST OF ACRONYMS AND DEFINITIONS**

<b>A&amp;P</b>	<b>Airframe and Powerplant</b>
<b>AC</b>	<b>Advisory Circular</b>
<b>AFSRB</b>	<b>Airworthiness &amp; Flight Safety Review Board</b>
<b>ANSI</b>	<b>American National Standards Institute</b>
<b>AOS</b>	<b>Aircraft Operations Support</b>
<b>APO</b>	<b>Aircraft Parts Office</b>
<b>ATC</b>	<b>Air Traffic Control</b>
<b>AWS</b>	<b>American Welding Society</b>
<b>CAD</b>	<b>Computer-Aided Design</b>
<b>CCB</b>	<b>Configuration Control Board</b>
<b>CFR</b>	<b>Code of Federal Regulations</b>
<b>CO</b>	<b>Contracting Officer</b>
<b>COM</b>	<b>Contractor's Operations Manual</b>
<b>CONUS</b>	<b>Contiguous United States (48 states)</b>
<b>COTR</b>	<b>Contracting Officer Technical Representative</b>
<b>D</b>	<b>Depot Level of Aircraft Maintenance</b>
<b>DAOF</b>	<b>Dryden Aircraft Operations Facility, Palmdale, CA</b>
<b>DCP</b>	<b>Dryden Centerwide Procedure</b>
<b>DFRC</b>	<b>Dryden Flight Research Center, Edwards, CA</b>
<b>DLA</b>	<b>Defense Logistics Agency</b>
<b>DOP</b>	<b>Dryden Organizational Procedure</b>
<b>DRD</b>	<b>Data Requirement Description</b>
<b>DTR</b>	<b>Drawing Tracking Record</b>
<b>ETIC</b>	<b>Estimated Time to Complete</b>
<b>FAA</b>	<b>Federal Aviation Administration</b>
<b>FAR</b>	<b>Federal Aviation Regulation</b>
<b>FLIP</b>	<b>Flight Information Publications</b>
<b>GIDEP</b>	<b>Government / Industry Data Exchange Program</b>
<b>GMAW</b>	<b>Gas Metal Arc Welding</b>
<b>GTAW</b>	<b>Gas Tungsten Arc Welding</b>

<b>I</b>	<b>Intermediate Level of Aircraft Maintenance</b>
<b>IEC</b>	<b>International Electrotechnical Commission</b>
<b>ISO</b>	<b>International Organization for Standardization</b>
<b>MIL</b>	<b>Military</b>
<b>NAMIS</b>	<b>NASA Aircraft Management Information System</b>
<b>NAS</b>	<b>National Aerospace Standard</b>
<b>NASA</b>	<b>National Aeronautics and Space Administration</b>
<b>NC</b>	<b>Numerical Controlled</b>
<b>NDI</b>	<b>Non-Destructive Inspection</b>
<b>NDT</b>	<b>Non-Destructive Testing</b>
<b>NPD</b>	<b>NASA Policy Directive</b>
<b>NPR</b>	<b>NASA Procedural Requirement</b>
<b>O</b>	<b>Organizational Level of Aircraft Maintenance</b>
<b>OAW</b>	<b>Oxyacetylene Welding</b>
<b>OCONUS</b>	<b>Outside Contiguous United States (outside the 48 states)</b>
<b>OEM</b>	<b>Original equipment Manufacturer</b>
<b>OSHA</b>	<b>Occupational Safety and Health Administration</b>
<b>PFPS</b>	<b>Portable Flight Planning Software</b>
<b>PIP</b>	<b>Product Improvement Publications</b>
<b>QA</b>	<b>Quality Assurance</b>
<b>QAR</b>	<b>Quality Assurance Report</b>
<b>QMS</b>	<b>Quality Management System</b>
<b>R&amp;D</b>	<b>Research and Development</b>
<b>SAME</b>	<b>Similar to Automated Maintenance Environment System</b>
<b>SMAW</b>	<b>Shielded Metal Arc Welding</b>
<b>SOW</b>	<b>Statement of Work</b>
<b>STD</b>	<b>Standard</b>
<b>TM</b>	<b>Technical Monitor</b>
<b>UAS</b>	<b>Uninhabited Aerial Systems</b>
<b>WAD</b>	<b>Work Authorization Document</b>

## LIST OF REFERENCE DOCUMENTS

DCP-O-001	Aircraft Maintenance and Safety Manual
DCP-O-004	Engineering Drawing Control
DCP-O-005	Parts Control and Identification
DCP-O-007	Metrology System
DCP-O-016	Aircraft Parts Purchasing
DCP-O-018	Environmental Acceptance Testing: Electronic & Electromechanical Equipment
DCP-O-024	Product Improvement Publications (PIP) on Dryden Controlled Aircraft
DCP-S-011	Aerospace Vehicles and/or Major Flight Subcomponents Acceptance Inspection
DCP-S-015	Product Quality Deficiency Reporting Process for Defense Logistics Agency (DLA) Hardware
DCP-S-019	Product Assurance
DCP-S-057	Inspection Stamp Control
DCP-S-058	Procurement Quality Assurance Process
DCP-S-064	Lifting Operations, Devices, & Equipment
DCP-X-020	Flight Operations Readiness Review
DOP-O-011	Aircraft Maintenance Operations
DOP-O-300	Aircrew Flight Operations Manual
DOP-O-301	Flight Crew UAS Flight Operations Manual
DOP-O-401	Aircraft Electrical Systems
NPD 7900.4	NASA Aircraft Operations Management
NPD 8730.1C	Metrology and Calibration
NPR 1441	NASA Records Retention Schedules
NPR 7120.5 Requirements	NASA Program and Project Management Processes and Requirements
NPR 7900.3	Aircraft Operation Management Manual
NPR 8000.4	Agency Risk Management procedural Requirements
NPR 8621.1	NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping
NASA STD 8719.9	Standard for Lifting Devices and Equipment

