

# Goddard Space Flight Center

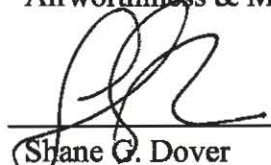
## General Maintenance Manual

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Dennis R. Rieke  
Airworthiness & Maintenance Manager

 13 JUN 2013

Shane G. Dover  
Chief of Flight Operation

**Goddard Space Flight Center**  
Wallops Flight Facility  
Wallops Island, Virginia

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**CHANGE HISTORY LOG**

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October 2006	0106		New Baseline
January 2010	0110		New baseline, NAMIS incorporated
October 2010	0210		New baseline updated in accordance with NPR 7900.3C, SMS incorporation, release authority and procedures, maintenance system positional structure and organizational chart, fall protection, P-3 MEL, PPE requirements
June 2013	0113		Major changes to all sections to comply with current NASA and industry standards.

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# **Preface**

## **P.1 Purpose**

The purpose of this manual is to set forth policy, procedures, guidelines, instructions, and responsibilities for aircraft maintenance at Goddard Space Flight Center (GSFC). It applies to all organizational elements, experimenters, and contractors under NASA GSFC control or jurisdiction, which are involved in maintenance or operation of GSFC aircraft, regardless of geographical location. This manual is not expected to cover every contingency, which may arise, nor every rule of safety or maintenance practice. When required, the Airworthiness & Maintenance Manager (A&MM) will issue special instructions.

## **P.2 Applicability**

This manual derives authority from, and is linked to, NPD 7900.4, NASA Aircraft Operations Management, and NPR 7900.3, Aircraft Operations Management. When used for Mission Management, program support aircraft are subject to procedures and rules contained in NPR 7900.3, Aircraft Operations Management and are supplemented, as applicable, by this manual. This manual provides specific maintenance guidance describing how maintenance is conducted on all NASA GSFC aircraft.

Comments and questions concerning the contents of this manual should be addressed to the Chief of Flight Operations, Code 830, Goddard Space Flight Center, Wallops Flight Facility, Wallops Island, VA 23337.

## **P.3 Authority**

GSFC as an aircraft owner/operator is responsible for maintaining the airworthiness of its aircraft. The Center Director delegates this authority to the Chief of Flight Operations.

The Chief of Flight Operations, under the cognizance of management authority, has the responsibility for maintaining the airworthiness of the Center's aircraft. Based on his assessment of safety, maintenance practices, personnel, and equipment limitation, he has the authority to release an aircraft for flight directly or by means of written delegation.

## **P.4 Applicable Documents**

NPD 1440.6 NASA Records Management  
NPR 4100.1 NASA Materials Inventory Management Manual  
NPD 8730.1 Metrology and Calibration  
NPD 8730.5 NASA Quality Assurance Program Policy  
AS 9100/9110 International Organization of Standardization Quality Management System Standard

Federal Aviation Regulations (FAR)  
 FAR Part 91 General Operating and Flight Rules  
 FAR Part 41  
 FAR Part 43.15, Part 65 - Subparts D and E  
 GPR 1440.8 Records Management  
 GPR 1700.8 GSFC Hazard Communication Program  
 GPR 1800.3B, Blood Borne Pathogens Exposure Control Plan  
 GPR 8500.3 Waste Management  
 GPR 8730.1 Calibration and Metrology  
 GPR 8730.6 Electrostatic Discharge Program (ESD)  
 830-FAOM-0001 GSFC Flight Facility Flight Operations Manual  
 830-FOM-0002 GSFC UAS Flight Operations Manual  
 830-PG-1410.2.1 Aircraft Office Configuration Management (CM) Procedure  
 830-PG-1410.2.1 Aircraft/UAS Engineering & Configuration Management Process  
 800-PG-1060.2.2 Airworthiness Process  
 Code 830 Quality Assurance Surveillance Plan  
 Beechcraft Super King Air B200 Maintenance Manual  
 Beechcraft Super King Air B200 Pilots Operating Handbook  
 NAVAIR 01-75 PAA-6(I) P-3 Maintenance Technical Manual  
 NAVAIR 15-01-500 Preservation Manual  
 NAVAIR 01-1B-50 Weight and Balance Manual  
 NAVAIR 01-75PPAA-IMP-6 P-3 PDM Manual  
 COMNAVAIRFOR INST 4790.2 Naval Aviation Maintenance Program (NAMP)  
 Shorts SD3 Sherpa Maintenance Manual  
 C-23 Quick Reference Checklist  
 Shorts SD3/SD3-60 C-23 Crewmember's Checklist  
 TM 55-1520-210-23 Technical Manual Army Aviation Maintenance  
 Engineering Manual Weight and Balance

## **P.5 Cancellation**

This is a controlled manual and will be reviewed annually and revised by page changes when necessary. All revisions shall be approved by the Chief of Flight Operations. New editions to this manual will not exceed a 5-year period.



# **Chapter 1. General**

## **1.1 Concept of Operations**

1.1.2 The Airworthiness and Maintenance Manager (A&MM) is responsible for assuring compliance with the provisions of this manual. This manual applies to all organizational elements, experimenters, and contractors performing maintenance, or research modifications to aircraft under the control of the A&MM. Copies may be obtained from the GSFC code 830 Aircraft Office. Changes and revisions will be issued as required. This manual supersedes all previous GSFC General Maintenance Manuals (GMM).

1.1.3 Current version validation. This document is posted at <http://code830.wff.nasa.gov/>; additional copies may be obtained from the GSFC Aircraft Office, Code 830.

## **1.2 Assignment of Authority and Responsibility**

1.2.1 This manual establishes the responsibility and procedures to effectively disseminate requirements, standards, procedures, and guidelines for the maintenance of NASA owned and operated aircraft assigned to the Goddard Space Flight Center (GSFC) Aircraft Office as well as any transient NASA or non-NASA owned and operated aircraft.

1.2.2 GSFC, as an aircraft owner/operator, is primarily responsible under NPR 7900.3 and FAR instructions, as applicable, for maintaining the airworthiness of its aircraft. This responsibility has been assigned by GSFC to the Chief of Flight Operations and the A&MM is responsible for compliance.

1.2.3 Aircraft Maintenance and Operations Contract (AMOC) employees are individually responsible for maintaining the best possible state of health in the interest of providing safe and efficient performance and accomplishment of their work and duties as outlined in and directed by this manual.

1.2.4 A person approved by the A&MM or his designee may perform any assigned work on GSFC aircraft as authorized by the manuals, and for which he possesses proper certification or licensing.

1.2.5 A person may undertake work, for which he is not certified or rated, when accomplished under the direct and continuous personal supervision of personnel authorized and certified for such work, inspections excluded.

1.2.6 Each person maintaining, altering, or performing maintenance will comply with the requirements set forth in NPR 7900.3 and the appropriate military and manufacturers' maintenance manuals. Performance standards will, at a minimum, meet FAR Part 43.

1.2.7 All Maintenance personnel are individually responsible for the safe and efficient accomplishment of their work and duties in accordance with standard GSFC maintenance procedures.

### **1.3 Scope**

1.3.1 Aircraft maintenance conducted for GSFC involves the inspection, servicing, repair and replacement of parts and components of assigned aircraft and support equipment. The level of on-site maintenance activity is generally limited to line support services and routine maintenance. Higher level maintenance being conducted by other maintenance service providers consists of all maintenance requirements up to that performed at depot level facilities. Major airframe structural inspections and repairs as well as major power plant inspections and overhauls are typically outsourced. Special tool calibrations and major motorized ground support equipment maintenance can be and is typically outsourced.

### **1.4 Organization**

1.4.1 Each Chapter of this manual addresses a specific area of aircraft maintenance as delineated in the Table of Contents. Chapters 1 through 8 describe general aircraft maintenance requirements applicable to all aircraft while Appendices A-D provides specific aircraft maintenance requirements.

## **Chapter 2. Quality Assurance and Safety**

### **2.1 Purpose**

2.1.1 The purpose of this section is to describe the requirements and standards associated with the quality assurance and safety in the maintenance and servicing of assigned aircraft.

### **2.2 Scope**

2.2.1 The quality assurance and safety provisions addressed in this section are confined to the maintenance of assigned aircraft and thus, are an integral part of the total quality management system that protects the operation, maintenance, and project support of assigned aircraft. The scope of this effort embraces all events from the ordering of parts and material through their receipt and installation including fabrication, assembly, rework, repair, modification, testing, servicing, final inspection, and completion of records.

### **2.3 Definition**

2.3.1 Quality Assurance (QA) is a systematic verification that ensures compliance with requirements and standards applicable to work and material so as to preclude or minimize fault and failure. Reliability and safety are results of quality assurance.

### **2.4 Policy**

2.4.1 The quality assurance plan and program for the maintenance and operation of aircraft shall be compliant with OEM recommendations on certificated aircraft and DOD directives for all other applicable aircraft. The quality assurance program will be maintained in accordance with the Aircraft Maintenance and Operations Contract (AMOC) and NASA policies and instructions as applicable. To assure quality of work and safety, QA personnel shall be trained and competent. These personnel shall have the autonomy to report to higher authority if necessary to resolve quality and safety matters.

### **2.5 Objective**

2.5.1 The Quality Assurance program will provide inspection and oversight for all aircraft maintenance functions, procedures and safety to ensure airworthiness and personnel safety.

### **2.6 Organization**

2.6.1 The Government provides quality assurance surveillance and evaluation of the AMOC through the use of a Quality Assurance Surveillance Plan (QASP). NASA provides quality assurance implementation through use of an Aircraft Quality Assurance Plan (QAP).

## **2.7 Responsibility**

2.7.1 Ensuring quality in the administration and performance of maintenance is the responsibility of all personnel involved in aircraft operations. Specific quality requirements are outlined in the QASP and QAP. To ensure the highest level of quality, chapter 2.13 outlines requirements assigned to specific individuals in the maintenance organization. Additionally, the following is a list of quality requirements for all maintenance personnel.

- a. Assure quality and safety in the aircraft maintenance environment.
- b. Assure only appropriately trained personnel complete maintenance work.
- c. Assure adequacy, currency, and management of technical information.
- d. Assure tool control and the use of certifiable tools and equipment through inspections.
- e. Assure quality in the procurement, handling, storage, packaging, marking, preservation, and transportation of material.
- f. Assure quality of workmanship through surveillance, inspection, and effective processes.
- g. Assure quality in functional check flights.
- h. Assure airworthiness of aircraft.
- i. Assure quality in release of aircraft for flight.
- j. Assure accuracy and timeliness in the quality documentation of work, record keeping, and reporting.
- k. Assure analysis and evaluation of material and performance trends.
- l. Assure control of non-conformance reporting of products and services and resultant corrective actions.

## **2.8 Standards**

2.8.1 The quality assurance effort must ensure that the requirements of this manual and associated contract services are met or exceeded. The performance standards are keyed to those prescribed by NASA and the QAP. Specific workmanship standards for aircraft and equipment are contained in their respective design and maintenance manuals.

## 2.9 Training

2.9.1 Maintenance, quality and safety training is essential and should be accomplished with a minimum of 40 hours training every two years for all technicians that support NASA aircraft maintenance. It is NASA policy to comply with all current training requirements and standards as they apply to assigned equipment and working conditions. Training requirements vary with changes in aircraft and support equipment assignments and therefore the Chief Flight Operations, A&MM and the Contract Maintenance Program Manager (CMPM) must continually assess training requirements and associated standards. Table 2.1 provides a list of what the A&MM considers to be the minimum training required, however, the A&MM may define additional training requirements for each employee. The AMOC shall provide aircraft maintenance training and maintain a training file for each employee. This file will contain documentation of training, qualifications, and licenses. Training shall be scheduled, completed, and documented in accordance with the QAP and be documented within NAMIS or locally available for inspection as applicable.

## 2.10 Technical Publications

2.10.1 Technical Publications that support the operation and maintenance of assigned aircraft and equipment are maintained and managed by the AMOC in a technical library. GSFC assigned aircraft Technical Publications are maintained and updated through the OEM, DOD and NATEC. Oversight of the technical library is the responsibility of Quality Assurance Manage/Ground Safety Officer (QAM/GSO).

## 2.11 Maintenance Safety

2.11.1 Aircraft maintenance safety is the responsibility of all assigned personnel but primarily to the Quality Assurance (QA) organization responsible for GSFC aircraft maintenance and management. QA personnel shall work closely with Safety personnel of interfacing organizations to ensure that all facets of maintenance safety are comprehensively addressed. The AMOC shall ensure that maintenance safety is a key part of the contract QA, health, and safety plans.

**Table 2.1 Minimum Maintenance Training Requirements**

<b>Type</b>	<b>Personnel Category</b>	<b>Frequency</b>
First Aid/CPR	Maintenance Personnel	Triennial
Fire Protection & Extinguishing	Maintenance Personnel	Triennial
Hazardous Materials & Environmental Requirements	Maintenance Personnel	Annual
Hearing Conservation	Maintenance Personnel	Annual
Human Factors	Maintenance Personnel	Annual
FOD Prevention Program	Maintenance Personnel	Initial

Fork Lift	Maintenance Technicians	Triennial
Fork Lift Review	Maintenance Technicians	Annual
Aircraft Towing	Maintenance Technicians	Annual
APU Operation	Maintenance Technicians	Annual
HVAC (Personnel)	Maintenance Technicians	Initial
AGSE Operation	Maintenance Technicians	Refer to Chapter 4
Marshaling	Maintenance Technicians	Initial
Maintenance Release Authority	Designated Maintenance Technicians and Pilots in Command	Initial
Minimum Equipment List (MEL)	All Maintenance and Aircrew	Initial
Washing	Maintenance Technicians	Initial
Jacking	Maintenance Technicians	Initial
Fueling	Maintenance Technicians	Annual
Weight & Balance	Maintenance Technicians	Initial
Aircraft Systems	Maintenance Technicians	Biennial
Battery Maintenance	Avionics Technicians	Initial
NDI Certification	Inspectors	Initial
Quality Assurance Inspection Training	Quality Assurance Representatives (QARs)	Annual
IA Certification	Inspectors	Annual
NAMIS	All Maintenance	Annual
Man Lift	Maintenance Technicians	Triennial
Man Lift Review	Maintenance Technicians	Annual
Medical Stations	Maintenance Personnel	Initial
Logistics Training	Designated Maintenance Technicians	Annual
Crimp & Harness Training	Avionics Technician	Biennial
ESD Training	Avionics Technician	Biennial
AS9110 Training	Designated Maintenance Technicians	Annual

## 2.12 Records, Reports, Material Requisition and Documentation

2.12.1 The AMOC is responsible for quality record keeping and aircraft maintenance-related documentation. Refer to Chapter 7 for additional information on maintenance documentation.

2.12.2 The Requisition Request Approval Tracking System (RRATS) is a requisition process used when the Defense Logistics Acquisition (DLA) Requisition system is not applicable. The RRAT's approval cycle is initiated based on the type of purchase and who is initiating the purchase. Authorized purchasers are then able to review every purchase and specify the funding

information. Additionally, for purchases initiated by AMOC personnel, the COR for the contract is able to review and approve the purchases, providing an audit trail. Reference Appendix E for the RRATS Flow Chart.

## **2.13 Quality Responsibilities**

2.13.1 Purpose. The purpose of this Section is to describe the Roles and Responsibilities of those personnel who are accountable for ensuring an effective quality assurance program.

2.13.2 Responsibility. While ensuring quality in the administration and performance of maintenance is the responsibility of all personnel involved in aircraft operations, the A&MM, CMPM, QAM/GSO and all Quality Assurance Representatives are accountable for program compliance.

### **2.13.3 Maintenance Organization Roles & Responsibilities**

2.13.3.1 Airworthiness and Maintenance Manager (A&MM). This position is a NASA Civil Servant who is assigned by, and reports directly to, the Chief of Flight Operations. The A&MM position is the equivalent of a Chief of Aircraft Maintenance and therefore responsible for compliance with NPR 7900.3 and all facets of airworthiness. The A&MM's responsibilities include, but are not limited to:

- a. Assuring quality surveillance of the AMOC. This NASA government official serves as the COTR and evaluates, for the Contracting Officer, the contractor's quality performance.
- b. Overseeing all AMOC maintenance activities.
- c. Administering the hiring of all "as needed" support team members.
- d. Administering the outsourcing of off-site maintenance activities.
- e. Ensuring proper long-term planning for scheduled maintenance activities.
- f. Authoring, updating, and ensuring compliance with the NASA GSFC Code 830 Quality Assurance Surveillance Plan (QASP).
- g. Providing oversight of the CMPM and ensuring he/she is fulfilling all requirements and responsibilities.
- h. Reviewing all assigned aircraft technical / airworthiness directives and approving final disposition.
- i. Qualifying and recommending (excluding NASA PIC's), aircraft release authority.

- j. Approves the designation of all assigned Quality Assurance Representatives (QARs).

#### 2.13.3.2 Contract Maintenance Project Manager (CMPM):

The CMPM is the senior onsite representative of the AMOC and reports directly to the A&MM. The CMPM is responsible for managing the daily work of assigned contract maintenance personnel, develops contractor missions, projects and task estimates, provides manpower planning and historical data, tracks accrued costs, manages scheduling, and assigns contractor assets and capabilities in the most cost effective manner to enable the Aircraft Office mission. The CMPM is responsible for ensuring all maintenance activities, to include project installations, are conducted in accordance with the General Maintenance Manual, the contract, and any other applicable NASA Procedures and Guidelines. The CMPM will remain on site, though may deploy with an aircraft if necessary. Specifically, the CMPM is responsible for:

- a. Administering and ensuring compliance with the QAP.
- b. Maintaining sufficient staff to support mission operations to include instrument installation support.
- c. Administering the Tool Control, FOD Prevention, IMTE, AGSE, and training programs.
- d. Oversight of all maintenance activities and technicians for assigned aircraft.
- e. Ensuring sufficient Aircraft Life Support Equipment is on board the aircraft.
- f. Ensuring required aircraft parts are properly procured for assigned aircraft.
- g. Ensuring assigned maintenance personnel are properly trained, certified and so designated.
- h. Attending regularly scheduled planning meetings with management to ensure required aircraft scheduled and unscheduled maintenance are properly planned for.
- i. Arranging for logistics support to include shipping to support experimenters.
- j. Ensure the aircraft logs and records are properly maintained.
- k. Ensuring NAMIS Maintenance and Logistics is used properly to track all aircraft parts and maintenance activities.
- l. Supporting the Inter-Center Aircraft Operations Panel Reviews when directed.

2.13.3.3 Quality Assurance Manager and Ground Safety Officer (QAM/GSO): The QAM/GSO reports directly to the NASA ASO and has direct access to the NASA Chief of Flight Operations. The QAM/GSO ensures all QAR maintenance personnel are qualified and designated to inspect or designate aircraft systems for the Safety of Flight. In addition, the QAM/GSO assures that all work is performed to a required standard and all ground evolutions (both maintenance and flight



operations) are conducted in accordance with applicable maintenance and safety practices. The QAM/GSO is responsible for:

- a. Approving and ensuring compliance with the Quality Assurance Plan (QAP).
- b. The AMOC's technical library.
- c. Providing monitoring via periodic audit of the Tool Control, FOD Prevention, IMTE, AGSE, and Training programs.
- d. Providing final inspection of all mission/experimental uploads and administering final sign-off.
- e. Reviewing all closed NAMIS Work Requests (WR) performed by the Aircraft Administrative Specialist for proper procedural compliance, documented feedback, and ensuring the labeling of WR's as historical within five working days.
- f. Supporting the Inter-Center Aircraft Operations Panel Reviews when directed.
- g. Reviewing all assigned aircraft technical / airworthiness directives and determining, documenting, and completing appropriate disposition.
- h. Ensuring proper qualification and designation of all assigned Quality Assurance Representatives (QARs).
- i. Provide quality assurance training for all QARs in accordance with Table 2.1.
- j. Screening all NAMIS Work Request to determine FCF requirements.
- k. Administering the FCF program. Issuing all FCF decks, briefings (pre- and post-), and flights are carried out in accordance with NASA and/or OEM standards. The QAM/GSO shall ensure all FCFs are properly recorded and documented upon completion.

2.13.3.4 Quality Safety Systems Manager (QSSM): The QSSM reports directly to the QAM/GSO and is responsible for providing safety, quality assurance and managerial oversight of aircraft and pilot readiness. Specifically, the QSSM is responsible for :

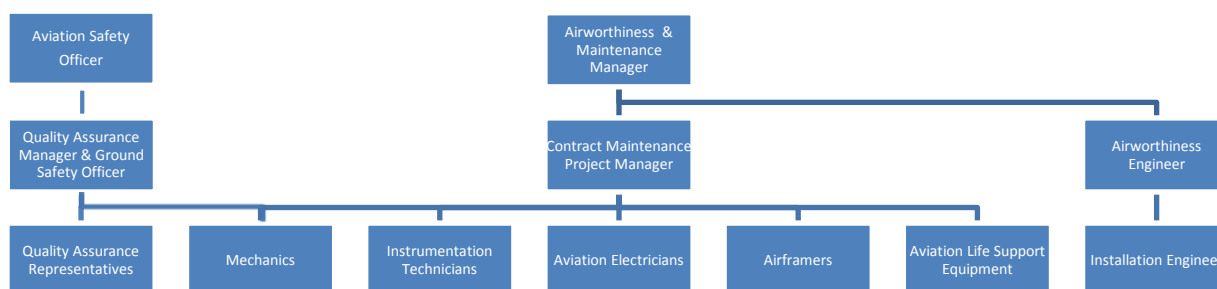
- a. Tracking pilot proficiency and currency
- b. Monitoring tool calibration
- c. Maintenance personnel training requirements
- d. Aircraft material readiness

- e. Flight hardware life limited components
- f. Provides historical documentation of all maintenance actions
- g. Quality surveillance of all aircraft release and pilot acceptance
- h. Provides tracking of quality assurance approvals

2.13.3.5 Quality Assurance Representative (QAR): QARs are designated by the A&MM, and approved by the QAM/GSO. Each QAR shall have a designation letter, signed by the ASO, in their training jacket which identifies the systems/aircraft on which they are qualified to perform duties as a QAR. QAR's work directly for the A&MM, and by instruction, the QAM/GSO, when fulfilling their QA duties. QARs are responsible for:

- a. Performing Safety of Flight In-process/final inspections.
- b. Performing FOD Inspections.
- c. Inspecting incoming materials, supplies and equipment to ensure conformity and Ready For Issue (RFI).
- d. Issuing Quality Deficiency Reports (QDR) for non-conforming material/equipment.
- e. Ensuring up to date Technical Publications are used.
- f. Issuing FCF requirements and brief FCF crew prior to flight as directed by the QAM/GSO..
- g. Reviewing post FCF checklist and debrief FCF crew. Close out FCF checklist in FCF log, as directed by the QAM/GSO.
- h. Ensuring Maintenance and Hangar Safety procedures are adhered to at all times.
- i. Supporting the Inter-Center Aircraft Operations Panel Reviews when directed.

**Figure A 2.1 Maintenance Program Structure**



## **2.14 Tool Control Program**

2.14.1 Purpose: The purpose of a Tool Control Program is to prevent Foreign Object Damage (FOD) to aircraft and the subsequent failure of equipment and injury to personnel.

2.14.2 Responsibility: Mechanics, technicians, inspectors, supervisors, and project personnel are responsible for program compliance. Mechanics, technicians, and project personnel are directly responsible for the control of tools, equipment, and supplies they use on or aboard aircraft. The QAM/GSO and QARs are responsible for enforcement. The CMPM is responsible for maintaining a current master list of individual and special tools.

2.14.3 Scope: This program shall apply to all aspects of maintenance operations that are under the authority of the Aircraft Office and shall involve home station as well as deployed operations.

2.14.4 Description: The Tool Control Program is a tool and associated hardware accountability program for all work on aircraft. Two methods of accountability shall be used. Method 1 involves shadow stowage of tools and equipment. Method 2 involves the use of an inventory checklist for all tools and hardware. Mechanics are issued individually identifiable tool pouches to carry tools and hardware from the respective shadowed toolbox or shops to the work site.

2.14.5 Procedures for Maintenance Personnel: The following will be used in the implementation of the Tool Control Program:

- a. Jet intake, compressor, and flight control areas are designated as "FOD Critical Areas." Work performed in or around these areas shall be documented on the NAMIS work request, and upon completion of the work, an inspection will be performed by a QAR. This inspection shall be documented on the NAMIS work request prior to reassembly of the component and/or close-up of work area. The inspection and documentation shall include an accounting of any FOD material found.
- b. Shop areas and toolboxes shall be maintained in a clean and orderly manner. All unnecessary tools and hardware that are not needed for daily work shall be removed or properly stowed.
- c. Toolboxes used in the work place shall have shadow stowage.
- d. All tools that are owned by a maintenance technician shall have the mechanic's initials permanently inscribed on the tool. Calibrated items owned by personnel shall not be stored or used in the workplace. A current master listing of each technician's tools shall be maintained by the CMPM.
- e. All tool pouches shall be maintained in a clean and empty condition except when being used for a specific job. At that time, the pouch will only contain those items required for a particular task.

- f. Equipment and parts that are not adaptable to shadow stowage will be controlled by use of an inventory checklist.
- g. If a maintenance technician discovers a tool or other piece of hardware is missing, refer to Chapter 2.14.7.

2.14.6 Procedures for Mission Project Personnel: The following will be used in the implementation of the Tool Control Program for mission project personnel:

- a. Mission Project Personnel shall provide an inventory of all tools to be used on or around the aircraft or hangar facilities to the CMPM or QA upon initial arrival.
- b. When a tool is not being used, it shall be placed in a secure toolbox or container. Unsecured tools and equipment may be subject to confiscation if left unattended.
- c. Prior to flight, all tools and equipment shall be inventoried by project personnel and verified by the CMPM or aircraft PIC if deployed.
- d. No in-flight maintenance of project equipment will be permitted without the approval of the PIC. Mission essential work will normally be permitted on a case-by-case basis depending upon safety factors such as turbulence. All tools and equipment must be securely stowed for landing.
- e. An aircraft may support more than one project during a particular period of time. Therefore, it is important that project personnel maintain their respective stations in a secure state of readiness unless specifically released from this requirement by the Aircraft Office.
- f. Mission Project Personnel who discover a tool or other piece of hardware is missing shall refer to Chapter 2.14.7.

2.14.7 Procedures for missing tools or hardware: If a tool or other piece of hardware is discovered to be missing, the discovering individual (maintenance technician, mission project individual or any other person) shall immediately report the incident to the QAM/GSO and the CMPM who will report it to the A&MM or aircraft PIC if deployed. As a result, the aircraft will be grounded and a NAMIS Work Request shall be generated against the appropriate aircraft for the missing tool. In the event the missing tool cannot be found, an entry will be made in the appropriate aircraft logbook(s) Miscellaneous History section describing the missing tool and subsequent search. A QAR will be required to close the missing tool work request.

## **2.15 FOD Prevention Program**

2.15.1 Purpose: The Foreign Object Damage (FOD) Prevention Program is to establish the procedures for FOD prevention to include awareness, practices, investigations, and reporting.

2.15.2 Scope: FOD is damage to aircraft or equipment caused by a foreign object. The object may be foreign to an area or system and may be ingested by, or lodged in, a mechanism. While the term FOD technically refers to damage, the term is also used to describe the foreign object. Strict adherence to the Tool Control Program is another major part of FOD prevention effort. No maintenance task is considered complete until the required tool inventory has been performed and recorded.

2.15.3 Responsibility: The FOD Prevention Program applies to all personnel performing maintenance, inspection, installation, and operational activities on or around an aircraft, hangar, or flight line area both at GSFC and during deployed operations. All maintenance technicians, inspectors, supervisors, project personnel, and aircrew are responsible for program compliance. In addition, :

2.15.3.1 The CMPM shall:

- a. Ensure FOD walk-downs are conducted regularly and documented.
- b. Inspect hangars for FOD.
- c. Ensure support equipment is FOD free.
- d. Ensure thorough FOD checks are performed of components, assemblies and completed units.
- e. Ensure FOD containers are properly marked and emptied as necessary.
- f. Ensure reporting to the A&MM and QAM/GSO of all FOD or suspected FOD accidents.

2.15.3.2 All maintenance technicians and project personnel will:

- a. Account for each tool, part, and material/hardware used in repair of aeronautical equipment.
- b. Keep all support equipment free from foreign/loose objects.
- c. Protect units, components and parts during handling, installation and operation.
- d. Perform thorough pre- and post-maintenance inspections of tool containers, ducts, and area around aircraft.
- e. Pick up all loose objects in the work centers, hangars and on the flight lines, and deposit all objects found into FOD containers.

- f. Remove all loose objects from clothing prior to working around or in aircraft.
- g. Perform a diligent FOD walk-down of areas as scheduled.
- h. Conduct a thorough FOD walk-down of high power run-up area and a thorough engine intake inspection prior to engine start. After aircraft run-up, a thorough clean-up and engine inspection will be conducted.

2.15.4 FOD program procedures: The following will be used in the implementation of the FOD Prevention Program:

- a. FOD walks will be completed regularly and documented.
- b. Prior to each engine start, inlet ducting will be thoroughly inspected for objects which could cause engine damage and possible failure.
- c. Air inlet covers will be installed when engines are not being operated, except when it is known that the engine will be operated again immediately following shutdown and/or maintenance will be performed on the engine.
- d. When maintenance is to be performed in the inlet duct area, suitable precautions will be taken to prevent maintenance debris (nuts, screws, washers, safety wire, etc.) from inadvertently entering the compressor inlet of the engine(s). After completion of necessary maintenance, an inspection will be made to ensure all accessories and attaching parts are secure and that work areas are cleared of foreign objects prior to engine operation.
- e. Properly marked FOD receptacles will be provided in all work areas in which trash, safety wire, etc., may be placed.
- f. Inlet duct run-up screens will be installed prior to engine start and removed on shut down.
- g. Any object lost in or on an aircraft will be treated as a lost tool. Refer to chapter 2.14.7 for lost tool procedures.
- h. As a minimum, a 6-volt light shall be used for preflight and turnaround inspections.
- i. All disconnected aircraft and engine lines and hoses shall be capped or plugged. A serviceability, cleanliness and FOD inspection of both male and female connectors of lines, hoses or electrical plugs will be performed prior to connection.

- j. Hats or caps shall not be worn in the intake danger zone of the aircraft while the engines are operating. Personnel wearing hats on the flight line will secure the hat with a lanyard or ear defender with the band across the top of the hat. Items such as wigs, metal/plastic, or leather hair fasteners, etc., will not be worn by personnel engaged in aircraft maintenance on the flight line. Head bands, rubber bands, and hairnets are permissible if they contain no metal or plastic.

2.15.5 Discovery of suspected Engine FOD. Upon discovery of suspected engine FOD, the following shall be accomplished:

- a. A downing work request will be issued in NAMIS requiring the discrepancy aircraft to be inspected by a QAR.
- b. All maintenance on the engine or aircraft will cease until the QAR inspection has been completed.
- c. Suspected damage will be reported to the A&MM, CMPM and the QAM/GSO.

2.15.6 Control of FOD during Maintenance Operation: The following additional procedures will be used during all maintenance operations:

- a. Storage and handling of materials and hardware components shall be protected against contamination or damage.
- b. Upon initial receipt of materials and components, inspect the items for contamination, damage, and assure that they are clearly and properly identified.
- c. Assure that corrosion control measures are implemented as required.
- d. Assure that open fittings or open ends or types, valves, pumps, air ducts and fluid-carrying items are protected with approved closures.
- e. Cap or otherwise protect exposed threads and fittings.
- f. Protect equipment items from exposure to physical, chemical, or environmental damage.
- g. Conduct scheduled inspections of stockrooms to assure that these areas are clean and free of foreign materials.

- h. Assure that approved protective devices for materials and components are properly installed before storage and prior to movement.
- i. Assure that material, equipment items, assemblies, etc., are moved with proper transportation and handling equipment, and that this equipment is clean and free from extraneous debris.
- j. Adequately protect hardware from splatter accumulation during brazing, soldering, welding, and like operations.
- k. Inspect components and equipment for damage, repair as necessary, and remove objects and damage before installation.
- l. Verify that required protective devices (e.g., dust covers, temporary seals, cushioning, etc.) are present and properly installed. Items with protective devices missing are to be cleaned of FOD, repaired if necessary and protective devices installed.
- m. After fluid and pneumatic system lines and tubing are cut and debarred, initiate a positive cleaning operation and cap ends of lines. After installation and system servicing, check fluids for contamination. If contamination is present, accomplish corrective decontamination and cleaning actions.
- n. Inspect for and remove FOD during maintenance/repair operation. Upon completion of each major assembly, conduct a foreign object inspection.
- o. Install protective covers on components, major assemblies, and equipment sensitive to damage or foreign object contamination as applicable.
- p. Conduct a foreign object inspection of all closed areas as well as all FOD entrapment compartments and migratory routes prior to final sealing. Quality Control approval must be obtained prior to closing inaccessible areas and compartments. If subsequent access should be required, QA shall re-inspect prior to closing the area.

2.15.7 Hardware control: Effective controls will be used by the AMOC and project personnel for control of loose hardware such as nuts, bolts, screws, cotter pins, rivet heads, etc., to include:

- a. Excessive hardware over and above that required to performs specific maintenance tasks will not be removed from pre-expanded bins.



- b. Maintenance/generated FOD must be removed at designated intervals. This will be accomplished upon completion of the specific maintenance action and end of shift.
- c. Hardware “scrounge” boxes will not be allowed in any work center.

2.15.8 Training: Maintenance personnel designated to fly as aircrew are subject to additional training requirements delineated in the FOM. Newly assigned and visiting personnel (such as project personnel) will be provided an orientation briefing discussing the following items as applicable:

- a. FOD hazards peculiar to the type of aircraft of engines.
- b. Classes of foreign objects: metal, stones, and miscellaneous.
- c. The potential for aircraft FOD during taxiing and takeoff.
- d. The hazard of engine runs on the flight line.
- e. FOD prevention for aircraft engine intakes, movable control surfaces, landing gears, tires, air inlets ducts for pressurization system, disconnected lines, hoses, and electrical connectors.
- f. Protecting aircraft during storms and high winds.
- g. Proper use of engine inlet and tailpipe covers.
- h. Controlling aircraft safety fins, chocks, aircraft logbooks, checklist, manuals and articles of clothing.
- i. Personal equipment such as hats, pens, pencils, coins, identification badges, jewelry, etc.
- j. Items that could be drawn into the intake areas or jam controls.
- k. Local work center, flight line, and hangar work policies, such as:
  - 1. The importance of good housekeeping.
  - 2. Local controls over all engines, including maintenance runs and the cell operations.
  - 3. FOD precautions for engines in transit, storage, or in spare status.
  - 4. Local controls over open fluid line, air lines, etc.
  - 5. FOD prevention for egress and electrical components.
  - 6. Preventing FOD during sheet metal work.