<b>NAS 410</b>	<b>Non-Destructive Testing (NDT) personnel qualifications</b>
<b>AWS D17.1</b>	<b>Specification for Fusion Welding for Aerospace Applications</b>
<b>FAA AC 20-109A</b>	<b>Service Difficulty Program</b>
<b>FAA AC 21-29C</b>	<b>Detecting and Reporting Suspected Unapproved Parts</b>
<b>FAA AC 43.13-1B or 2B</b>	<b>Acceptable Methods, Techniques and Practices – Aircraft Inspection and Repair</b>
<b>FAA 14 CFR Part 43</b>	<b>Maintenance, Preventive Maintenance, Rebuilding, and Alteration</b>
<b>FAA 14 CFR Part 91</b>	<b>General Operating and Flight Rules</b>
<b>AS9100C</b>	<b>Quality Management Systems – Requirements for Aviation, Space and Defense Organizations</b>
<b>ANSI ISO/IEC 17025</b>	<b>General Requirements for the Competence of Testing and Calibration Laboratories</b>

## **1 Introduction**

This Statement of Work (SOW) describes the work to be performed and the deliverables to be provided by the Contractor under this Aircraft Operations Support (AOS) contract. The purpose of this contract is to support the operations of all aircraft assigned to Dryden Flight Research Center (DFRC). Contractor shall manage its workforce to ensure that quality products and safe operations are provided to NASA and NASA customers.

## **2 Scope**

DFRC aircraft are operated to meet both Center and Agency platform, research, and support aircraft requirements. DFRC aircraft are defined as those located at main campus (Edwards Air Force Base, California) and Dryden Aircraft Operations Facility (DAOF) located in Palmdale, California. During deployments, DFRC may conduct aircraft operations from other facilities, including Contiguous United States (CONUS) and Outside Contiguous United States (OCONUS). The Contractor shall support all aircraft operations, including aircraft maintenance (Organizational [O], Intermediate [I], as well as limited Depot [D] level), aircraft modification, aircrew, and flight-line operations.

## **3 Aircraft**

The Contractor shall maintain all assigned equipment, as described herein on airframes, and engines assigned to DFRC. Aircraft types include, but are not limited to, motorglider through large commercial, military and experimental one-of-a-kind research aircraft. Some are FAA certified. For a current listing see Appendix 1.

## **4 General Requirements**

The Contractor shall meet the requirements for maintenance and operations as directed in [NASA Procedural Requirement \(NPR\) 7900.3, Aircraft Operations Management Manual](#), [NPR 7120.5, NASA Program and Project Management Processes and Requirements](#), and the Federal Aviation Administration (FAA) [Federal Aviation Regulations 14 CFR \(Code of Federal Regulations\) Part 43](#). 14 CFR Part 43 shall be the default document for minimum standards for acceptable maintenance practices. NASA reserves the right to inspect any system or procedure with NASA personnel that affects quality or safety. The Contractor's responsibilities include but are not limited to:

1. Exercise management and operational control for performance requirements set forth in this SOW
2. Meet or exceed the metrics outlined in the Data Requirement Description (DRD), Performance Goals
3. Support surge demands in staffing or workloads dictated by mission deployments, operations or maintenance requirements. Examples include: adjusting shifts, adding multiple shifts or part time/temporary personnel

## **5 Management**

The Contractor shall provide on-site management and establish management procedures to fulfill the requirements of this SOW. The Contractor also shall be required to interface,

as required, with various NASA organizations, other NASA Contractors, and appropriate regulatory bodies.

Specifically the Contractor shall:

1. Provide all management, supervision, labor and materials to perform the requirements of this contract. Provide a fully trained, qualified and certified (if required) workforce that must meet the personnel requirements listed in the DRDs. All Contractor personnel duties shall be in compliance with DCP-O-001, Aircraft Maintenance & Safety Manual as it pertains to Flight Operations requirements
2. Plan, organize, schedule, and direct their staff in order to successfully accomplish the requirements of this SOW
3. Control their costs to meet the contract's estimated cost budget
4. Procure goods and services in accordance with the Federal Aviation Regulation (FAR) and NASA FAR Supplement as approved by the Contracting Officer (CO) or Contracting Officer Technical Representative (COTR)
5. Resolve conflicts involving daily activities, planning future operations, and supervising Contractor personnel assigned to this contract
6. Provide timely and effective communications with the NASA CO, COTR and Technical Monitor (TM)
7. Develop a safety and health plan
8. Implement safety, health, and environmental program requirements. Respond to center-wide safety, health, environmental, and fire protection concerns and goals, and participate in meetings and other activities related to the Safety and Health Plan
9. Develop, implement, and maintain a Contractor's Operations Manual (COM)
10. Maintain reports and records in accordance with [NPR 1441, NASA Records Retention Schedules](#)
11. Use the Government furnished aircraft maintenance, logistics, and inventory management information systems to input all data to ensure aircraft maintenance and logistics functions are accomplished

## **6 Safety**

### **6.1 Safety Involvement**

The Contractor shall participate in Center and Flight Operations level safety meetings, forums and initiatives as communicated by the COTR. Participation includes both activity related to, preparation for, attendance at, and responses to such activities. These include, but are not limited to, Center Safety All-Hands meetings, Safety Management System audits and inspections, Safety committees, Safety Forums, Safety culture surveys, and mishap investigation support.