7. FOD prevention in inspection areas and hangars.
  8. Special FOD prevention controls for construction work on or near aircraft or engines.
  9. FOD prevention when using test equipment, stands, and other support equipment.
  10. Control of screws and fasteners when removing or installing panels.
  11. Using proper containers to dispose of foreign objects.
- l. NASA and GSD policies for tool control.
  - m. Cause, cost, and corrective actions from local FOD mishaps.
  - n. How to inspect all vehicles that operate on the flight line or in hangar areas for foreign objects.
  - o. The use of the “FOD Boss” and how to request mechanical sweepers.
  - p. Policies and procedures in all FOD prevention directives.
  - q. Investigating and reporting FOD mishaps.

## **2.16 Quality Standards for Flight Release and Functional Checks**

### **2.16.1 Certification for Release of Aircraft for Flight**

2.16.1.1 The Chief of Flight Operations has the responsibility for maintaining the airworthiness of the Center’s aircraft. The airworthiness of an aircraft is provided by a Certificate of Airworthiness in accordance with NPR 7900, the FAA or DOD. If the aircraft has been modified from the airworthiness certificate basic configuration the aircraft must possess a signed Safety of Flight Release prior to maintenance release.

2.16.1.2 The Chief of Flight Operations will designate in writing maintenance personnel authorized to release aircraft. Aircraft releasing authority is subject to revocation at the discretion of the Chief of Flight Operations. When no qualified releasing authority is available, any person holding a designation as a NASA Pilot in Command may release GSFC aircraft for which they hold said designation unless otherwise specifically prohibited by the Chief of Flight Operations.

2.16.1.3 Prior to aircraft release, the releasing authority shall ensure that the aircraft meets all requirements of the mission / profile and is in compliance with the applicable MEL as referenced in Appendices A-D. This includes the incorporation of all action items required by the Airworthiness and Flight Safety Review Board, confirmation that the aircraft is equipped with communications and navigation equipment (and redundancy thereof) appropriate for the area of operation, validation of all electronic data bases, and compliance with ICAO Annex 6, Part II for

VFR, IFR and night operations when applicable.

2.16.1.4 Reference Appendices A-D for specific NASA GSFC aircraft releasing procedures.

2.16.1.5 The AMOC shall defer to the PIC of an aircraft requiring any maintenance action after release. Reference Chapter 12.27.3 & 12.27.7 of the NASA GSFC Flight Operations Manual for specific direction.

## 2.16.2 Major Maintenance Release Procedures

2.16.2.1 On all aircraft, certain major maintenance actions require additional procedures before the aircraft is released for flight. The following maintenance actions and conditions require maintenance personnel and QA signatures to verify quality and completeness of work prior to maintenance release of the aircraft for flight status. This list is provided as a guide and is not considered to be all inclusive. Refer to Appendices A-D for a more detailed list of aircraft specific requirements.

- a. Any maintenance action or condition that could result in a compromise to airworthiness or safety of flight.
- b. Engine change, removal and reinstallation, and/or re-rigging.
- c. Fuel control change or adjustments to fuel metering system.
- d. Propeller change or removal and reinstallation.
- e. Propeller governing or regulating component change.
- f. Maintenance on propeller control systems including rigging and adjustment.
- g. Maintenance on flight control systems including replacement of components, rigging, and adjustment of these systems.
- h. Replacement of landing gear components and adjustments to the system.
- i. All work performed on pitot static systems.
- j. Maintenance on pressurization systems, including replacement of components and adjustment.
- k. Repair of aircraft primary structures, including pressure bulkheads on pressurized aircraft.
- l. All scheduled maintenance.
- m. All modifications or alterations.

- n. Maintenance that requires a functional check flight as specified in this publication.
- o. All Primary Pilot/Copilot flight instruments.
- p. Missing tool.

### 2.16.3 Conditions Requiring a Functional Check Flight

2.16.3.1 A Functional Check Flight (FCF) is required for all aircraft where maintenance or modification(s) have been performed on a system that cannot be completely certified through ground based testing or is required by the specific AMM, Time Compliance Technical Order, or Maintenance Work Request. Prior to an FCF, the flight crew shall receive a detailed briefing by QA and maintenance management personnel on the maintenance work performed and specific FCF requirements. This briefing shall be documented on the specific aircraft FCF checklist. A locally generated FCF Control Log shall be used to log all FCFs by calendar year. Appendix A-D describes additional FCF documentation requirements. Engineering Check Flights/Test Flights and the Aircraft modifications associated with these flights are separate from the FCF process.

## 2.17 Unilateral Stop Authority Policy

2.17.1 Policy: The purpose of the Unilateral Stop Authority (USA) is to provide workers with authority to temporarily stop work if continued work might result in an unsafe situation.

2.17.2 This policy applies to organizations working directly for or with the Code 830/Aircraft Office.

2.17.3 It is the responsibility of managers, directors, and supervisors to ensure that the workforce understands this policy and that it is effectively carried out.

2.17.4 If a worker observes an unsafe work condition or a potential hazard that would conceivably result in an unsafe condition, the worker should simply state “stop work” and explain the reason. With this statement, the ongoing work is required to be stopped, unless a greater risk would result from the stoppage. The senior employee conducting the work shall concur with the “stop work” declaration and seek a safety evaluation in accordance with the USA process described in Figure 2.2. All USA actions shall be documented by organizational quality or safety officials.

2.17.5 Immediate Remedy to unsafe acts: “Stop Work”, “Time Out”, and “Knock It Off” Policy

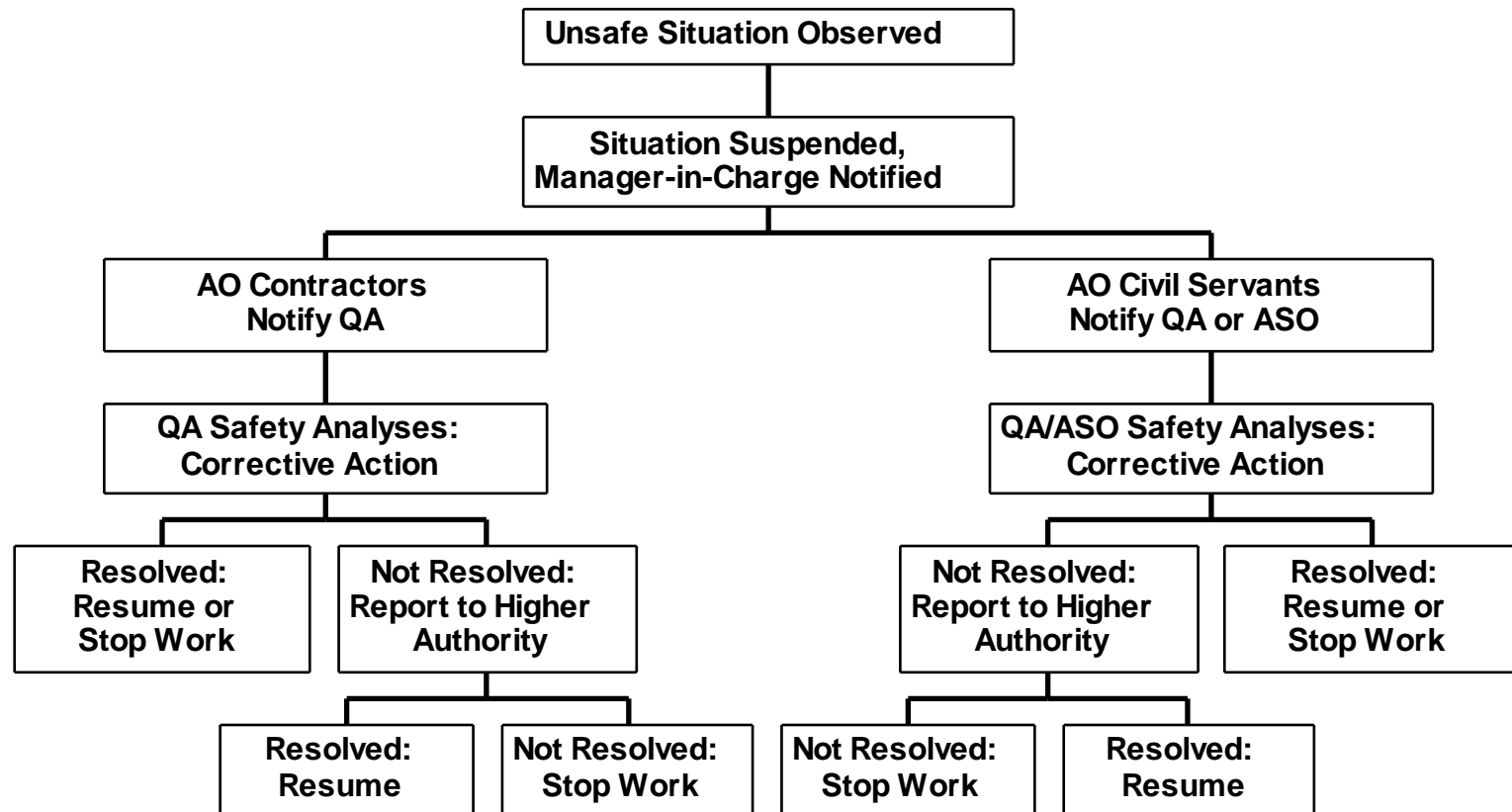
2.17.5.1 Ground “Stop Work”. During any ground evolution, any member of the evolution may initiate a “Stop Work” request. The evolution lead shall terminate the evolution and render the situation safe for all participants, aircraft or associated hardware. The ASO or duly designated

Quality Assurance Representative may reinitiate work once the situation has been resolved. All “Stop Work” events shall be reported, in writing, to the ASO for appropriate disposition.

2.17.5.2 Training “Time Out”. During any training evolution, the trainee may initiate a “Training Time Out” (TTO), verbally or via acknowledged gesture. The instructor leading the evolution shall terminate training and render the situation safe for all participants then take prudent action. All TTO events, resulting in a situation other than a momentary pause in training, shall be reported, in writing, to the ASO for appropriate disposition.

2.17.5.3 Operational “Knock It Off”. Any aircrew station may call “Knock It Off”, at any time, during any operational phase of flight or ground evolution. As soon as is practical, the aircrew member shall verbalize the reason for the concern to allow for appropriate pilot decision making. The pilot at the controls shall discontinue the current evolution, reestablish aircraft control and configuration, then evaluate via the PIC a prudent course of action. All “Knock It Off” events, resulting in a situation other than a momentary pause in operation, shall be reported, in writing, to the ASO for appropriate disposition (i.e. Pilot’s Irregularity Report or IRIS Close Call input).

[Figure 2.2]  
Code 830  
Unilateral Safety Stop Authority



## **2.18 Inspection, Measurement, and Test Equipment (IMTE)**

2.18.1 Policy: Inspection, measurement, and test equipment (IMTE) or Metrology and Calibration (METCAL) assigned to the AO and used by the AMOC shall be managed in accordance with GPR 8730.1. All AMOC owned or controlled IMTE shall be managed in accordance with the AMOC processes.

2.18.2 Responsibility: It is the responsibility of users, supervisors, quality personnel, and calibration providers to ensure that IMTE has been properly certified prior to use and that the provisions of GPR 8730.1 or the corporate equivalent are adhered to.

2.18.3 Procedures: The CMPM is responsible for ensuring all tools and equipment requiring calibration or certification are in date and in good working order. Oversight and audits will be accomplished by QA. All calibrated tools will be uploaded into and tracked by NAMIS. The maintenance technician shall check the calibration date on any tool prior to use. When notified by the local calibration lab or NAMIS, that a specific tool or test equipment is due for 'Cal', the tool is pulled from service or special tools and sent to the calibration lab for service. Currently, IMTE tools are tested and calibrated "On-Site" at the Meteorological and Calibration Testing Facility, GSFC.

2.18.4 Outside Laboratories: IMTE that is beyond the capability of the GSFC Code 540 Calibration Laboratory is calibrated by other certified laboratories. Control and tracking of IMTE is performed in accordance with GPR 8730.1. Letters of laboratory certification recall lists and usage logs are used.

2.18.5 Storage, Handling and Maintenance: IMTE storage, handling, and maintenance are performed in accordance with manufacturers' and calibration laboratory requirements, as applicable. IMTE tools are to be tracked on a 12 month cycle with a 36 day early deviation but no late deviation. Any IMTE tool with an expired calibration date will be "DOWNED" in accordance with NAMIS and GPR 8730.1. In the event a tool fails the calibration testing or is rendered "Not Usable", the tool is removed from service, removed from the asset inspection portion in NAMIS Maintenance and NAMIS Logistics and a salvage report is created to dispose of the tool or equipment. IMTE is maintained and quality audited by QA, the CMPM and the A&MM.

## **Chapter 3. Hangar and Flight Line Operations**

### **3.1 Policy Requirements and Standards**

#### **3.1.1 Hangar Operations**

3.1.1.1 Hangar and flight line orderliness and cleanliness: Normal hangar deck upkeep includes the daily removal of dust, dirt, litter and accumulation of trash, and is the responsibility of the CMPM and the AMOC. Accumulations of oil, grease, liquids, and used material shall be cleaned up by maintenance personnel prior to the end of each working day. On a weekly basis, at a minimum, the CMPM and the AMOC will conduct a 'Field Day' in order to ensure the hangar deck is thoroughly cleaned and free of any unauthorized equipment or material and all authorized hardware is positioned in the most efficient manner. When deployed, the aircraft maintenance crew and aircrew shall make every effort to meet or exceed the local basing environmental conditions.

3.1.1.2 Storage, handling, preservation, and disposal of hazardous materials: Hazardous materials shall be handled and stored in accordance with established environmental programs and OSHA standards. Materials such as oils, cleaning solvents, paint remover, paint thinner, water/methanol or other flammable material shall be stored in compliance with HAZMAT requirements.

3.1.1.2.1 Hazardous waste shall be staged (satellite accumulation point) at a designated and approved location and stored in compliance with Code of Federal Regulation (CFR) Title 40, Protection of Environment, Sections 260-299. Disposal of hazardous waste will be in accordance with GPR-8500-3 Waste Management.

3.1.1.2.2 All AO personnel shall report any observed hazardous conditions to the QAM/GSO as soon as possible. Environmental emergencies shall be reported immediately by observing personnel.

3.1.1.3 APU and GPU operation inside hangar: Aircraft or internal combustion ground power units other than approved tow tractors or support equipment shall not be operated inside the hangar. Exceptions must be approved by the A&MM and QAM/GSO.

3.1.1.4 Use of grease solvents or liquid sprays inside hangar: Under certain conditions and when approved, limited use of approved cleaning solvents for engine and parts cleaning may be permitted inside hangars. Spray painting of aircraft in hangars shall be limited to minor touch-up work, as approved by the A&MM.

3.1.1.5 All maintenance technicians will comply with all GSFC/WFF Electromagnet Interference (EMI) and Electrostatic Discharge (ESD) programs. All solid state electronic components and assemblies are considered ESD-sensitive items, unless otherwise directed by higher authority.



### 3.1.2 Use of Battery Powered Hand Tools and Lights

3.1.2.1 The use of battery powered hand tools and lights on or in the immediate vicinity of aircraft may be permitted provided the following basic standards are followed:

3.1.2.2 Caution, safety and common sense must prevail at all times when using battery powered tools. Prior to use, an inspection shall be accomplished to ensure that no open fuel panels nor evidence of fuel fumes and other flammable materials exist in the area of anticipated use.

- a. Battery powered tools must be approved for use by the CMPM or QAM/GSO.
- b. The operator of the tool must have proper authorization from supervisory personnel.
- c. Battery powered tools shall not be used in fuel tanks or other confined areas where trapped fuel fumes may exist unless such tools are specifically certified and approved for such use.

### 3.1.3 Smoking by Personnel

3.1.3.1 Smoking is not permitted inside any NASA owned buildings nor is smoking or open flames permitted within 100 feet of any parked aircraft or AGSE. Smoking is allowed only in designated smoking areas.

### 3.1.4 Fire Precautions for Flight Lines and Hangar Areas

3.1.4.1 Unless specifically directed otherwise by the PIC of the aircraft, flight line crew and maintenance personnel shall have, as a minimum, a 50 pound fire extinguisher bottle readily available for immediate use during engine starts. In addition, the services of a fire fighting vehicle shall be used for maintenance and operational conditions when additional protection is advisable.

3.1.4.2 All aircraft engine start and run-up operations shall have a radio in operation for the purpose of calling for assistance in the event of an aircraft fire.

3.1.4.3 Aircraft aisles and areas that provide access to fire extinguishers and fire equipment shall be kept clear of obstructions.

3.1.4.4 All fuel spills shall be reported to the fire department who in turn will take immediate action to wash down or neutralize the spills. During such times, maintenance operations will cease and the area cleared of personnel.