### **6.2 Safety Management System**

The contractor shall participate and comply with DFRC's selected Safety Management System protocol as it applies to their activity. The contractor shall develop and maintain a system to manage risks to DFRC operations in accordance with NPR [8000.4, Agency](#)

[Risk Management Procedural Requirements](#) that are associated with their statement of work. This activity will be formally documented and reported quarterly to the COTR.

### **6.3 Mishap Investigation Support**

Where mishaps will be investigated by NASA (either solely or in parallel to another organization), the Contractor and their employees will participate in providing data, information, hardware, software, firmware, etc. that are deemed by NASA to be pertinent to the mishap investigation. Contractor property, equipment, and information will be protected as marked and will be returned at the end of the investigation. Contractor personnel involved or witnessing the mishap or related events will complete a witness statement and participate in interviews at the direction of authorized NASA investigation personnel. Written and oral contractor testimony will be deemed privileged and protected in accordance with [NPR 8621.1, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping](#).

## **7 Maintenance and Modification Services**

The following sections apply to all platform, research, and support aircraft.

All maintenance shall be performed in accordance with the approved aircraft technical data and the QMS procedures identified in Section 7.4. The applicable technical data is available in the DFRC technical order library. The Contractor shall provide common aviation hand tools for the performance of aircraft maintenance.

Contractor operations shall include servicing, preventive and routine maintenance on - DFRC, aircraft and their respective systems. The Contractor's responsibilities include but are not limited to:

1. Remove, disassemble, inspect, repair, overhaul, adjust, test, assemble and re-install components when required by the aircraft inspection program
2. Perform maintenance to comply with FAA regulations as defined in NPR 7900.3 and applicable aircraft technical data
3. Support NASA directed maintenance on Government transient aircraft

### **7.1 Performance Rules**

All maintenance and inspections shall be performed in accordance with applicable NASA, Air Force, Navy, FAA and commercial requirements.

### **7.2 Maintenance Operations Office**

The Contractor shall support the Maintenance Operations Office in accordance with DOP-O-011, Aircraft Maintenance Operations, to include:

1. Maintain currency of permanent record/historical databases for Support and Research aircraft assigned to DFRC in accordance with applicable NASA, Air Force, Navy, FAA and commercial requirements
2. Operate and maintain the F-18 Similar to Automated Maintenance Environment System (SAME). This includes:

- a. Downloading data from the Maintenance Data Recording System package.
- b. Reviewing and entering additional data required for update of the strain gage and engine databases in accordance with Command Navy Air Pacific Instruction 4790.33
- c. Providing data to the Navy authority for each F-18 aircraft under DFRC control and retain backup archive tapes for 1 year
3. Maintain aircraft schedule for unscheduled and scheduled maintenance or related activities to include:
  - a. Inspections
  - b. Calibration
  - c. Weight & balance
  - d. In-flight operational checks
  - e. Air Force Support (i.e. Edwards AFB back-shop and facility support)
4. Coordinate with Flight Operations Scheduling Office to determine mission support requirements
5. Process all electronic or manual documentation required for aircraft flight release
6. Request fuel and maintenance support from NASA approved activity as required
7. At the daily aircraft maintenance meeting, shall provide updated aircraft status to include the Estimated Time to Complete (ETIC) of the maintenance in work
8. Input data into the NASA provided maintenance data collection system and produce reports as requested
9. Interface daily with NASA to meet flying requirements and requests. The Contractor shall maintain the ability to add aircraft to the schedule on a day-to-day basis to meet changing operations and maintenance requirements
10. Ensure aircraft are not released for flight with safety of flight discrepancies, inspections or Life-Limited Components due scheduled maintenance, or any discrepancy that can impact the mission, and coordinate all efforts through the NASA Aircraft Maintenance Division Chief

### **7.2.1 Parts Expeditor and Tool Crib Attendants**

The Contractor shall provide the following support:

1. A Parts Expeditor to transport DFRC aircraft hardware when required
2. A Tool Crib Attendant to work in the Tool Cribs handing out tools, minor hardware, inventorying tools, and inspecting tools

### **7.2.2 Required Maintenance Training**

The Technical Training Instructor shall prepare, schedule, and conduct classroom instruction for initial and re-certification training of Government employees and other Government contractor employees requiring training in the following areas:

- Surface Mount Technology

- Soldered Electrical Connections

- Manufacturing of cable harnesses, to include wire crimping, splicing and stripping techniques

- Manufacturing of fiber optic bundles, connectors and terminations

### **7.3 Maintenance**

The Contractor shall support maintenance and repair at the Organizational (O) and Intermediate (I) Level, as well as limited Depot (D) level for all platform, research, and support aircraft, under this contract.

The Contractor shall maintain all aircraft systems in accordance with NASA, Air Force, Navy, FAA and commercial requirements. All Contractor aircraft airframe and powerplant technicians shall obtain a FAA Airframe and Powerplant (A&P) certificate no later than one year from date of assignment to NASA/DFRC. Avionics/Electrical technicians for support aircraft shall only be required to obtain the Airframe certificate and shall accomplish this no later than one year from date of assignment to NASA/Dryden.

The Contractor shall assist, when requested by NASA, in performing limited O, I, and D level-type research modifications requiring the installation of special equipment or instrumentation packages for all platform, research, and support aircraft, under this contract. All documentation and authorization for modifications shall be in compliance with existing procedures and specifications and approved by the cognizant Configuration Control Board (CCB).

The Contractor shall follow the maintenance instructions on product improvement publications listed in DCP-O-024, Product Improvement Publications (PIP) on Dryden Controlled Aircraft.

The Contractor shall maintain a safe and clean shop environment; conform to all relevant NASA, Occupational Safety and Health Administration (OSHA) and industry safety standards and requirements.

All Contractor Technicians shall have the ability to obtain and possess a SECRET security clearance.

### **7.3.1 Scheduled Maintenance**

The Contractor shall provide the following support:

1. Perform maintenance, modification and repair at the Organizational and Intermediate level in accordance with DCP-O-001 and NPR 7900.3 for all aircraft systems and subsystems
2. For all FAA certificated aircraft, ensure maintenance standards meet FAA 14 CFR Part 91, subparts A and B except when requirements of NPR 7900.3 are more restrictive
3. The Contractor shall be responsible for maintenance, modification, and repair at the Operational Level and Intermediate Level for all systems and subsystems in accordance with the manufacturer's technical data

#### **7.3.1.1 Pre-dock Meeting**

Pre-dock meetings shall be conducted in accordance with NASA-approved contractor developed process.

### **7.3.2 Unscheduled Maintenance**

#### **7.3.2.1 General**

The Contractor shall provide the following support:

1. Perform unscheduled maintenance for each aircraft type
2. Ensure aircraft with safety of flight discrepancies are not released for flight with inoperative instruments or equipment installed unless an approved Minimum Equipment List exists and is approved by NASA or the FAA
3. Ensure flyable discrepancies are repaired as soon as practical
4. Ensure maintenance is accomplished in accordance with NASA, Air Force, Navy, FAA and commercial requirements
5. For all FAA certificated aircraft, ensure maintenance standards meet FAA FAR Part 91, subparts A and B except when requirements of NPR 7900.3 are more restrictive

#### **7.3.3 Flightline Services**

Support flightline services on all DFRC assigned and transient aircraft in accordance with NASA, Air Force, Navy, FAA and commercial requirements. This support includes all flight line servicing, aircraft handling, launch, and recovery.

#### **7.3.4 Off Site Recovery**

Repairs required on aircraft off site shall be performed by the Contractor when required and authorized by NASA. The Contractor shall comply with DCP-O-001. These off site locations include both CONUS and OCONUS. The Contractor shall also be required to participate with NASA in emergency recovery operations for any

incidents/accidents associated with DFRC aircraft. Participation may require the repair of disabled aircraft, recovery of aircraft or aircraft related hardware from crash sites. The Contractor shall participate in the security and safety of the aircraft as required until the aircraft is returned to DFRC.

## **7.4 Quality Management System**

### **7.4.1 Management Responsibility**

The Contractor shall provide an on-site Quality Manager who is responsible for the Contractor's overall Quality Management System (QMS). The Quality Manager shall be independent of the maintenance organization. The Contractor shall prepare a Quality Assurance Manual in accordance with AS9100C, Quality Management Systems – Requirements for Aviation, Space, and Defense Organizations and define and document its policy for quality; including objectives for quality, and its commitment to quality. The quality policy shall be relevant to the organizational goals and expectations and align with DFRC's quality policy. The Contractor shall ensure that this policy is understood, implemented, and maintained at all levels of the organization.

### **7.4.2 Contractor Inspectors**

The Contractor shall perform inspections on all aircraft work indicated below and when required by the applicable Work Authorization Document (WAD). The Contractor shall ensure all Inspections are accomplished prior to the aircraft, engine, or appliance being returned to service. Inspections may be performed on any system or procedure to ensure quality of the product. These duties shall include but are not limited to:

1. Perform aircraft inspections of quality procedures, processes, and change requests
2. Perform toolbox inventory inspections
3. Monitor currency and filing of technical publications at aircraft
4. Perform operational tests/checks on equipment in accordance with approved technical data
5. Recommend changes in methods, procedures, processes and other techniques employed to improve the productivity without compromising safety or quality of assigned tasks
6. Ensure the requirements for Continued Airworthiness are available prior to the aircraft being returned to service
7. Shall have an A&P certificate

### **7.4.3 Inspection Stamp Control**

The Contractor's Quality Manual shall establish Inspection/Stamp Control Procedures for the issuance, control, and use of inspection stamps. The Contractor stamps shall not resemble the NASA Quality assurance (QA) quality stamps. The inspection stamp shall not be duplicated, loaned or used by any employee except to whom it is assigned. The Contractor's Stamp Control Procedures shall meet or

exceed DCP-S-057, Inspection Stamp Control. The Contractor's Quality Manual shall also comply with the requirement for submitting Appointing Orders to DFRC QA Branch Chief. The Contractor shall obtain concurrence from Maintenance Operations, Avionics or the applicable backshop Branch Chief prior to submitting to the DFRC Quality Assurance Branch Chief for approval and issuance of stamp. The Contractor shall provide the following evidence to support certification / qualification of personnel the Contractor is considering for stamp issuance:

1. Training records
2. Experience of individual

#### **7.4.4 Corrective Action**

The Contractor shall take action to eliminate the cause of workmanship and customer audit nonconformance's in order to prevent recurrence. Corrective or preventive actions shall be appropriate to the effects of the nonconformance encountered or the effects of the potential occurrence. The Contractor shall establish and maintain a documented procedure for identifying and preventing deficiencies in the QMS that include:

1. Procedures for reviewing nonconformance
2. Determining the causes of nonconformance
3. Evaluate, determine, and implement corrective actions to ensure that nonconformance is prevented and/or do not reoccur
4. Recording the results of action taken
5. Reviewing corrective and/or preventative action taken
6. Identifying the specific actions where timely and effective corrective actions are not achieved
7. Perform root cause analysis, corrective and preventive actions for all nonconformance's discovered by NASA Quality Assurance in accordance with DCP-S-006, Quality Assurance Audit
8. Implement and record any changes to Contractor's documented procedures if applicable, resulting from corrective action
9. Utilize FAA systems identified in [FAA AC 20-109A, Service Difficulty Program](#), [FAA AC 21-29C, Detecting and Reporting Suspected Unapproved Parts](#), and Government / Industry Data Exchange Program (GIDEP) to alert other agencies of suspect components. Problems shall also be reported to the DFRC Quality Assurance Branch Chief or designee

#### **7.4.5 Inspection and Test Status**

The Contractor shall use DCP-S-019 to status inspection and test records. The Contractor's responsibility includes but is not limited to:

1. Record all Contractor inspections and / or Quality assurance Report (QAR) inspection coverage on the applicable quality records
2. Record measurement results (the record shall show the actual test results data) and evaluate test / inspection results against accept / reject criteria
3. Record measurement instruments used including identification number and due date

4. Ensure all work which requires an inspection by the Quality Manager or contractor inspector is performed and subsequently captured in the NASA aircraft maintenance management system, on the appropriate quality record (if applicable), or other approved documentation format
5. Each inspection or repair action shall be entered in the NASA aircraft maintenance management system showing completion of the task
6. Ensure specified type aircraft technical data or [FAA AC 43.13-1B or -2B, Acceptable, Methods, Techniques and Practices - Aircraft Inspection and Repair](#), are followed
7. The Contractor shall perform special inspections / one-time inspections in accordance with the Aircraft Maintenance Program and DCP-O-001 and DCP-S-015 Product Quality Deficiency Reporting Process for Defense Logistics Agency (DLA) Hardware

#### **7.4.6 Control of Nonconforming Product**

The Contractor shall control nonconforming products in accordance with DCP-S-019 and DCP-O-005.

#### **7.4.7 Internal Quality Audits**

The Contractor shall perform, as a minimum, audits of their QMS on an annual basis. Audits will include personnel training and qualifications, procedures, services, and operations for tasks assigned under this SOW to verify compliance with AS9100C.

The Contractor shall support all audits and reviews and will provide supporting documents when requested.

### **7.5 Aircraft Configuration and Drawing Control**

#### **7.5.1 Configuration Control**

The Contractor shall accomplish configuration control procedures in accordance with DCP-O-001 to provide a systematic approach for the control of all documents, drawings, reports, and quality records associated with project activities and modifications involving all DFRC assigned aircraft.

1. Provide document control, re-production, distribution and storage of Configuration Control and related documents concerning engineering changes as required
2. Record and distribute minutes from Configuration Control and other designated meetings

#### **7.5.2 Drawing Control**

The Contractor shall provide drawing control services. The Contractor shall perform all work in accordance with DCP-O-001 and DCP-O-004, Engineering Drawing Control, using Computer-Aided Design (CAD) techniques. The Contractor's CAD systems shall be NASA approved, currently using Auto-Cad and Pro-ENGINEER.

Any changes to the CAD system or any changes to the processes and procedures used with the CAD system shall be approved by NASA prior to change.

The Contractor's responsibility includes but is not limited to:

1. Create original CAD drawings from rough sketches
2. Modify existing CAD drawings from rough sketches or redlined prints
3. Update the files of drawings and associated records and maintain currency of drawing databases. Manage the existing collection, and any additions to that collection. The system shall include drawings and traceability of drawings for all modifications associated with the aircraft, including those drawings and documents provided by external organizations
4. Create and update the Drawing Tracking Records (DTR's)
5. Maintain currency of CAD software and hardware used by this function
6. Maintain custody of all original drawings, sketches, and other related official drawings records
7. Create and distribute prints and copies of official drawings
8. Create and ensure secure custody of microfilm copies of archived drawings

## **7.6 Flight Crews and Operations**

The Contractor shall provide flight operations support for the platform, research, and support aircraft operations identified in this SOW. NASA Policy Directive (NPD) [NPD 7900.4, NASA Aircraft Operations Management](#) defines the procedures and guidelines for management, utilization, operation, and control of NASA aircraft.

### **7.6.1 Flight Crew**

The Contractor shall provide flight crew personnel to operate DFRC aircraft. Specific duty requirements are identified in [NPR 7900.3](#), DOP-O-300, Aircrew Flight Operations Manual, DOP-O-301 Flight Crew UAS Flight Operations Manual, and this SOW.

### **7.6.2 Flight Crew Performance Standards**

1. All crewmembers shall comply with the provisions set forth in [NPR 7900.3](#), FAA, Original Equipment Manufacturer (OEM), and other applicable directives, regulations, and instructions
2. The Contractor aircrew shall maintain performance standards in accordance with DOP-O-300, DOP-O-301, aircraft specific training plans, and Flight Crew Branch policies and procedures. These standards include, but are not limited to:
  - a. Knowledge of safety precautions identified in the applicable aircraft technical data
  - b. Knowledge of airfield operations
  - c. Knowledge of normal aircraft operations identified in the applicable aircraft technical data

- d. All applicable Emergency boldface procedures demonstrated without reference to the checklist
- e. Knowledge of aircraft systems identified in the applicable aircraft technical order
- f. Knowledge of aircraft limitations in the applicable aircraft technical order
- g. Knowledge of procedures, Air Traffic Control (ATC) regulations, and systems for planning, coordination, and execution of flights

### **7.6.3 Proficiency, Currency and Certification**

The Contractor flight crew personnel shall maintain proficiency, currency, and annual requirements in accordance with [NPR 7900.3](#), DOP-O-300, and DOP-O-301 as applicable

The Contractor shall provide: aircrew qualifications, copies of medical and FAA certificates, and flight experience to the Chief Pilot (or designee) upon the request of NASA.