3.1.4.5 An adequate number of fire extinguishers shall be properly located throughout the flight line area. All extinguishers will be sealed and periodically inspected. Primary inspection responsibility is with the fire department; however, maintenance personnel shall report any extinguishing equipment that is out of date. Personnel will not break fire extinguisher seals unless they are actually going to use the extinguisher. In the event that a fire extinguisher is

partially or completely discharged or damaged, it will be removed from service. The fire department shall be notified immediately and the extinguisher recharged, repaired, or replaced. In no case will the contents of an extinguisher be partially used and the extinguisher resealed prior to filling.

3.1.4.6 Drip pans or containers to retain excess oil or fuel spillage shall be used in hangars.

3.1.4.7 Prompt removal of trash, debris, contaminated oil, fuel, and other fluids from the hangar is required.

3.1.4.8 Proper grounding and bonding of aircraft and fuel tankers is required to ensure the safe dissipation of static electricity during all fueling and defueling operations. Aircraft parked inside hangars shall be grounded.

3.1.4.9 Proper placement of power units (maximum distance from aircraft consistent with cable length) and fire extinguishers relative to aircraft location is required.

3.1.4.10 Mobile servicing equipment (such as vacuum cleaners, air compressors, air movers) having electrical wiring and equipment not suitable for Class I, Division 2 or Zone 2 locations shall be so designed and mounted that all such fixed wiring and equipment will be at least 18 in. above the floor.

3.1.4.11 Welding or arc cutting operations are performed when required by certified personnel from an external supporting organization. Welding or arc cutting will not be permitted on or near aircraft unless specifically authorized by the A&MM.

3.1.4.12 Aircraft shall not be fueled, de-fueled, or serviced with oxygen while inside hangars. The internal transfer of fuel within an aircraft fuel system is not considered a fueling operation.

### 3.1.5 Operation of Vehicles on Flight Lines and Parking Ramps

3.1.5.1 Aircraft ground support equipment (AGSE) and service vehicles are a necessary and integral part of all aircraft servicing operations. Equipment operators must exercise extreme care since these vehicles are required to work in close proximity to parked aircraft and confined spaces.

3.1.5.2 Only personnel who are designated by the CPM will operate assigned AGSE.

3.1.5.3 All operators of AGSE shall conduct a pre-operational inspection of the AGSE prior to use. Defects shall be reported to supervisors without delay. Supervisors shall not assign or require personnel to operate AGSE with an unsafe condition.

3.1.5.4 Operators shall not leave a vehicle with the engine running near an aircraft. When parking a vehicle near the aircraft, parking brakes shall be set, the transmission selected to "Park" and chocks installed to preclude inadvertent collision.

3.1.5.5 Motor vehicle operators must possess an appropriate valid state driver's license to operate Government motor vehicles.

3.1.5.6 When emergency vehicles are observed, other vehicles shall be stopped or positioned clear until the emergency has passed.

3.1.5.7 Vehicle operators shall drive at a speed that is reasonable and proper. The flight line speed limit is 20 mph and the speed limit within the hangar shall be no greater than 5 mph. These speed limits shall be enforced at all times by supervisory and security officials.

3.1.5.8 Operators of AGSE shall not back a vehicle while in the immediate vicinity of an aircraft unless for the specific purpose of loading/unloading cargo, positioning air stairs, or attaching a vehicle to a tow bar. In such cases, when the operators vision is obstructed, the driver shall not begin backing action until a guide person is clearly visible and the signal for movement to begin is given.

3.1.5.9 AGSE shall not be left standing or parked in front of aircraft when aircraft engines are in operation or about to be placed in operation. AGSE shall not be operated or parked in any position that might receive damage from aircraft engine or propeller blasts.

3.1.5.10 Proper and adequate headlights, tail lights, and stop lights shall be on vehicles operated during the hours of darkness. Vehicle operators shall always be alert for personnel on foot in the flight line area.

3.1.5.11 Personnel shall not ride on top of material being transported by motorized equipment, nor will personnel get on or off motor vehicles while they are in motion.

3.1.5.12 All equipment, including cranes, forklifts, power units, servicing equipment, and other units not specifically mentioned shall be positioned by qualified personnel to ensure that accidental contact with aircraft is avoided. All AGSE rolling equipment near aircraft or on the flight line will be chocked and brakes set (if equipped) to prevent accidental movement.

3.1.5.13 All power units shall be unplugged from the aircraft and the cables properly stowed prior to movement of either the aircraft or power unit. When the need for such units has been satisfied, they shall be returned immediately to the designated parking areas.

### 3.1.6 Aircraft Towing

3.1.6.1 Aircraft shall not be towed or otherwise repositioned without A&MM, ASO or Operations Manager notification. Aircraft towing shall follow the guidelines and procedures contained in the applicable aircraft flight and maintenance manual or technical orders for the particular aircraft.

3.1.6.2 A designated towing supervisor shall be in charge of each towing operation. No aircraft will be moved unless a qualified pilot or qualified maintenance technician is in the cockpit for the specific purpose of operating the wheel brakes and any other controls necessary for ground operations. Aircraft will not be towed without the landing gear pins installed, as applicable. The towing supervisor is responsible for ensuring all personnel involved in the tow are appropriately briefed.

3.1.6.3 In the event an aircraft is to be towed into an area that does not have a painted centerline appropriate for the type aircraft to be towed, the towing supervisor and all personnel involved with the towing operation shall walk the towing path prior to commencing the tow to verify obstacle clearance and clearance from any item that may cause damage to the aircraft.

3.1.6.4 An aircraft window shall be open if available on the pilot's side during the period of the towing operation to allow for conversation between the cockpit brake operator and the tow supervisor.

3.1.6.5 The person in the cockpit shall not release or set the aircraft brakes until ordered to do so by the supervisor in charge of the overall operation.

3.1.6.6 Wing walkers equipped with a sound signaling device shall always be employed when towing in close proximity to other aircraft or obstructions.

3.1.6.7 Chock walkers in addition to wing walkers shall be used when aircraft brakes are inoperative.

3.1.6.8 When backing an aircraft in congested or confined areas, a designated tow supervisor will position him/herself so he/she can be seen by both the tug operator and the cockpit occupant.

3.1.6.9 Standard international aircraft marshaling signals shall be used for all towing operations. Maximum towing speed shall never exceed five miles per hour.

### 3.1.7 APU Operation

3.1.7.1 Auxiliary Power Unit (APU) operation shall be conducted by either qualified flight crew or those maintenance personnel who have been appropriately trained and certified by the AMOC and authorized by the A&MM and QAM/GSO. Positioning of aircraft for APU operation shall be in locations that do not present a noise or exhaust problem for personnel or property. Precautionary fire protection equipment shall be pre-positioned and readily available as needed. In addition to precautions and guidelines previously established in aircraft flight and maintenance manuals or technical orders for individual aircraft types, the following standards shall apply to aircraft ramp operations:

- a. APU operation is not permitted inside hangers or during aircraft towing. Any deviation requires approval from the QAM/GSO or A&MM.

- b. The APU operator shall use applicable checklists.
- c. All personnel working in areas where sound hazards exist shall use approved noise suppression devices.

### 3.1.8 Engine Ground Run-Up Policy

3.1.8.1 Engine run-up of assigned aircraft for maintenance purposes shall be conducted by either qualified flight crew or those maintenance personnel who have been appropriately trained and certified by the A&MM and authorized by the QAM/GSO. Positioning of aircraft for engine run-up operations shall be in locations that do not present a noise or exhaust problem for personnel or property. Precautionary fire protection equipment shall be pre-positioned and readily available, as needed. Precautions and guidelines previously established in aircraft flight and maintenance manuals or technical orders for individual aircraft types will be adhered to at all times.

3.1.8.2 A qualified pilot or qualified maintenance person who is certified to start and run engines shall be in the pilot's seat of the aircraft involved or the flight engineer seat, depending upon type aircraft involved. Engine start and run-up from the flight engineer position requires an additional qualified brake operator in the pilot's seat. Radio contact with the Control Tower is to be maintained during engine operation.

3.1.8.3 The supervisor of the run-up activity shall ensure that the surrounding area is clear of equipment and material that may be subject to damage from engine and prop blast. Run-ups will be accomplished so engine exhaust and prop wash will not interfere with aircraft in the process of taxiing or runway operations.

3.1.8.4 A member of the ground crew shall be in continuous contact by ICS (on aircraft so equipped) with the person operating the engines. On aircraft not equipped with a system for ICS communications, a ground observer shall be stationed so as to be visible and to give proper signals to the person operating the engine.

3.1.8.5 The ground engine turn operator shall use applicable checklists.

3.1.8.6 All persons, vehicles, and other aircraft shall be prohibited from passing immediately behind or in front of a jet engine in operation. When necessary, a member of the ground crew shall be positioned to enforce this precaution.

3.1.8.7 Access doors and cowling subject to damage from propeller and jet blasts shall be secured or removed prior to ground testing engines.

3.1.8.8 All personnel working on or in the immediate vicinity of an aircraft during engine ground run-up shall properly wear all applicable personal protective equipment (eye and hearing protection).

3.1.8.9 In the event jet engines must be operated on the ground for a prolonged period of time, the aircraft should be moved to an isolated area to reduce personnel hazards and interference with other nearby operations.

### 3.1.9 Taxi

3.1.9.1 Only designated NASA GSFC pilots may taxi aircraft. All aircraft taxiing shall be done in accordance with the approved taxi checklist and taxiing procedures contained in the official operating manual for the aircraft. Wing walkers shall be used during taxi operations when in close proximity to other parked aircraft, vehicles, buildings, or other obstructions. Taxi speeds shall be maintained within safe operating limits.

### 3.1.10 Aircraft Launch and Recovery Procedures

3.1.10.1 Safety is the paramount consideration during aircraft ground operations. Injury to ground crew personnel and damage to equipment is likely if communications are deficient between ground and flight crew personnel. To enhance safety and effectiveness of aircraft launch and recovery operations, procedures have been standardized.

3.1.10.2 Ground crew shall be knowledgeable of and use standardized international aircraft marshaling signals.

3.1.10.3 Ground crewman shall properly use personal protective equipment (eye and hearing protection).

3.1.10.4 Prior to engine start the ground crewman shall ensure that no vehicles, equipment, or obstacles are located in the immediate vicinity or in the path of the aircraft.

3.1.10.5 To maximize the safety of ground personnel, all aircraft wheel chocks shall be removed prior to engine starts.

3.1.10.6 If an air start unit is required, the entire procedure shall be briefed between the ground crew and flight/turn crew. The air starting unit shall be removed immediately after the initial engine start and prior to additional engine starts unless a specific aircraft requires an air starting unit for each engine.

3.1.10.7 The ground crewman and pilot shall maintain positive visual contact with each other. If visual contact or communication is inadvertently lost between the ground and flight crew, the PIC should stop the aircraft until contact is reestablished.

3.1.10.8 During aircraft recovery, the pilot shall follow the taxi director's signals. Brakes must be used and monitored as required until the wheel chocks are installed. Wheel chocks will not be put in place on propeller driven aircraft until prop rotation has stopped.

3.1.10.9 Aircraft shall not be towed unless landing gear pins have been installed, as applicable.

3.1.10.10 If deviation from previously listed procedures is required, such as during deployed operations, the interim procedures shall be thoroughly briefed by the PIC and understood by the ground and flight crew.

### 3.1.11 Flight Line and Hangar Aircraft Integrity

3.1.11.1 Motorized AGSE and aircraft parked on ramps and flight lines shall be chocked when not being driven or taxied. The tie down of aircraft shall be accomplished in accordance with the instructions and guidelines set forth in applicable flight manuals, AMM, or technical orders pertaining to individual types of aircraft.

3.1.11.2 During periods of high winds or when high winds are forecasted, all appropriate tie downs shall be used IAW the applicable AMM. The CMPM and AMOC shall ensure that all aircraft under their control are properly secured while parked on the flight line. In addition to aircraft security during forecasted high wind conditions, the A&MM, CMPM and project personnel shall ensure the security of all-special equipment and material in use on the ramp or flight line.

3.1.11.3 Protection of aircraft and associated equipment from adverse weather shall receive high priority. Aircraft that cannot be protected through use of hangar space shall be considered for fly-away. Aircraft involved with high priority missions shall normally receive hangar bay storage as dictated when adverse weather warrants. In the event any NASA aircraft are stored in hangars without fire protection, a tug and tow bar shall be attached if available.

### 3.1.12 Oxygen Servicing

3.1.12.1 Only trained and qualified personnel who have been certified in writing by the AMOC shall be authorized to handle or transfer liquid or gaseous oxygen. The following precautionary standards shall be taken when servicing oxygen:

- a. No aircraft shall be serviced within 50 feet of hangars, structures, or any source of ignition (hot exhausts, sparks, flame, smoking, or operating ground cart).
- b. Connect the aircraft and oxygen cart to an approved ground during oxygen servicing.
- c. Check that the aircraft external electrical power is disconnected and the battery switch is in the "OFF" position.
- d. Aircraft shall not be serviced with fuel or oil during oxygen servicing operations.
- e. Other maintenance shall not be performed on an aircraft during oxygen servicing operations.
- f. Personnel shall properly wear a face shield, full-length apron, hat, and protective gloves when handling liquid oxygen.



- g. Drip pans or other suitable containers shall be positioned under the overflow vents of the aircraft being serviced with liquid oxygen to prevent contact with ramp.
- h. Do not handle tubes, fittings, or overflow containers carrying liquid oxygen with bare hands. If skin adheres to liquid oxygen equipment, attempt to carefully free immediately.
- i. Keep all petroleum products (oil, grease, fuel, etc.) away from oxygen equipment.
- j. Ensure quality of oxygen transfer lines through regular inspections.

### 3.1.13 Fueling and Defueling of Aircraft

3.1.13.1 Aircraft fueling and defueling shall be conducted in accordance with the guidelines and procedures contained within the applicable aircraft flight or maintenance manual.

3.1.13.2 Prior to aircraft fueling or defueling, the aircraft shall be electrically bonded between the servicing vehicle and aircraft. (Alternate three-way grounding provisions that tie the servicing vehicle to ground, aircraft to ground, and servicing vehicle to aircraft may also be used.)

3.1.13.3 Refueling personnel, AGSE operators, and other equipment specialist shall be trained and qualified in applicable regulations. Ground crewmen shall have the proper type fire extinguishers (minimum 50 lb. with long hose) and maintain a visual surveillance of the operating units throughout the fueling operation.

3.1.13.4 Ground power units and other equipment that may emit sparks, heat, or flame shall be positioned with consideration for direction of wind, slope of ramp, and location of fuel vents on aircraft. AGSE shall always be placed at the maximum distance permitted by the length of their power cables and at an angle that provides the greatest clearance from the aircraft. Only approved ground power units with a minimum 50 ft. length shall be used during fueling and defueling operations.

3.1.13.5 Fueling or defueling operations shall not be conducted within a radius of 100 feet of operating aircraft or within 50 feet of hangars, measured from the fueling/defueling point.

3.1.13.6 During aircraft fueling operations, only required maintenance personnel shall normally be aboard the aircraft. When mission requirements dictate, the Pilot in Command (PIC) may authorize essential project personnel to be aboard the aircraft during refueling provided no electronic emissions occur except essential VHF/UHF communications. Sufficient flight crewmembers as designated by the PIC must be in position to evacuate personnel, if required. An announcement shall be made to all personnel onboard the aircraft that fueling operations are in progress.

3.1.13.7 Fueling or defueling operations shall be stopped immediately upon detection of fuel leakage or seepage from equipment until repairs are made and fuel spills neutralized. Fueling operations shall be halted for fuel spillage and the area cleared of all personnel. A guard shall be



posted to keep personnel from spillage areas and operations will not be resumed until approved by fire officials.

3.1.13.8 Fueling personnel shall visually inspect fuel hoses prior to commencement of fueling.

3.1.13.9 Aircraft shall be properly chocked during fueling operations.

3.1.13.10 All maintenance activity on the flight line, to include fueling or defueling operations, shall be suspended when lightening potential from an electrical storm is detected within 10 nautical miles or the potential for an electrical storm is forecast within 5 nautical miles of the field or during a fire, aircraft crash, or crash warning. Fuel trucks shall be removed from the area of the aircraft when these conditions exist.

3.1.13.11 No maintenance shall be performed on aircraft being fueled or defueled, nor will any other concurrent servicing be conducted (i.e., alcohol, oxygen, or hydraulic fluid).

3.1.13.12 Personnel in the area of aircraft being fueled or defueled shall observe the “No Smoking” rule and shall not carry matches or mechanical lighters near the operation. Personnel shall exercise care not to create any friction or static sparks in the handling of tools, metal equipment, wearing of metal shoe taps, or nylon clothing which produce charges of static electricity.

3.1.13.13 The fuel truck shall be located as far from the aircraft as fuel hose length will permit and the truck parked in the best position to be driven or towed away from the aircraft in case of emergency.

3.1.13.14 Fuel nozzles shall not be locked or blocked in an open position but shall always be manually controlled.

3.1.13.15 Care shall always be taken when topping off fuel tanks to prevent overflow.

3.1.13.16 Maintenance personnel are responsible for checking for contaminants in delivered fuel by way of a fuel sample at the time of delivery. Acceptance of delivered fuel shall be in accordance with ATA Specifications 103 chapter 2-8. In addition, aircraft fuel Samples shall be taken during the daily or preflight inspection in accordance with the specific aircraft's DAILY/PREFLIGHT card.