NASA will provide training and qualification checks for Contractor aircrew, including required periodic simulator training. A NASA authorized flight surgeon will provide periodic flight physicals for aircrew.

NASA may, with appropriate notification to the Contractor, designate the requirement for contract aircrews to operate different aircraft, or the existing aircraft with configuration changes. NASA will provide additional training when aircraft equipment, configuration, model, or type is changed.

The Contractor shall operate the designated aircraft in compliance with the current editions of the applicable aircraft flight manuals and other official aircraft documents.

### **7.6.4 Pilots**

The Contractor shall provide pilots whose duties include but are not limited to:

1. Identified in NPR 7900.3, DOP-O-300, and DOP-O-301
2. Fly piloted and Uninhabited Aerial Systems (UAS) as assigned by the Chief Pilot
3. Perform preflight, thruflight, and postflight inspections on NASA aircraft in accordance with the Aircraft Flight Manual or NASA approved flight crew checklists
4. Perform normal and emergency procedures in accordance with the Aircraft Flight Manual and NASA approved flight crew checklists
5. Perform Functional Check Flights or Operational Checks on aircraft in accordance with DOP-O-300 or DOP-O-301, and applicable aircraft checklists
6. Perform Operational Readiness Reviews on aircraft prior to deployment in accordance with DCP-X-020, Flight Operations Readiness Reviews

### **7.6.5 Flight Engineers**

The Contractor shall provide Flight Engineers whose duties include but are not limited to:

1. Identified in [NPR 7900.3](#), DOP-O-300, and DOP-O-301
2. Perform preflight, thruflight, and postflight inspections on NASA aircraft in accordance with the Aircraft Flight Manual or NASA approved flight crew checklists
3. Perform normal and emergency procedures in accordance with the Aircraft Flight Manual and NASA approved flight crew checklists
4. Perform Functional Check Flights or Operational Checks on aircraft in accordance with DOP-O-300 or DOP-O-301, and applicable aircraft checklists
5. Perform Operational Readiness Reviews on aircraft prior to deployment in accordance with DCP-X-020
6. Perform ground engine runs when requested by maintenance personnel

### **7.6.6 Navigator/Mission Planner**

The Contractor shall provide Navigators and Mission Planners whose duties include but are not limited to:

1. Identified in [NPR 7900.3](#), DOP-O-300, and DOP-O-301
2. Produce detailed flight plans to support mission objectives
3. Coordinate and execute real time changes during flight (Navigator only)
4. Proficient with government furnished mission planning software such as Portable Flight Planning Software (PFPS)
5. Utilize the Flight Crew Branch Flight Information Publications (FLIP) program
6. Perform Operational Readiness Reviews on aircraft prior to deployment in accordance with DCP-X-020

### **7.6.7 Flight Safety Technicians**

The Contractor shall provide Flight Safety Technicians whose duties include but are not limited to:

1. Ensure cabin security before and during flight
2. Ensure safety of non-essential aircrew and passengers
3. Provide in-flight emergency assistance in the event of an incident (smoke, fire, first aid, evacuation, decompression, evacuation, hazardous material spill, cryogenic mishap, etc) or at the direction of the flight crew to mitigate life-threatening situations
4. Maintain knowledge of all hazardous chemicals on board and their proper use and containment in order to effectively respond to an incident
5. Provide support to experimenters during ground and flight operations as required

### **7.6.8 Flight Instructors**

The Contractor shall provide qualified and certified personnel who shall perform Flight Instructor duties in accordance with DOP-O-300.

### **7.6.9 Flight Operations Activities**

1. Project support and project aircraft operations shall be conducted in accordance with DFRC approved operational directives and the NPR 7900.3, Aircraft Operations Management. Aircraft will normally be operated as public aircraft for this mission.
2. Aircrews flying Mission Management aircraft transporting officially approved passengers in response to Government travel requirements shall conduct operations in accordance with FAA 14 CFR [Part 91](#), and DOP-O-300. The Contractor aircrew shall operate NASA Mission Management Aircraft as civil aircraft when carrying passengers.
3. The Contractor aircrew shall input aircraft discrepancies into the NASA authorized maintenance database, currently NASA Aircraft Management Information System (NAMIS), in accordance with DCP-O-001, and DOP-O-300.