3.1.13.17 The A&MM will evaluate Confined Space entry as needed. If it is determined that a confined space entry is to be made, the AMOC will follow the procedures in accordance with the GSFC/WFF Safety Manual.

3.1.14 Aircraft Jacking

3.1.14.1 Supervisors shall ensure that jacking crews are prepared and understand the objectives, procedures, and precautions necessary to safely perform aircraft jacking operations. Jacking of aircraft shall always comply with the applicable AMM.

3.1.14.2 Jacks and other equipment shall be serviceable with current load test and available in proper numbers. Faulty equipment shall not be used.

3.1.14.3 Ramp or hangar areas shall be cleared of all unnecessary equipment and material in the immediate vicinity of jacking operations. No aircraft shall be positioned and placed on jacks that would block other aircraft from exiting the hangar. Jacking done inside a hangar must be done with the entire aircraft enclosed in the hangar.

3.1.14.4 Jacking crews shall always include a qualified supervisor and a sufficient number of qualified crewmembers to perform the operation.

3.1.14.5 The assigned supervisor shall ensure that each member of the jacking crew is qualified and that specific locations and duties are understood.

3.1.14.6 The assigned supervisor shall ensure that the area around the aircraft is cordoned off and appropriate warning signs posted; that safe procedures are utilized, and that proper checklists are used for the particular requirements and conditions.

3.1.14.7 The aircraft parking brake shall be released prior to jacking the aircraft to compensate for landing gear strut extension during jacking operation.

3.1.14.8 Jacking of aircraft is permitted outside the hangar only if absolutely necessary. Under these conditions, the above procedures are applicable except that wind conditions must be less than 10 MPH and jacking surface must be level and capable of supporting the aircraft.

### 3.1.15 Aircraft Washing and Cleaning

3.1.15.1 Prior to washing aircraft, the aircraft batteries will be disconnected and protected.

3.1.15.2 Only approved cleaning soaps, compounds, and solvents shall be used. Personnel shall avoid breathing harmful or toxic fumes and avoid skin contact with cleaning materials, acids, or strong alkalis. Only qualified personnel shall operate all spray nozzles.

3.1.15.3 Personnel shall not climb or walk on external surfaces of aircraft during washing operations unless required. If required, extreme care shall be exercised to protect personnel from falling. Protective systems such as safety lines and safety belts along with properly worn PPE (head and eye protection) shall be utilized. Long handled brushes will be used to aid in cleaning those aircraft areas that are difficult to reach.

3.1.15.4 Supervisors and personnel using work stands shall ensure that the guardrails are in place. Stands and rails shall be maintained in good condition and stands will be secured against

accidental movement while personnel are on them. Extreme caution shall be exercised to avoid slipping or falling from work stands. PPE and clothing shall be properly worn at all times.

3.1.15.5 Aircraft washing shall be performed only at the authorized aircraft washing area.

3.1.15.6 Personnel involved in aircraft wash process shall comply with all OSHA standards for PPE requirements.

3.1.16 Explosives

3.1.16.1 Only trained and qualified technicians will perform maintenance on systems containing explosive devices.

3.1.16.2 The CMPM will ensure the proper safety precautions are adhered to when performing maintenance on aircraft systems containing explosive devices. All off-aircraft explosive replacement or maintenance will be performed in a designated area. The CMPM will track explosive procurement, storage, and disposal. A dedicated explosive storage locker will be used to keep all devices when not being used. Initial and recurring training will be provided, and technicians will follow all aircraft manufacturers, department of defense, and the GSFC Safety Manual when performing maintenance on explosive devices and systems.

3.1.16.3 Any person requiring access to an aircraft with ejections seats and egress system must first be trained by a certified technician on the hazards associated with the explosives for that aircraft. This training will be recurring on an annual basis for all personnel.

## **3.2 Records and Reports**

3.2.1 Records: All maintenance actions conducted on GSFC assigned aircraft shall be documented in NAMIS and in the appropriate aircraft logbook.

3.2.1.1 A Hold-Off Tag (also referred to as a Danger Tag) is used to identify an “unsafe to operate” condition that could result in damage to equipment or personal injury if the subject equipment were operated. The Hold-Off Tag is red in color to readily identify unsafe-to-operate equipment and/or related systems. The Hold-Off Tag shall be used for all “unsafe-to-operate conditions” either on aircraft, maintenance support equipment, and or systems.

3.2.1.2 When a maintenance discrepancy is deferred in accordance with the Minimum Equipment List (MEL) an INOPERATIVE label shall be placed on the effected component or control panel. These placards will remain in place until AMOC personnel correct the discrepancy and document it in NAMIS.

3.2.2 Reports: The AMO personnel shall report deficiencies, complaints, or safety-related problems associated with line services to the QAM/GSO upon their occurrence

## **Chapter 4. Aircraft Ground Support Equipment (AGSE)**

### **4.1 Policy**

4.1.1 AGSE assigned to the Aircraft Office in support of local and visiting aircraft shall be operated and maintained in accordance with the general requirements and standards specified in this Section.

### **4.2 Operation of AGSE**

4.2.1 The AMOC is responsible for the safe and proper operation of AGSE as well as ensuring maintenance personnel receive appropriate training prior to the operating of any AGSE equipment. Operation of equipment shall conform to rules and regulations on use of Government vehicles, including training certification requirements if applicable. AGSE equipment shall not be left unattended outside and shall remain in the hangar or appropriate storage facility when not in use.

### **4.3 Maintenance of AGSE**

4.3.1 The AMOC is responsible for performing pre-operational inspections, servicing, and preventative maintenance of powered AGSE and the QAM/GSO is responsible for recording the status within NAMIS. Deficiencies not repairable by the AMOC shall be reported to QAM/GSO and the motor vehicle garage.

- a. An AMOC AGSE technician shall be designated in writing for oversight of the AGSE program.
- b. AGSE will go through a PMCS prior to its use by the operator to ensure its serviceability.
- c. Corrective actions taken towards a fault found during a PMCS will be noted on NAMIS entry.
- d. Support maintenance will be utilized to perform maintenance on GSE above unit / operator level.
- e. Load testing and similar maintenance may be work ordered to the support maintenance activity.

4.3.2 All AGSE equipment will be entered into an inspection program not to exceed 180 days or in accordance with applicable maintenance manuals.

4.3.3 Non-powered AGSE is inspected, serviced, and maintained by the AMOC. AGSE that requires maintenance beyond the AMOC capability shall be brought to the attention of QAM/GSO and CMPM. The AMOC shall ensure compliance with “prior-to-use” inspections and periodic inspections.

4.3.4 Marking of AGSE: Reflecting tape will be used to mark maintenance stands, tugs, and tow bars that are to be used on the flight line as required.

- a. Ready-made markings will be used to indicate load test dates, and annual inspections. These markings will be placed in a clearly visible spot on AGSE equipment.
- b. Maintenance work stands and lifting devices will be stenciled with load rating and next inspection due date.
- c. Lifting and carrying capacities of aircraft jacks, work stands, hoists, slings, and stands will have capacities, and load ratings legibly marked and next inspection due date stenciled or tagged.
- d. Under no circumstances shall the stenciled markings be removed, except for changing next inspection date, load test date, or annual inspection at which time the new date will be re-stenciled.
- e. If AGSE is in a down status a hold off tag shall be attached to clearly identify “DO NOT OPERATE”.

4.3.5 Corrosion Control: All ground support equipment will be inspected and treated for corrosion on a 180-day cycle or as stated in the applicable directive for that item. The inspection cycle will be documented in NAMIS.

4.3.6 AGSE Training: All personnel requiring the use of ground support equipment, to include vehicles, will hold a valid training certificate for the equipment.

- a. The AMOC is responsible for training maintenance personnel in the proper use of all AGSE in accordance with the specific operating manual and all applicable Aircraft Office instructions.
- b. The QAM/GSO will maintain training files on all AGSE qualified personnel.

## **4.4 Quality Assurance and Accountability**

4.4.1 The AMOC shall provide quality assurance and accountability of all AGSE that is assigned to the contractor. Accountability shall include a computer based real-time listing of all assigned AGSE with a condition status of each that is available to both the contractor and the Government. Recommendations for disposal, replacement, or addition of AGSE shall be submitted to the QAM/GSO and CMPM.

## **4.5 Records and Reports**

4.5.1 NAMIS is the primary method of record keeping. All AGSE equipment will be identified and entered into this system. Records and reports will be distributed according to the following schedule:

- a. An updated AGSE Condition Report of powered and non-powered equipment shall be maintained by the AMOC.
- b. A GFE/GFP Deficiency Report shall be submitted by the CMPM to the QAM/GSO when there is missing or damaged NASA owned AGSE. Details of the deficiency, including cause and effect, shall be included in the reports.
- c. Inspection and maintenance records for AGSE shall be maintained in NAMIS, these records will list the type of equipment, identification numbers, inspection schedule, inspection results, discrepancies, repairs, and operational status using standard maintenance symbols.

## Chapter 5. Aircraft Life Support Equipment (ALSE)

### 5.1 Policy

5.1.1 ALSE is to be maintained and handled with the highest level of care so as to ensure its functionality, when needed. ALSE, including flight clothing, shall only be used for official purposes and when engaged in flight operations.

### 5.2 Requirements and Standards

5.2.1 The AMOC shall ensure all ALSE is properly stored, maintained, and properly repaired in accordance with the manufacturer's specifications, military standards and/or FAA requirements, as applicable.

5.2.2 ALSE is inspected to manufacturer specifications by the AMOC. Nonconforming ALSE is tagged with a Parts Control Tag and precluded from use. Conforming ALSE are inventoried and tracked in NAMIS which contains the inspection schedule and location. The ALSE specialist controls this process.

5.2.3 The AMOC is responsible for the custodial management and issuance of flight clothing and equipment to flight and project personnel. The AMOC assists personnel with equipment functional demonstrations, technical information, and fitting; and maintains signed custody forms for all issuance to flight personnel. These forms are retained while equipment is in a sub-custody status. Government Furnished Property (GFP) and Government Furnished Equipment (GFE) shall be promptly returned to the ALSE Shop for turn-in upon termination of need or employment.

5.2.3.1 GFP and GFE that are lost or damaged through carelessness shall be subject to replacement by responsible parties.

### 5.3 ALSE Aircraft Assignments

5.3.1 ALSE shall be located on and issued to aircraft as follows:

- a. First Aid Kit: One (1) prominently located kit shall be aboard each medium aircraft. Two (2) kits shall be aboard each large aircraft. An exception will be made for small aircraft unable to accommodate a standard medical kit due to limited cockpit size. In such cases, an individual medical kit shall be included within the aircrew PPE.
- b. Emergency Signal Kit: One (1) prominently located kit shall be aboard each medium aircraft. Two (2) kits shall be aboard large aircraft. Small aircraft shall have an emergency signaling kit located within the respective aircrew PPE.

- c. Crash Axe and Gloves: One (1) prominently located crash axe and holder shall be aboard each medium aircraft. Two (2) such units shall be installed in large aircraft. Protective gloves may be located with each crash axe. An exception will be made for small aircraft unable to accommodate a crash axe due to limited cockpit size.
- d. Flotation Vest: One (1) vest per aircraft occupant shall be located at each occupant's seat plus 10% reserve. Aircrew operating small aircraft shall have a flotation device integrated in to their respective PPE.
- e. Flotation Raft: All flights operating over water more than 50 miles from land shall carry flotation rafts and associated accessory kits adequate to accommodate all on board personnel.
- f. Anti-Exposure Suit: Anti-Exposure suits may be required for selected over-water missions as described in specific mission directives. These suits shall be maintained in the ALSE Shop and placed aboard aircraft as required.
- g. Fire Extinguisher: Portable fire extinguisher units shall be located aboard aircraft in conformance with their respective flight manual. Fire extinguisher shall be hydrostatically tested per the D.O.T. schedule.
- h. Oxygen System: Each aircraft occupant shall have ready access to oxygen. Oxygen use shall be from an integral aircraft system, portable oxygen bottle, or portable oxygen hood depending upon the particular aircraft. Oxygen provisioning shall be in conformance with each aircraft's flight manual.

5.3.2 ALSE may be removed from aircraft that are in maintenance, modification, or reconfiguration status; however, a NAMIS Work Request is required upon removal and reassignment.

5.3.3 Cold weather survival attire and equipment shall be assigned to aircraft missions requiring cold weather environmental protection as determined by mission requirements.

5.3.4 Defibrillators shall be installed when aircrew and non-aircrew (qualified non-crewmembers) are on board.

## **5.4 Records and Reports**

5.4.1 NAMIS shall be used for monitoring inventory, accountability, and inspection requirements for all ALSE shop maintained items. A custody record shall be used for issue of equipment and or personal attire to flight crew personnel. Inventory Management and Reporting shall comply with NPR 4100.1.



## **Chapter 6. Material Management**

### **6.1 General Policy**

6.1.1 Material procurement, handling, storage, packaging, delivery, and issuance shall be conducted in accordance with the NASA Materials Inventory Management Manual (NPR 4100.1) and other applicable regulations. NASA will only acquire materials for mission performance and official purposes.

### **6.2 Responsibility**

6.2.1 The AMOC is responsible for the procurement of all parts and equipment necessary to support aircraft maintenance and to maintain the aircraft in an airworthy condition. For those parts to be purchased through the DOD, the AMOC will create the part requisition in NAMIS Logistics and provide it to the COR for submission through the AMOC.

### **6.3 Parts procurement**

6.3.1 Any request for the purchase of parts over \$100 shall be approved in advance by the COR. The parts requested shall be purchased from an approved vendor or through the DOD.

### **6.4 Shipping, Traceability, Receiving, Inspection, and Testing**

6.4.1 The shipping and receiving of material will be the responsibility of the AMOC. When parts are received, either from a purchase or repair facility, a QAR will immediately place the item in a secure area and inspect the item for quality, accuracy, and usability. The inspection will also include compliance with applicable Federal Aviation Regulations. If the item is determined to be serviceable, it will be labeled with a parts serviceable tab and logged into NAMIS Logistics prior to being installed on an aircraft or placed into supply. If the part is incorrect or unserviceable, the AMOC will return the part if it was commercially acquired or coordinate with the COTR for the return of the part if it was acquired through the DOD.

### **6.5 Services Procurement**

6.5.1 Procurement of aircraft services such as aircraft inspections and engine overhauls that are beyond in-house capability are normally performed on an individual basis using existing government contracts where available. At the discretion of the government, these service-related procurements may be requested through the AMOC.

### **6.6 Handling and Storage of Material**

6.6.1 The aircraft maintenance stockroom (and associated storage areas) is the focal point for the receipt, storage, and issuance of assigned aircraft related parts, supplies, material control,

accountability, and security. The AMOC maintains and manages stockroom and storage functions. All serviceable aircraft spare parts assets shall be inventoried and tracked using NAMIS.

## **6.7 Special Tools and Equipment**

6.7.1 Special tools and equipment that are considered Government Furnished Property (GFP) are provided to the AMOC for the maintenance of aircraft and associated AGSE. This property is categorized as special because it is more complex than common tools, which are furnished by contract employees and typically smaller and less in value than government furnished items. Special tools and equipment are inventoried and tracked using the tool control program described in Chapter 2.14.

## **6.8 Records and Reports**

6.8.1 Monthly contractor procurement report: This report lists direct purchases by the AMOC and is provided to the COR at the end of each month. The report contains a line item for each purchase with a date, description of purchase, source of purchase, and amount of item.

6.8.2 Inventory reports and forms: Inventory reports of Government stock property shall be made in compliance with the NPR 4100.1, Materials Inventory Management Manual. Inventory of aircraft parts will be managed through NAMIS.

6.8.3 Procurement Nonconformance Reports (NCR): NCR's detail procurement-related nonconformities. These reports are initiated by the AMOC or the Government for a procurement nonconformance. The report is submitted through GSFC and AMOC NCR systems.

6.8.4 Parts serviceable tag: The parts control tag is used to identify maintenance parts determined to be in serviceable condition, when returning an aircraft part to service after repair or overhaul by the repair station and when a new or repaired part is coming into the system through receiving inspection.

6.8.5 Unserviceable tags: This tag will be attached to any item removed from the aircraft that is considered not serviceable or did not pass receiving inspection.

6.8.6 Condemned part tag: This tag is attached to a part when it is found un-repairable, un-airworthy or condemned.

6.8.7 Part identification tag: This tag is used for parts that are removed from the aircraft in serviceable condition to facilitate other maintenance.

6.8.8 Component cannibalized tag: This tag is used when a part or component is borrowed, removed or cannibalized from a higher assembly. The tag is to be filled out by the mechanic removing the part and authorized by a QAR. The mechanic will write the repair order number or

the requisition number on the back of the tag and attach it to the cannibalized part. The repair order or requisition will have the information on it that identifies it as a replacement part for the cannibalized unit.

## **Chapter 7. Aircraft Maintenance Documentation**

### **7.1 General Administration**

7.1.1 This chapter prescribes requirements for the administration of maintenance documents. Instructions on forms completion, filing, and disposition of records are included. Aircraft maintenance documentation addressed in this section shall be administered in support of all NASA GSFC owned and operated aircraft.

7.1.2 All entries on maintenance documents, with the exception of signatures or stamps, shall be typed or printed. Signatures shall be typed or printed if transcribed by an individual other than the original signer. The handwritten entries on maintenance documents shall be made with black ink (ball point pen), unless otherwise specified. The minimum signature for maintenance personnel certifying entries on forms governed by this manual shall be first initial, second initial and last initial. Maintenance documents shall be legible, complete, correct, and clean.

7.1.3 Historical files shall be maintained and preserved for each aircraft and unit of Aircraft Ground Support Equipment (AGSE). Historical document files for aircraft components and subsystems may be included within equipment-end-item files or may be maintained in separate files. Each file shall contain a complete maintenance record of the subject equipment. Maintenance records shall be retained electronically or in a secure, climate-controlled environment.

7.1.4 Documents for aircraft, engines, and/or equipment in extended storage shall be in accordance with directions published within this section.

7.1.4.1 When aircraft engines or equipment are removed from storage, their records shall be reviewed to ensure they are complete and accurate, and that all outstanding relevant technical directives are listed on the applicable forms for follow-up action.

7.1.4.2 When aircraft engines or equipment are maintained in flyable storage at GSFC, maintenance requirements may be modified if necessary with the approval of the QAM/GSO. Aircraft power plants mounted aboard aircraft that are not in a preserved state shall be ground run on a 30-day basis or as required by propeller and engine manufacturers. The AMOC must request a waiver for any noncompliance. When maintenance or inspections are performed during the storage period, such documentation shall be recorded in NAMIS, on applicable forms, and logbook entries made as applicable for that item. Although items are in storage, all documents must be accurate, complete, and maintained in properly established files.

7.1.5 Record all dates on the forms prescribed in this manual by digits in the order of year, month, day unless otherwise directed by specific maintenance manual direction. Example: 13/03/28 for March 28, 2013.

7.1.6 Inoperative labels are maintained as a part of each aircraft maintenance logbook. These adhesive labels are to be affixed on flight station equipment or instrumentation that is inoperative. These labels are to be placed on such equipment by either flight crew or maintenance personnel depending on who first discovers the inoperative status. The inoperative labeling shall be removed by maintenance personnel when repairs or replacement of equipment is complete. The labeling of inoperative equipment is an FAA and NASA/GSFC requirement for such equipment that is permissible for continued flight. The purpose of this labeling policy is to preclude misunderstanding or forgetfulness relative to flight with inoperative equipment. Maintenance supervisors and pilots-in-command are especially responsible for enforcement of this policy.

## **7.2 NAMIS Documentation**

7.2.1 The NASA Aircraft Management Information System (NAMIS) will be the primary means of documenting and tracking the status of aircraft, aircraft components, AGSE, and parts. NAMIS is a computer software package designed to focus on the four major categories common to aircraft operations organizations: flight operations support; aircraft-related maintenance management; logistics/spares management, and aircraft configuration management. NAMIS shall be used to submit, review, place in-work, and sign off all aircraft maintenance actions and work requests. No maintenance work shall be performed on an aircraft, installed aircraft component, or installed mission system before a work request has been generated in NAMIS and placed “in-work.” Additional information is available in the NAMIS Maintenance User Guide and NAMIS Logistics User Guide.

7.2.2 Symbology description: The symbols described in this section are established for use on maintenance documents to ensure that important notations are instantly apparent. NAMIS uses two symbols to describe the overall condition, flight readiness, or status of operation of aircraft or support equipment units. These symbols and their use must be fully understood in order to make and interpret entries on maintenance documents. When a work request is submitted, either through NAMIS Flight Data Capture or NAMIS Maintenance, the work request can be entered as either “up” or “down.”

7.2.2.1 An upward facing arrow indicates that an aircraft, support system, required publication, or essential equipment is operational and/or considered safe for flight. When an item is in this condition it is commonly referred to as being “up.”

7.2.2.1.1 Additionally, a work request submitted as “up” indicates that a discrepancy exists on an aircraft or unit of equipment; but it is not sufficiently serious to warrant grounding of the aircraft or discontinuing the use of the equipment. When maintenance or aircrew personnel discover an unsatisfactory condition that warrants submission of an “up” work request, a description of the condition shall be provided in the description block in NAMIS. This documentation is necessary to reflect a complete history of the work to be accomplished and to keep the aircraft, support system, and unit of equipment in an operational condition.

7.2.2.2 A Down Arrow indicates that an aircraft, support system, required publication, or essential equipment is missing, unusable, and/or considered unsafe for flight. When an item is in this condition, a down work request shall be generated in NAMIS. Items marked with a down arrow are commonly referred to as being “down.” If the work request is labeled “down,” each parent component or system will also be labeled by NAMIS as down (e.g. if a down work request is submitted against a generator installed on an engine, the generator, engine, and aircraft will all be labeled as down). The component(s) will remain in a “down” condition until qualified personnel electronically sign the work request signifying the discrepancy has been fixed or is no longer considered down. Use of aircraft, support systems, or equipment with a down arrow designation shall not occur until the unsatisfactory condition is corrected or the symbol is cleared.

7.2.2.2.1 A down arrow shall be used to “ground” or remove equipment from service. An “Immediate Action” technical directive, an “Urgent Action” directive within specified time limits, or an “Alert Service Bulletin” are examples for symbol usage.

7.2.2.2.2 When a down arrow is applied, all related work, inspection, and review must be accomplished by maintenance technicians and QA personnel authorized to clear the downing discrepancy.

7.2.2.2.3 No one shall authorize or direct an aircraft to be flown or equipment to be used until all downing discrepancies have been properly cleared.

7.2.2.2.4 The down arrow symbol is mandatory for high time change items.

7.2.2.2.5 Repairs or work to remedy conditions indicated by a down arrow shall be completed by a qualified maintenance technician. The inspection of work performed to clear the down arrow shall be accomplished before the symbol is cleared. This is required to ensure that the work has been properly accomplished and that nothing has been overlooked. Special procedures for clearing a downing discrepancy are described in the following paragraphs:

- a. The AMOC shall maintain a list of personnel authorized to sign “corrected by” and “QA” signature blocks on maintenance documents.
- b. Supervisor personnel who participate in accomplishment of repair work and are authorized to clear downing discrepancies may enter their signature in the “QA” block provided that another member of the maintenance crew accomplishing the work signs the “Corrected By” block. Work accomplished by supervisors without the assistance of another individual requires a QA signature by another supervisor or inspector.
- c. During deployed operations when a qualified maintenance technician is not available to QA maintenance work, the flight engineer or pilot-in-command may sign the QA signature block of a downing discrepancy when specific authorization is granted by the Chief of Flight Operations. When one of these personnel is authorized, that individual will inspect the work performed before signing the “QA” signature block.

- d. When an aircraft, support system, or unit of equipment is in an unsafe condition and a depot facility or contractor is providing corrective action for the particular discrepancy, the inspection of work and the clearing of the down arrow shall be accomplished by the depot personnel or contractor.

7.2.3 NAMIS will be the sole method of initiating work requests. Discrepancies noted during flight shall be entered by the flight crew using either Flight Data Capture (FDC) or NAMIS Maintenance. All other work requests shall be generated through NAMIS Maintenance. Detailed instructions are available in the NAMIS Maintenance User Guide.

7.2.3.1 Specific entries are required for inspections to aircraft systems or components that have been subjected to unusual wear and tear that may cause a potential problem. The entries shall be made by the individual having initial knowledge of such occurrences regardless of the apparent condition of the aircraft. As an example, aircrew shall generate a work request when an aircraft has:

- a. Been involved or damaged in a ground or air mishap.
- b. Encountered severe turbulence or icing during flight.
- c. Made contact with a foreign object.
- d. Exceeded the airspeed or “G” load limitations.
- e. Made a hard landing.
- f. Used excessive braking.
- g. Flown a sustained flight at low altitude over salt water.

7.2.4 Changing symbols after an original entry: Entry of a downing work request by an individual represents their understanding and interpretation as to the seriousness of the defect. Therefore, no individual shall be directed to change a symbol that has been entered.

7.2.4.1 If an individual within the maintenance activity believes that a condition is more serious than represented by the symbol, they can change the work request in NAMIS from up to down. The work request will automatically be stamped with the individual’s name.

7.2.4.2 If any personnel believe that a condition is less serious than represented by the symbol, the matter shall be brought to the attention of the A&MM and QAM/GSO by means of the CMPM. If a decision is made to downgrade the symbol, the individual who made the decision shall change the work request in NAMIS to an up discrepancy and annotate in the “justification” block the reason for the change. Individuals who take such action will assume responsibility by making the change in NAMIS which will automatically stamp the individuals name on the work request. The work request will remain as an up discrepancy until corrected and closed.



7.2.4.3 An aircraft with a down work request may be released for a one-time flight to a repair facility provided the aircraft is airworthy for the specified operating conditions. Such action must be approved by the Chief of Flight Operations and the ASO. If the aircraft is located at a deployed location the assigned flight engineer and pilot-in-command shall coordinate with the A&MM and QAM/GSO to determine the seriousness of the downing discrepancy and to receive guidance on releasing or not releasing the aircraft for a one time flight to a repair facility or to home station.

7.2.4.4 When a discrepancy has been entered as an up work request and it becomes more serious after additional flights or usage, the symbol shall be upgraded and appropriately described. The work request will automatically be stamped in NAMIS with the individual's name.

7.2.5 All Technical Directives (TD's), service, airframe, powerplant bulletins, etc., will be reviewed by the AMOC and recommendations made to the A&MM, QAM/GSO in order to determine applicability and action. Those determined to be applicable will be logged into NAMIS as a Technical Directive and a NAMIS work request will be generated. The A&MM and QAM/GSO shall determine compliance requirements with concurrence from the Chief of Flight Operations and the AMOC maintainers will annotate the applicable disposition in NAMIS. The QAM/GSO shall be responsible for each technical directive entered into NAMIS and that the QAM/GSO or authorized representative has signed the TD.

7.2.5.1 A directive allowing a certain number of hours, cycles, or calendar time to pass prior to compliance shall be written up as a down discrepancy and deferred until the expiration time. Deferring the maintenance will change the work request in NAMIS to an up discrepancy until the time limit has been reached, at which point NAMIS will automatically down the aircraft. If compliance with a TD needs to be deferred beyond its published limits, the A&MM and QAM/GSO shall make appropriate recommendations to the ASO and written approval by the GSFC Chief of Flight Operations shall be obtained and attached to the NAMIS Work Request.

7.2.6 Could not Duplicate: When a discrepancy for an unsatisfactory condition cannot be duplicated by maintenance personnel, the discrepancy (if entered as an up work request) shall be considered for upgrade to a down work request, depending on the seriousness of the condition. Before closing the work request, maintenance personnel shall verify all efforts to duplicate the reported condition and to correct the problem have been expended to the extent that it is safe to conclude that a problem does not exist. The discrepancy shall then be closed with a recommendation for an FCF or In-flight Evaluation if needed.

7.2.7 Repeat Discrepancy: A discrepancy that recurs during the next flight or system operation is considered a Repeat discrepancy. Second recorded repeat discrepancy (third write-up) affecting the same system shall be deemed unsatisfactory and the aircraft shall be restricted from further flight until action is taken to correct the discrepancy. In this case, the work request in NAMIS shall be annotated with the phrase "REPEAT DISCREPANCY". 'System' is defined as aircraft components, either singular or in combination that function to facilitate flight or mission accomplishment. Normally, these systems are identified in a Minimum Equipment List (MEL) or



equivalent chart with Work Unit Code (WUC). Discrepancies that do not impact or contribute to flight or mission accomplishment and do not possess a system identification code or nomenclature shall not restrict flight activity, but nevertheless will require investigation and QA attention. Subsequently, these discrepancies will be annotated with “REPEAT DISCREPANCY”. These type discrepancies will be inspected by QA following corrective action.

7.2.8 An In Process Inspection (IPI) is performed during assembly of systems, subsystems, or components in accordance with applicable maintenance directives or by on-condition checks. Maintenance actions involving an IPI are normally identified with specific aircraft inspection requirements. It is essential that maintenance and quality assurance personnel be familiar with IPI requirements. Locally generated IPI sign-off sheets shall be used for safety-of-flight systems. When a NAMIS work request which included an IPI is closed, a copy of the IPI will be scanned and attached to the work request and a paper copy of the IPI will be filed in historical files.

7.2.8.1 An IPI shall be performed by QAR’s authorized and designated by the QAM/GSO. The IPI shall be accomplished during a particular phase of assembly or disassembly as identified by work checklists and cards or by an on-condition check.

7.2.8.2 An inspector who completes an IPI is ensuring that an inspection was completed on the particular system, subsystem, or component identified in the IPI requirements listing and that further assembly is authorized.

7.2.8.3 The IPI and final inspection of the completed maintenance action does not require inspection by the same inspector. The inspector who signs the “Inspected By” block in NAMIS shall ensure that any required IPI was complied with prior to placing a signature in the “Inspected By” block.

7.2.9 Functional Check Flights (FCF) will be required for all aircraft where maintenance or modification(s) have been performed on a system that cannot be completely certified through ground based testing or is required by the particular Aircraft Maintenance Manual (AMM), Technical Order, or Maintenance Work Request (refer to chapter 2.16, Quality Standards for Flight Release and Functional Checks for additional information). When maintenance requiring an FCF is performed on an aircraft, the work request shall be annotated with “FCF required” in the “Action Performed” block. Additionally, in the “asset management” portion of NAMIS, the aircraft shall have the “FCF required” block checked with a brief explanation of the requirement and the FCF Control Number from the AMOC maintained FCF Control Log.

7.2.9.1 Prior to releasing an aircraft for flight, the individual releasing the aircraft shall ensure that any maintenance performed since the previous flight that requires an FCF is properly annotated and if such maintenance has been performed, the aircraft is only released for the purpose of an FCF. The Work Request initiating the FCF requirement shall be signed off and closed prior to releasing the aircraft for flight. If an FCF is unsatisfactory, a new Work Request shall be initiated with the new discrepancy and the same procedure described above followed.

The FCF Control Log will be annotated that the FCF was unsatisfactory and will refer to the next FCF for continuity.

7.2.10 Closing work requests: The signatures entered in the signature blocks of maintenance records indicate that the individual whose name appears in the block has accomplished the required maintenance or has inspected the work and has found the condition satisfactory. When the signature is entered, the particular discrepancy is considered to be “closed” or “signed-off”. Any individual who signs-off a maintenance action or work request must do so IAW technical manuals applicable to the task.

7.2.10.1 NAMIS automatically determines the number of signatures required to close a work request based on the type of work request. Generally, down work request will require a “completed by” and an “inspected by” signature while up work request will only require a “completed by” signature. Certain work request upon initial issue may not automatically require an “Inspected by” signature; however, if a maintenance technician or QAR believes the work justifies a second set of eyes from a qualified inspector, he shall add another signature block on the work request. Additionally, Chapter 2.16, Quality Standards for Flight Release and Functional Checks, details maintenance actions that require a second signature for closing. The maintenance technician completing the work shall add the additional signature block when required or deemed appropriate. The final signature on any down work request shall be a designated inspector or quality assurance representative.

7.2.11 Review items: Some invalid entries made in NAMIS are called to the user’s attention through the generation of a review item. The following list provides a few examples of what will cause a NAMIS generated review item:

- a. Removed serial number is installed on another assembly.
- b. Removed part is not associated to a NAMIS Part record.
- c. Installed Serial Number is not associated to an Asset record.
- d. Mechanic installed an unserviceable part.

7.2.11.1 By design, NAMIS will not prevent a work request from being closed based on an open review item. This allows an aircraft to be returned to service and released for flight with open review items. The CMPM shall examine all review items on a daily basis to ensure they are being closed appropriately and in a timely manner.

7.2.12 Changing work request to historical: Closed NAMIS work request will be reviewed by QA and changed to historical. At a minimum, the QAM/GSO or his/her authorized representative should review each work request for the following items:

- a. Ensure the corrective action taken was appropriate for the discrepancy.

- b. Ensure the work request was correctly identified as being up or down.
- c. Ensure the technical reference is entered correctly.
- d. Ensure all required blocks have been filled in correctly.
- e. Ensure all review items have been closed with appropriate reviewer's comments.
- f. Ensure the appropriate numbers of signatures were added to close the work request. (refer to chapter 7.2.10 and Section 2.16)

7.2.12.1 After review, a QAR can accept the closed work request as is and change it to historical, reopen the work request, or change the work request to historical and conduct training as required to improve documentation in NAMIS.

### **7.3. Aircraft Maintenance Logbooks and Forms**

7.3.1 The primary means for tracking the day to day maintenance activities on GSFC assigned aircraft will be NAMIS. However, certain actions must also be annotated in the paper aircraft logbooks which shall be maintained in accordance with instructions within this section and GPG 1440.7. When applicable, the requirements identified in FAR, Parts 43, Part 91 and all applicable aircraft maintenance programs shall be adhered to and the QAM/GSO must approve any deviation.

7.3.1.1 Regarding assigned aircraft that were previously owned and operated by other organizations, the original aircraft maintenance records are maintained for historical reference only and are not updated. Aircraft maintenance information is transformed into GSFC's aircraft maintenance system and all required information is extracted and transferred into NAMIS and GSFC forms and records.

7.3.1.2 The maintenance and custody of aircraft maintenance records is the responsibility of the AMOC quality assurance personnel. Aircraft flight and maintenance records are maintained for each aircraft by the AMOC who documents current aircraft operational status, inspections, and discrepancies.

7.3.2 Deployed operations: NAMIS will remain the primary means of tracking maintenance activities while aircraft are deployed from GSFC. Additionally, due to the nature of operating locations and internet availability, it is essential to maintain a back-up method in the event NAMIS is temporarily unavailable. This will provide the ability to schedule and track maintenance work, release aircraft, log aircraft and aircrew flight time, and submit aircraft discrepancies.