### **7.6.10 Operations/Scheduling Officer**

The Contractor shall provide Operations/Scheduling Support the duties include but are not limited to:

1. Produce and update the daily flight schedule
2. Schedule aircrew training
3. Maintain the Flight Crew Branch flight publications library
4. Distribute FLIP and aircraft publication changes
5. Maintain aircrew records and reports

## **7.7 Maintenance Support**

The Contractor shall provide the following support in accordance with NASA, Air Force, Navy, FAA and commercial requirements:

### **7.7.1 Life Support/Egress**

1. Inspect, maintain, repair, and modify passenger and aircrew life sustaining equipment, including ground servicing equipment
2. Fabricate any unique aircraft/aircrew soft goods required for platform, research and support aircraft
3. Inspect, maintain, repair, and modify the installed aircraft egress systems
4. Inspect, maintain, repair and modify NASA and other supplied Full Pressure suits and all associated equipment including fit and dress crewmember and integrate into the aircraft cockpit. Operate and calibrate pressure suit test equipment and prepare equipment for worldwide deployment
5. Life Support/Egress training required for all flight crew members and ground support personnel

### **7.7.2 Avionics/Airborne Instrumentation**

In addition to the above mentioned requirements, the Contractor shall also provide the following support in accordance with DOP-O-401 Aircraft Electrical Systems:

1. Layout, fabricates, install, modify, maintain, repair, test, calibrate, and troubleshoot airborne avionics, electrical, video, and associated systems and components
2. Layout, installs, modify, operate, maintain, repair, test, calibrate, and troubleshoot airborne research data system
3. Fabricate, integrate, and maintain prototype and developmental research instrumentation and airborne science experiments
4. Test, verification, validation and documentation of preceding systems for flight worthiness

### **7.7.3 Instrumentation Support**

#### **7.7.3.1 Electronics Lab**

1. Install, modify, maintain, repair, test, calibrate and troubleshoot avionics hardware, research instrumentation systems, and avionics sensors and components
2. Devise layouts and/or fabricate, install, modify, repair, and troubleshoot data acquisition and integrated avionics systems
3. Provide advice and assistance to instrumentation and systems engineers in evaluation and developing unique research systems

#### **7.7.3.2 Metrology Calibration**

1. Provide initial acceptance testing, routine maintenance, calibration, cleaning and status tagging of various NASA furnished standards, precision test equipment, hand tools, instruments, scales, gauges and other equipment
2. All acceptance tests and calibrations shall be performed in accordance with:
  - a. ANSI ISO/IEC 17025, General Requirements for the Competence of Testing and Calibration Laboratories
  - b. NPD 8730.1C, Metrology and Calibration
  - c. DCP-O-007, Metrology System
  - d. Manufacturers calibration procedures and specifications
  - e. Locally developed and approved calibration procedures

### **7.7.3.3 Environmental Testing**

1. Set up and operate environmental simulation test systems, including vibration/shock systems and high altitude (thermal vacuum chambers) systems
2. Conduct acceptance testing, vibration, shock, and combined environmental testing (temperature cycling/thermal vacuum cycling)
3. Devise layouts, fabricate, install, modify, and assemble test fixtures
4. Provide advice and assistance to instrumentation and Systems Engineers in evaluation and developing unique research systems
5. Coordinate test activities conducted at other independent laboratories
6. All acceptance tests and environmental testing shall be performed in accordance with:
  - a. DCP-O-018, Environmental Acceptance Testing
  - b. MIL-STD-810, Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests
  - c. Locally developed and approved procedures

### **7.7.4 Engine Shop**

1. Support aircraft engine, component and sub-assembly O, I, and D level maintenance and non-standard modifications on NASA operated engines in accordance with NASA, Air Force, NAVY, FAA and commercial requirements
2. Operate engines in accordance with applicable maintenance instructions
3. Perform engine preservation and de-preservation in accordance with manufacturers' manuals, NASA, Air Force, Navy, FAA and commercial requirements

### **7.7.5 Fabrication**

#### **7.7.5.1 Hydraulic Shop**

1. Perform Hydraulic Shop inspection, repairs or modifications in accordance with NASA, Air Force, Navy, FAA and commercial requirements
2. Interface with engineers, scientists and mechanics to provide design inputs
3. Fabricate hydraulic or pneumatic components or systems from blueprints, sketches and engineering drawings
4. Perform routine/periodic maintenance of tools and equipment for the Hydraulic Shop

#### **7.7.5.2 Machine Shop**

1. Perform Machine Shop inspection, repairs or modifications in accordance with NASA, Air Force, Navy, FAA and commercial requirements
2. Interface with engineers, scientists and mechanics to provide design inputs

3. Fabricate, modify and repair machined parts, tooling, fixtures or assemblies from blueprints, sketches and engineering drawings using various types of hardened and non-hardened steels, stainless steels, aluminum and other exotic materials
4. Use computer aided design systems and Numerical Controlled (NC) equipment to complete parts or assemblies
5. Set up and operate all shop equipment including manual and NC milling machines, lathes, grinders, EDM machines and other pieces of equipment to fabricate Research and Development (R&D) or experimental aircraft parts
6. Perform routine/periodic maintenance of tools and equipment for the Machine Shop

#### **7.7.5.3 Non-Destructive Inspection (NDI) Shop**

The Contractor shall provide a NDI technician, with back-up support as needed, to perform Liquid Penetrant Inspection, Magnetic Particle Inspection, Eddy Current, Ultrasonic Inspection, and Radiographic Inspection to a minimum NDI/NDT Level II in accordance with National Aerospace Standard 410 (NAS 410) concerning Non-Destructive Testing (NDT) personnel qualifications. All chemicals and inspection equipment necessary to perform all inspections shall be Government provided.