7.3.2.1 Prior to initially deploying and then weekly at a minimum while deployed, the following reports shall be printed:

- a. Components Due Report
- b. Scheduled Inspections
- c. Work Request Status Report (previous 10 flights minimum)
- d. Flight Preparedness Report

7.3.2.2 These reports will provide the information needed to continue aircraft operations without NAMIS accessibility.

7.3.2.3 The AMOC shall also maintain blank copies of the following forms at the deployment site:

- a. NF 1671a – Aircraft Maintenance Packet (Work Request)
- b. NF 1672a – Aircrew Flight Form
- c. NF 1673a – Flight Preparedness Form

7.3.2.4 These forms mirror the NAMIS Maintenance and Flight Data Capture (FDC) modules, providing a means to continue aircraft operations and record maintenance and flight activities in a method that will be easily uploaded into NAMIS as soon as accessibility is restored. The AMOC shall ensure that all maintenance and flight activity documented on paper forms is uploaded into NAMIS as soon as practical to guarantee the most up to date information is available on the NAMIS server.

## **Chapter 8. Aircraft Inspection and Maintenance**

### **8.1 Purpose**

8.1.1 The purpose of this chapter is to describe in general terms the policy, requirements, and standards applicable to GSFC assigned aircraft. A more detailed explanation of aircraft specific requirements and standards is listed in appendices A-D.

### **8.2 Scope**

8.2.1 This chapter and appendices A-D address the GSFC aircraft maintenance program in both general and specific terms for assigned aircraft. The quality assurance and safety aspects of aircraft maintenance are primarily addressed in Chapter 2.

### **8.3 Policy**

8.3.1 The maintenance of aircraft involves specific requirements. Checklists and inspection cards are used to provide guidance for mechanics and inspectors. Inspection work cards are not intended to be all-inclusive but rather specify minimum requirements. Mechanics and inspectors are expected to use inspection cards and their respective skills in understanding and interpreting work requirements associated with them. Changes and supplements to requirements shall be incorporated when deemed advisable. Changes shall be based on factual data accumulated from experience, data submitted by the manufacturer, user input, or from other Government agencies. Recommendations for change to maintenance policy, requirements, and standards should be submitted to the Code 830 QAM/GSO and approved by the A&MM and Chief of Flight Operations.

8.3.2 Qualification: Personnel who perform maintenance or inspection work on assigned aircraft must be certified as an Airframe and Powerplant Mechanic (A&P) in accordance with FAR, Part 65, Subparts D or E or be supervised by certificated personnel. Equivalent military qualifications in specialty areas may be substituted for FAA certificates with the approval of the A&MM and QAM/GSO.

8.3.3 All applicable FAA Airworthiness Directives, manufacturer's Service Bulletins, Technical Orders, and other related requirements shall be reviewed by the A&MM and QAM/GSO to determine applicability. Applicable directives and the action taken shall be documented in NAMIS and the aircraft logbooks.

8.3.4 All parts, components, repairables, and consumables used to maintain aircraft shall be of the type, model, and specification as that being replaced, exchanged, or repaired unless specifically authorized by the QAM/GSO. Such items may be new, overhauled, or serviceable and shall not have exceeded shelf time limits.

8.3.5 Correction of discrepancies that are found during scheduled inspections or at other times may be delayed if they are not readily correctable and do not adversely affect the airworthiness or the mission performance of the aircraft. Consideration of the combined effects of more than one deferred discrepancy must be evaluated in approving delayed maintenance. Delayed maintenance shall be monitored by the A&MM, approved by the QAM/GSO with written concurrence of the Chief of Flight Operations and corrected at the earliest opportunity.

8.3.6 Aircraft shall not be operated beyond specified time (hourly or calendar) intervals for required maintenance inspections except to return the aircraft to an appropriate maintenance facility to perform the required scheduled maintenance. This one time reposition flight shall be approved by the Code 830 Chief of Flight Operations. The following exceptions apply:

- a. To facilitate maintenance scheduling, a plus or minus 10% deviation for inspections and high-time components based on flight hours/flight cycles is authorized without specific approval from the Chief of Flight Operations.
- b. To facilitate maintenance scheduling, a plus or minus 5% deviation for inspections and high-time components based on calendar days is authorized without special approval from the Chief of Flight Operations.

8.3.7 Aircraft modifications and configuration control are addressed in 830-PG-1410.2.1, Aircraft/Unmanned Aerial Systems Engineering and Configuration Management Process and 800-PG-1060.2.2, Airworthiness Process. In essence, modifications to aircraft are conducted under a controlled process that must be approved by an independent GSFC Airworthiness Review Board and by QA. Documentation pertinent to modification shall be included in aircraft historical records with appropriate entries made in NAMIS and the appropriate aircraft logbook(s).

8.3.8 It shall be the responsibility of all personnel engaged in the maintenance or operation of assigned aircraft to accurately and promptly report the mechanical and operational condition of aircraft. NAMIS, aircraft logbooks, maintenance records and applicable forms shall be kept current at all times. When any discrepancy is discovered that may affect safety of flight, the subject aircraft shall be grounded until repaired and cognizant maintenance and operational officials notified. Refer to Chapter 2 of this manual for information on aircraft logbook entries and notations.

## **8.4 Aircraft Scheduled Inspection Requirements**

8.4.1 The aircraft scheduled inspection requirements for GSFC aircraft have been derived from established systems developed by aircraft manufacturers. Former military aircraft inspection systems are used as a basis for aircraft transferred from military organizations. The objective is to increase the safety and reliability of the aircraft. Requirements and completed records will be maintained by the A&MM.

8.4.2 Appendix A –D describe the basic inspection requirements for NASA GSFC assigned aircraft.

8.4.3 A special inspection (SI), sometimes referred to as a conditional inspection, is an inspection required due to other than normal operational conditions or functional discrepancies. Examples of conditions requiring an SI are hard landings, flight through severe turbulence, exceeding engine limitations, engine failure, trend analysis or spectro analysis reports, aircraft wash, lubrication, and corrosion inspections. Special Inspections also include inspections specifically required by service instructions, bulletins, airworthiness directives, and military technical directives. Mandatory or optional inspections published by the FAA, manufacturers' bulletins, and operational letters are categorized as SIs.

8.4.3.1 When SI work duplicates a portion of a scheduled inspection, it shall be clearly documented with reference to the specific work card item. Upon completion of an SI, it shall be documented in NAMIS and in the appropriate aircraft logbooks as applicable.

8.4.4 It is the intent of the scheduled phase inspection system to apply standardized requirements for all GSFC aircraft. However, the nature of NASA program support aircraft operations vary from industry and military operations and thus, specific inspection schedules and procedures have been established. Appendix A - D describe the phase inspection systems for specific GSFC aircraft.

8.4.4.1 When program support aircraft are scheduled for extended missions, the phase requirements may be accomplished in advance to cover the period of the planned mission. In addition to inspection requirements peculiar to each phase package, recurring inspection items listed in each phase work card deck may be accomplished once for the entire phase package grouping.

8.4.4.2 Preparations for the accomplishment of phase inspections shall ensure the required parts, material, and equipment are on-hand and ready for each phase inspection. It is essential that a pre-phase planning meeting be conducted well in advance of the scheduled phase induction to ensure all required Technical Directives and deferred maintenance is planned for and required parts are ordered.

8.4.4.3 Prior to removing an aircraft from service for phase inspections, aircraft logbooks and computerized records shall be reviewed in detail to determine the extent of work to be accomplished. This review shall include component time change items, airworthiness directives, and modification orders. In addition, the following is required:

- a. Prepare work cards for the particular phase package.
- b. Verify availability of components and accessories needed and put pre-draw package together.
- c. Ensure that required equipment and tools are available and ready.



- d. Assemble all required material, equipment, and technical instructions to accomplish the inspection and work.
- e. If applicable to the specific aircraft, schedule an engine compressor wash and performance run prior to removing the aircraft from service to determine if additional work is needed to correct performance related discrepancies during the aircraft down time.
- f. Perform on-aircraft serial number verification and concurrence with aircraft logbooks.

8.4.5 Inspection records: Accurate documentation of inspections performed, discrepancies discovered, corrective actions taken, and replacement of components is an essential requirement. Completion of these tasks shall be recorded in NAMIS and appropriate aircraft logbooks.

8.4.5.1 Upon completion of a phase inspection, the complete phase package is reviewed by the A&MM and the QAM/GSO. If incomplete work or documentation errors are noted, action shall be taken to correct errors. When the completed phase inspection package is approved and closed in NAMIS, an entry validating completion of the phase inspection is documented in the appropriate aircraft logbook. This entry shall not be documented or signed until the following is complete:

- a. Aircraft maintenance and phase inspection requirements are complete in accordance with applicable maintenance and inspection specifications.
- b. All applicable technical directives and bulletins for the inspection are complete and required entries are recorded.

8.4.6 Deviation from inspection requirements for program support and research aircraft requires prior approval from the Chief of Flight Operations.

8.4.7 A weekly aircraft status report is initiated by the CMPM and forwarded to the A&MM and QAM/GSO and designated personnel. This form provides status of aircraft with hours or time remaining to the next inspection.

## **8.5 Aircraft Weight and Balance**

8.5.1 GSFC Aircraft weight and balance will be maintained in accordance with the respective Aircraft Maintenance Manual (AMM), Pilots Operating Handbook or applicable DOD instructions and procedures. Additionally, all personnel responsible for maintaining the weight and balance or performing weight and balance calculations shall be trained by an appropriate civilian or DOD training facilities except where excluded by instruction. Furthermore, current automated weight and balance systems shall be used in conjunction with the instructions and procedures where applicable. At a minimum, GSFC aircraft will be weighed after any major configuration change prior to deployment but no less than every 5 years.



## **8.6 Oil Analysis Program**

8.6.1 It is the responsibility of the AMOC to perform oil sampling to determine the type and amount of wear metal. Refer to the appropriate aircraft appendix for the sampling intervals. It is the responsibility of the A&MM and the QAM/GSO to review all sample results and the recommended course of action received from the oil analysis laboratory. Oil from aircraft engines and other selected components shall be analyzed at intervals determined by the A&MM with the concurrence of the, QAM/GSO. Sampling shall be completed in accordance with the aircraft maintenance manuals 30 minutes after engine has been shut down. Reference Appendix A, B, C, and D for specific sampling requirements.

8.6.2 Maintenance personnel shall:

- a. Collect oil samples in accordance with original equipment manufacturers recommendations
- b. Record samples in the Oil Sample Log.
- c. Package the sample using approved containers only and forward to the approved oil analysis laboratory in accordance with recommended timelines.

## **Appendix A: B-200**

### **A-1 Scheduled Inspection Requirements**

The source document for maintenance and inspection procedures for the B200 is the OEM Aircraft Maintenance Manual and is administered through the NASA Aircraft Management Information System (NAMIS). NAMIS is a computer based maintenance and inspection program tailored to effectively and continually monitor the maintenance and inspection requirements of the B-200 aircraft. The program is updated on a continuing basis to include the manufacturer's recommendations, FAA Airworthiness Directives, and changes deemed necessary by the responsible FAA Flight Standards District Office. All B-200 maintenance and flight activities shall be tracked in NAMIS.

### **A-2 B-200 Release Procedures**

When launching from WFF the CMPM is responsible for reviewing the aircraft status in NAMIS to ensure all inspections are up to date and that there are no work requests/discrepancies that could affect the airworthiness of the aircraft. The CMPM shall also be responsible for the conducting of a Preflight Inspection in accordance with the Preflight Checklist (NASA WI-1116). Once the aircraft has been serviced and all logs are properly reviewed and updated, the CMPM, as authorized by the A&MM and in coordination with the QAM/GSO, will be responsible for closing out the preflight work request and printing and signing the Flight Preparedness Report (FPR).

The PIC will then review and sign the Preflight Checklist and accept the aircraft by signing the printed FPR. The aircraft remains in a "released status" the rest of the day or until a pilot initiates a NAMIS work request. The next day, the aircraft must be released again as per the same procedure.

During extended deployments, the PIC is responsible for the preflight inspection and ensuring the aircraft is properly serviced. When complete, the PIC will review NAMIS and ensure the aircraft is in an "up" status before signing the FPR electronically via NAMIS. The QAM/GSO is responsible for reviewing the aircraft status through NAMIS prior aircraft flight operations and in addition, shall ensure all appropriate data was entered correctly into NAMIS post flight.

**A-3 B-200 Minimum Equipment List (MEL)**

Table A-1

	IFR Operations	VFR Operations	Night Operations
Airspeed Indicators	1	1	1
Altimeters, Adjustable For Barometric Pressure	1	1	1
Annunciator Fails to Illuminate	1	1	1
Annunciator Remains Illuminated	1	1	1
Area Navigation (RNAV)	1	0	1
ATC Transponders	1	1	1
Autopilot Control Wheel Disconnect Switches	1	1	1
Bleed Air Shutoff Valves	1	1	1
Bleed Air Shutoff Valves (Environmental)	1	1	1
Combined Traffic Alert (TA) and Resolution Advisory (RA)	1	0	1
DC Generator Caution Lights	1	1	1
Digital N1 Indicators	1	1	1
Digital Percent Torque Indicators	1	1	1
Distance Measuring Equipment (DME)	1	1	1
Dual Motors System	2	2	2
Electric Engine Air Inlet Lip Boot Heat	1	1	1
Engine Driven Low Pressure Fuel Boost Pumps	1	1	1
Flight Management System	1	0	1
Fuel Flow Indicators	1	1	1
Fuel Quantity Indicators	1	1	1
Green L & R Ice Vane Ext and Amber L & R ICE VANE	1	1	1
Gyro-magnetic Compass System	1	1	1
Gyroscopic Directional Indicator System	1	1	1
Gyroscopic Pitch And Bank Indicator Systems	1	1	1
Gyroscopic Rate of Turn/Skid Indicators	1	1	1
Instrument Air Valves	1	1	1
Inverters	1	1	1
Inverters Warning Light	1	1	1
L or R GEN BUS TIE Relay	1	1	1
Landing Gear Handle Lights	1	1	1
Landing Gear Position Indicator Lamps	3	3	3
Landing Lights	1	1	1
Master Caution Annunciators	1	1	1
Master Warning Annunciators	1	1	1
Oil Pressure Annunciators	1	1	1
Pitot Heaters	1	1	1
Separate Hand Microphone Plug-In	1	0	1
Shoulder Harness	1	1	1
Standby Fuel Boost Pumps	1	1	1

Vertical Speed Indicators (VSI)	1	1	1
Wing Ice Lights	1	0	1

## **A-4 Preflight Inspection**

The preflight inspection (PR) is a flight preparedness check required prior to the first flight of the day and is valid for 24 hours after completion of the inspection. The inspection consists of operational checks of components and systems and a visual examination to assure flight readiness. It is typically completed by a designated AMOC maintainer but may be completed by the PIC when the aircraft is away from home base. This inspection is issued using NAMIS, completed and documented on Form WI-1116, and then closed in NAMIS.

## **A-5 Post flight Inspection**

The post flight inspection is a conditional check of the aircraft accomplished after the last flight of the day. The inspection is a visual examination of the aircraft to assure that no defects exist that may affect the airworthiness of the aircraft for follow-on missions. It is completed by both the PIC and AMOC personnel. The only documentation required is a NAMIS work request for any discrepancies noted during or after the flight and for any aircraft servicing done during post flight, such as fueling.

## **A-6 Phase Inspection**

The Phase Inspection (PH) is due upon accrual of an established number of operating hours. The B-200 Inspection System divides 800 flight hours equally into four individual inspection periods. The periods (Phases #1, #2, #3, and #4) are due 200 hours from the previous inspection.

The inspection package is provided prior to the due date of each inspection. The items listed on the requirement sheets shall be accomplished by certificated mechanics, technicians, and inspectors. After all requirements have been accomplished, a quality assurance supervisor shall file a copy and forward another copy for updating of records. In addition, the inspection completion date shall be entered in NAMIS and on the aircraft records by date, numbered operation, aircraft time, and next due date. A statement releasing the aircraft as airworthy is required.

## **A-7 Maintenance Monitoring**

An Engine Trend Monitoring Log is used to track PT6A-42 engine performance data. Engine readings are recorded at designated intervals on preprinted cards. The information is entered into the web based trend analysis program for monitoring engine performance. Deterioration of engine performance is tracked and enables planning for corrective maintenance actions.

## **A-8 Oil Sample Frequency**

Engine oil sample must be completed annually.

## Appendix B: P-3

### B-1 Scheduled Inspection Requirements

The source documents to determine maintenance and inspection procedures are the current NAVAIR Directives for the P-3 series aircraft. These directives include all scheduled and unscheduled maintenance requirements. All P-3 maintenance and flight activities shall be tracked in NAMIS.

The NASA P-3 inspection program is based on the NAVAIR 01-75PAA-IMP-6. The program also includes the Navy Phase Depot Maintenance (PDM) inspection. All PDM inspection elements will be performed based on the Navy PDM program.