#### **7.7.5.4 Sheet Metal Shop**

1. Perform Sheet Metal Shop inspection, repairs or modifications in accordance with NASA, Air Force, Navy, FAA and commercial requirements
2. Interface with engineers, scientists and mechanics to provide design inputs
3. Fabricate, modify and repair sheet metal or composite parts, tooling, fixtures or assemblies from blueprints, sketches and engineering drawings
4. Use computer aided design systems and NC equipment to complete parts or assemblies
5. Perform routine/periodic maintenance of tools and equipment for the Sheet Metal Shop

#### **7.7.5.5 Welding Shop**

1. Perform Welding Shop inspection, repairs or modifications in accordance with NASA, Air Force, Navy, FAA, commercial and American Welding Society (AWS) D17.1 (Specification for Fusion Welding for Aerospace Applications) requirements
2. Interface with engineers, scientists and mechanics to provide design inputs

3. Assembly welded structures using Gas Tungsten Arc Welding (GTAW), Gas Metal Arc Welding (GMAW), Shielded Metal Arc Welding (SMAW) or Oxyacetylene Welding (OAW) as required from blueprints, sketches and engineering drawings
4. Utilize powered and non-powered hand tools to accomplish design objectives
5. Perform welding on aircraft, engines, aircraft components, aerospace ground equipment and other equipment or facilities to support NASA aircraft operations and activities
6. Perform routine/periodic maintenance of tools and equipment for the Welding Shop

### **7.8 Quality Assurance**

The Contractor may be requested by the COTR to provide personnel to support the DFRC Quality Assurance Branch. These personnel will:

1. Inspect and verify aircraft and aircraft subsystem work per NASA, Air Force, Navy, FAA and commercial requirements
2. Interface with project management, engineers, crew chiefs and aircraft crew
3. Be issued a NASA Inspection stamp by the DFRC QA Branch
4. Be assigned to any project or shop which fall under the DFRC QA Branch
5. Be assigned to other duties which support DFRC's Quality Management System, including, but not limited to, audits, corrective action plans, close call investigations, NAMIS and work order database entries
6. Attend project training and QA professional training if required by the DFRC QA Branch
7. Attend project meetings, including, but not limited to, technical briefs, crew briefs, CCB and Airworthiness & Flight Safety Review Board (AFSRB) and provide feedback/reports to DFRC QA Branch Chief if requested
8. Follow all DFRC QMS safety requirements
9. Attend symposiums, forums or professional presentations if requested
10. Follow all DFRC Management System Documents, including, but not limited to, DCPs and DOPs

## **8 Procurement/Material Control**

### **8.1 Procurement**

The Contractor may be requested to purchase aircraft parts on an as requested basis by DFRC. The Contractor shall utilize the Aircraft Parts Office (APO) for processing requests per DCP-O-016, Aircraft Parts Purchasing and DCP-S-058, Procurement Quality Assurance Process. The Contractors Quality Manual shall describe how they will comply with DFRC processes.

## **8.2 Material Control**

The Contractor shall perform Material Control activities for maintaining aircraft parts and equipment in compliance with NASA requirements and regulations. Coordination of material support requires knowledge of material, work sequences and schedules and specialized needs of the Center projects or operational areas supported. The Contractor shall:

1. Track and issue parts and materials required to support phase maintenance. Maintain the flyaway kits for project deployments. Manage the inventory of all stocked assets in accordance with NAMIS. This includes designation of controlled items or other items requiring specific consideration. This includes all repairable items. All end item assets, to include aircraft engines, will be tracked in the NAMIS
2. Provide technical support required to carry out repair, supply or maintenance operations, and initiating requisitions for supply issue or purchase action. Consult stock lists and technical publications to obtain interchangeability of substitution information; performing identification and destination acceptance of items received from supply or procurement sources
3. Review stock items, which have been in the NAMIS inventory for at least 12 months with little or no usage, for retention or elimination
4. Maintain optimum inventory utilization and levels
5. Replenish stock based on demand levels in accordance with DCP-O-016 Aircraft Parts Office
6. Issue controls on assets for designated users and designated program assets as determined by NASA. This includes scarce aircraft parts, which are no longer in production or are easily obtainable

# APPENDIX 1

## DFRC Aircraft

Aircraft currently assigned to DFRC include the following, but are not limited to:

Quantity	Type	Mission
1	Beechcraft, King Air B-200	FAA Certified
1	Beechcraft, King Air B-200	Program Support
1	Gulfstream, G-II	FAA Certified
1	Gulfstream, G-III	Research
1	Gulfstream, C-20/G-III	Science Platform
4	McDonnell-Douglas, F-18A/B	Program Support
1	McDonnell-Douglas, F-18B	Research
2	Lockheed, ER-2	Science Platform
1	Boeing, 747 SP	Science Platform
1	McDonnell-Douglas, DC-8-72	Science Platform
1	Raytheon, T-34C	Program Support
1	General Atomics, MQ-9A (Predator B)	Program Support
2	Northrop-Grumman, YRQ-4A (Global Hawk)	Science Platform
1	McDonnell-Douglas, F-15B	Research
1	McDonnell-Douglas, F-15D	Program Support
1	Lockheed, YO-3A	Program Support
1	Aermot, AMT 200S/TG-14A	Research

The aircraft are powered by the following types of engines:

- Pratt & Whitney PT6A-42. (B-200)
- Rolls Royce Spey MK511-8, (G-II/G-III/C-20)
- General Electric 404-400, (F-18A/B)
- General Electric F118-101, (ER-2)
- Pratt & Whitney JT9D-7J, (747 SP)
- General Electric CFM56-2-C1, (DC-8-72)
- Pratt & Whitney PT6A-25, (T-34C)
- Garrett/Honeywell TPE-331-10YGD, (MQ-9A)
- Rolls Royce AE3007-H, (YRQ-4A)
- Pratt & Whitney F100-PW100, (F-15B/D)
- Continental I-0360, (YO-3A)
- Rotax 912 S4, (TG-14A)