### B-2 P-3 Release Procedures

Regardless of operating location, the CMPM is ultimately responsible for ensuring all inspections are up to date and that there are no work request that could affect the airworthiness of the aircraft. The CMPM may delegate these actions to the Flight Engineer (FE) in order to correspondingly ensure the review of NAMIS for any inspections or work request that would affect airworthiness. The FE, as authorized by the CMPM, shall be responsible for ensuring the Daily Inspection is current, conducting the Preflight Inspection in accordance with the Preflight Checklist (NASA WI-1436), initialing and signing the preflight card and annotating the applicable service limits in NAMIS. The FE, as authorized by the A&MM and in coordination with the QAM/GSO, shall then complete the Weight and Balance and print the FPR. The PIC shall then review the FPR, the Weight and Balance, and accept the aircraft by signing the FPR. The aircraft remains in a “released status” until either a NAMIS work request is initiated or the Preflight Inspection expires.

### B-3 P-3 Minimum Equipment List (MEL)

Table B-1

	IFR Operations	VFR Operations	Night Operations
AC Generator system	2	2	2
AC Hydraulic pumps	2	2	2
Air brake pressure indicator	1	1	1
Anti-collision beacon light	1	1	1
Clock with sweep hand	1	1	1
Combined TA & RA dual displays	1	1	1
Compass system sensor	2	2	2
Control wheel disengage switch	1	0	1
Control yoke press to talk switch	1	1	1
Engine air scoop & inlet vane icing lights	2	2	2

Engine air scoop & inlet vane system	7	0	7
Engine bleed air valve lights	5	5	5
Engine oil pressure caution lights	2	2	2
Fuel crossfeed valve position lights	3	3	3
Fuel flow indicators	3	3	3
Fuel Tank boost pumps	3	3	3
Generator mechanical failure light	2	2	2
Hyd system Pressure indication	1	1	1
Landing light	1	1	1
Oil cooler flap position indicator	2	2	2
Oil quantity indicators	2	2	2
Pitot heat annunciator lights	1	1	1
Speed sensitive controls (65% switch)	3	3	3
Torque (Horse power) indicator	3	3	3
Transformer rectifier units (TRU's)	2	2	2
Turn and bank indicator	1	1	1

## B-4 Daily Inspection

A Daily Inspection is a scheduled inspection for preventive maintenance done IAW the NAVAIR 01-75PAA-IMP-6-2 manual and is valid for 72 hours. A current daily inspection is required prior to flight, but the aircraft may be flown multiple times within the three day period without completing another Daily Inspection. This inspection is issued using a NAMIS work request and documented on a WI-1436 Daily/Preflight Inspection card. When the aircraft is idle for 7 days or more a daily inspection shall be conducted on a weekly basis when the aircraft is NOT in Type I or II Preservation based on the NAVAIR 15-01-500 Preservation Manual.

## B-5 Preflight/Turnaround

The Preflight/Turnaround inspection is done IAW the NAVAIR 01-75PAA-IMP-6-1 manual. This inspection is issued using a NAMIS work request and documented on a WI-1436 Daily/Preflight Inspection card. The Preflight inspection is completed by the Lead Flight Engineer and is required prior to the first flight each day. Each subsequent flight on the same day only requires completion of the Turnaround Inspection items. The Turnaround Inspection is an abbreviated Preflight Inspection. A flight may contain multiple legs and each leg does not require an additional Preflight/Turnaround Inspection. A multi-leg flight is a flight with minimal turnaround time (such as fuel stop) in which the PIC and Lead Flight Engineer remains the same.

## B-6 Post Flight Inspection

The post flight inspection is a conditional check of the aircraft accomplished after the last flight of the day. The inspection is a visual examination of the aircraft to assure that no defects exist that may affect the airworthiness of the aircraft for follow-on missions. It is completed by both

the PIC and Lead Flight Engineer. The only documentation required is a NAMIS work request for any discrepancies noted during or after the flight and for any aircraft servicing done during post flight, such as fueling.

## **B-7 Fueling and Defueling of Aircraft**

Specific to the P-3, when a new Commercial Fuel Vender (nonmilitary base) is used for the first time the fuel shall be verified that it is free of contamination prior to being loaded in the aircraft. An Airframe and Powerplant (A&P) mechanic or flight engineer must conduct the fuel sampling. Sampling kits shall be provided on the aircraft. An entry on the DAILY/PREFLIGHT card will be made stating Fuel Sampling was completed.

During P-3 offsite extended deployments, the flight engineer and maintenance personnel shall become familiar with the location of Spillage Kits and local fuel spill procedures.

## **B-8 Calendar Based Inspections**

Calendar Inspections (CI) are conducted for maintenance requirements that are based on accrual of calendar days as an inspection interval. All inspections shall be documented in NAMIS.

7-Day Preservation – When the P-3 does not fly for 7 days, a Daily Inspection shall be performed to ensure all servicing requirements are maintained and the aircraft maintains a flyable status unless the aircraft is put in Type I or Type II preservation.

30-Day Inspection - When the P-3 does not fly or is out-of-commission for more than 30 consecutive days, an FCF profile G shall be issued IAW NA 01-75PAG-1F.

90-Day Inactivity Inspection - When the P-3 is expected not to fly for more than 90 consecutive days, it should be put into Type I preservation IAW NA 15-10-500. An FCF profile G shall be issued IAW NA 01-75PAG-1F prior to returning to service.

## **B-9 Engine Ground run-up policy**

Occasionally a low power turn is required while maintenance personnel are working inside the open nacelle of the operating engine. This procedure, commonly referred to as a “Man on a Stand Turn,” is typically used to identify bleed air and fluid leaks when all other means have been exhausted. In the event this procedure is required, all personnel involved shall be thoroughly briefed by the CMPM or QAM/GSO on both the procedure and appropriate hand signals. In addition, the following additional safety precautions shall be observed:

1. Nacelle Cowlings shall be secured with .032” double strand safety wire.
2. All support strand railings and the tongue shall be secured with .032” double strand safety wire.



3. Engine power shall remain at or below 250 SHP in order to limit hazardous prop wash.
4. The AMOC must ensure the engine driven compressor is prevented from porting bleed air onto personnel during ground run-up.
5. The maintenance stand shall be secured with no less than two tie-down chains and secured to two separate tie-down points.
6. An additional outside observer shall be positioned to observe all external personnel and the cockpit observer.

## B-10 Aircraft Towing

When the P-3 is deployed, the Lead Flight Engineer will coordinate aircraft towing procedures with local authorities to ensure all procedures and signals are understood.

## B-11 Aircraft Wash and Lube

Due to the nature of the missions and deployments of the NASA P-3, it shall be washed and lubed after each extended deployment and as deemed necessary by the A&MM or QAM/GSO. The wash and lube shall comply with items listed in Section 3.1.15 of this manual and is conducted IAW NAVAIR 01-75PAA-2-2.1 and NAVAIR 01-1A-509-4 Maintenance Manuals and logged in NAMIS.

## B-12 Conditions requiring a Functional Check Flight

**Table B-2: P-3 QAR AND FCF REQUIREMENTS**

NOMENCLATURE	QA Signature Required	FCF PROFILE (Note 1)	REMARKS
<b>ENGINES</b>			
Engine Re-rigging	X	B	
Engine Replaced or Reinstallation	X	A	
Fuel Control Replaced or Reinstallation	X	B	
Engine Mount Bolt Torque	X		
Final Installation Inspection	X		
<b>PROPELLER</b>			
Prop Replaced or Reinstallation	X	C	Note 2
Prop Rigging	X	C	Note 2
Prop Control Replaced or Reinstallation	X	C	Note 2
Valve Housing Replace / Valve Housing Cover Replaced	X	C	Note 2
Valve Housing Reinstallation / Valve Housing Cover Reinstallation	X	C	Note 2

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Prop Nut Breakaway Torque / Prop Nut Installation Torque	X		
<b>TURBINE</b>			
Front of Vane	X		
<b>REDUCTION GEAR BOX</b>			
RGB Replaced or Reinstallation	X	A	
<b>LANDING GEAR</b>			
Jacking Aircraft	X		
NLG/MLG Trunion Bolt Torque	X		
NLG/MLG Door Rigging	X		Drop Check Required
NLG/MLG R/R	X		Drop Check Required
Final Installation Inspection	X		
Drop Check	X		
<b>FLIGHT CONTROLS / FLAPS</b>			
Flight Control Surface REPLACED	X	D	
Flight Control Rigging	X	D	
Final Cable Rigging	X	D	
Flap REPLACED or FOM	X	D	
Flap Carriage Rigging	X	D	If more than one carriage is adjusted
Flap Carriage Rigging	X		If only one carriage is adjusted
Flap Rigging	X	D	
Trim Tab Actuator REPLACED or FOM	X	D	
Trim Tab Actuator Rigging	X	D	
Trim Tab Actuator Throws	X		
Flight Control Throws	X		
Aileron Push/Pull Check	X		
Installation of TQ Tube Bolt	X		
Final In Process Inspection	X		
<b>FLIGHT CONTROL BOOSTER ASSEMBLIES</b>			
Elevator Booster Package Replaced or Reinstallation	X	D	
Aileron Booster Package Replaced or Reinstallation	X	D	
Rudder Booster Package Replaced or Reinstallation	X	D	
Booster Assemblies Operational Check	X		
Saddle Bolt Torque	X		
Any Booster Package Actuator			No FCF required
Final In Process Inspection	X		
<b>INS SYSTEMS</b>			
Both Pilots and Co-Pilots FDI's Replaced or Reinstallation	X	F	Step 33(b)
RINU's / Stand-By-Gyro / Peanut Gyro Replaced			Note 3
<b>MISCELLANEOUS</b>			
ISIS	X	E	
All Floor Boards	X		FOD check prior to installation/reinstallation
Flapwell Area	X		FOD check after unscheduled maintenance
Interior and Exterior Safe for Flight Areas	X		
Fuel Cell Pre-Closure FOD Check	X		

ISIS Pre-Closure FOD Check	X		
After 30 days of NO-Flying		G	
<b>NOTE:</b>			
1) Refer to NAVAIR 01-75PAC-1 NATOPS Flight Manual for FCF profiles.			
2) If engine adjustments are also required, Profile B shall be added to FCF.			
3) If more than two of the four attitude reference sources has been replaced or reinstalled, Profile F Step 33 shall be issued.			

## B-13 Annual Phase Inspection

The P-3 Annual Phase Inspection is based on the Navy P-3 Isochronal Scheduled Inspection System which is broken down into 4 inspection segments. Due to the NASA P-3 mission schedule, ISIS has been combined into two annual inspection cycles; Phase A and Phase B. The complete NASA Phased Inspection will be completed over a two year (104 week) period whereas the Navy cycle is completed over 128 weeks. This inspection will typically require the aircraft to remain out of service for an average of one to two months each year and requires a hangar facility. The AMOC, with concurrence of QA, will annotate the Master ISIS Phase deck with the maintenance requirements for the NASA P-3. It is essential that a pre-phase planning meeting be conducted well in advance of the scheduled phase induction to ensure all required Technical Directives and deferred maintenance is planned and required parts are ordered.

The Annual Phase Inspection may be combined with PDM requirements as well as incorporating Technical Directives, applicable Service Bulletins, and other Airworthiness Directives to assure continued airworthiness of the aircraft while minimizing aircraft down time. This annual inspection will normally be conducted at GSFC by the AMOC but may be outsourced. NASA and/or the AMOC shall have a representative at any contractor facility during any outsourced maintenance.

## B-14 Phased Depot Maintenance

The NASA P-3 Phased Depot Maintenance (PDM) program is a depot level maintenance cycle based on the Navy P-3 PDM program. PDM consists of three phases conducted over a 162 month period; 54 months between phases. The PDM requirements provide for airframe, systems, and component inspection and for defect correction, preventative maintenance and modification, and Technical Directive (TD) compliance. These requirements include a thorough and comprehensive inspection of selected aircraft structure, flight essential systems, and flight critical components by appropriate inspection methods. The PDM inspection is outsourced due to the depot level maintenance requirements.

## Appendix C. C-23

### C-1 Scheduled Inspection Requirements

The NASA C-23 inspection program is based on the Shorts SD3 Sherpa maintenance program. The program includes inspections based on flight hours and calendar inspections. All inspections shall be completed in accordance with locally produced maintenance inspection cards based on the SD3 maintenance program manual.

### C-2 C-23 Release Procedures

When launching from WFF the CMPM is responsible for reviewing the aircraft status in NAMIS to ensure all inspections are up to date and that there are no work requests/discrepancies that could affect the airworthiness of the aircraft. The CMPM shall also be responsible for conducting a Preflight Inspection in accordance with the Shorts SD3 maintenance program manual that, when complete, is valid for 72 hours. The Daily inspections will include all elements of a preflight and “A” check inspection as outlined in the Shorts SD3 program manual. Once the aircraft has been serviced and all logs are properly reviewed and updated, the CMPM, as authorized by the A&MM and in coordination with the QAM/GSO, will be responsible for closing out the preflight work request and printing and signing the Flight Preparedness Report (FPR).

The PIC will then review and sign the Preflight Checklist and accept the aircraft by signing the printed FPR. The aircraft remains in a “released status” the rest of the day or until a pilot initiates a NAMIS work request. The next day, the aircraft must be released again as per the same procedure.

During extended deployments, the PIC is responsible for the preflight inspection and ensuring the aircraft is properly serviced. When complete, the PIC will review NAMIS and ensure the aircraft is in an “up” status before signing the FPR electronically via NAMIS. The QAM/GSO is responsible for reviewing the aircraft status through NAMIS prior aircraft flight operations and in addition, shall ensure all appropriate data is entered into NAMIS post flight.

### C-3 C-23 Minimum Equipment List (MEL)

Table C-1

	IFR Operations	VFR Operations	Night Operations
Aft Cargo Smoke Detectors	1	1	1
Air Conditioning Engine Bleed Systems	1	1	1
ATC Transponders and Automatic Altitude Reporting Systems	1	1	1
Audio Selector Control Panels	1	1	1
Autopilot Disconnect Functions	1	1	1

Bank (Slip) Indicators	1	1	1
Clocks	1	1	1
Cockpit Headsets	2	2	2
Combined TA and RA Dual Displays	1	0	1
DC Amperage Indications	1	1	1
DC Electrical System Indicators	7	7	7
DC Voltage Indications	1	1	1
Engine Anti-Icing Vane Systems	1	0	1
Fine Pitch Indicating Light Systems	1	1	1
Flight Deck and Stub Wing Leveling Valve Indicators	2	2	2
Flight Deck Fuel Quantity Indicating Systems	1	1	1
Forward Cargo Smoke Detectors	1	1	1
Frequency Indication	2	2	2
Frequency Knob Selector	2	2	2
Fuel Filter Caution Light Systems	1	1	1
Fuel Flow Indicating Systems	1	1	1
Fuel Pressure Caution Lights System	1	1	1
High Frequency (HF) Comms	1	1	1
Inverter Systems	2	2	2
Landing Lights	1	1	1
Main Brake Pressure Indicating Systems	1	1	1
Main Cabin Cargo Smoke Detectors	2	2	2
Oil Low Pressure Caution Lights System	1	1	1
Pitot Heat Indicating Light Systems	1	1	1
Pitot-Static Heater Systems	1	1	1
Primary Attitude Indicator	1	1	1
Propeller Deicer Timer System	1	0	1
Radio Magnetic Indicators (RMI)	1	1	1
Turn Indicators	1	1	1
Wing Deicer Boot Cycle Indicating Light Systems	3	0	3

## **C-4 Daily/Preflight Inspection**

A Daily/Preflight Inspection is a scheduled inspection for preventive maintenance done in accordance with the Shorts SD3 maintenance program manual and is valid for 72 hours. The Daily inspections will include all elements of a preflight and a “A” check inspection as outlined in the Shorts SD3 program manual. The inspection consists of operational checks of components and systems and a visual examination to assure flight readiness. It is typically completed by AMOC personnel but may be completed by the PIC when the aircraft is away from home base. This inspection is issued and closed using NAMIS. A current daily inspection is required prior to the first flight of the day, but the aircraft may be flown multiple times during the same day without completing another Daily/Preflight Inspection card. When the aircraft is idle for 15 days or more a Daily/Preflight inspection shall be conducted.

## **C-5 Post Flight Inspection**

The post flight inspection is a conditional check of the aircraft accomplished after the last flight of the day. The inspection is a visual examination of the aircraft to assure that no defects exist that may affect the airworthiness of the aircraft for follow-on missions. It is completed by both the PIC and Lead Mechanic. The only documentation required is a NAMIS work request for any discrepancies noted during or after the flight and for any aircraft servicing done during post flight, such as fueling.

## **C-6 Flight Hour (FH) Based Inspections**

Flight Hour (FH) based inspections are conducted for maintenance requirements that are based on accrual of flight hours as an inspection interval. All inspections shall be documented in NAMIS. The following inspection cycle shall be followed:

“2A” Check:	120 FH
“B” Check:	300 FH
“2B” Check:	600 FH

The following inspections are based either on a Calendar or Flight Hour basis as outlined below:

“C” Check:	12 months or 1200 FH
“2C” Check:	24 months or 2400 FH
“D” Check:	48 months or 4800 FH
“2D” Check:	96 months or 9600 FH
“E” Check:	144 months or 14,400 FH

Component and Non-Structural Significant Inspections shall be tracked in NAMIS as outlined in the Shorts SD3 maintenance program manual.

## **C-7 Aircraft Wash**

Due to the nature of the missions and deployments of the NASA C-23, it shall be washed after each extended deployment cycle or as deemed necessary by the AMOC or QAM/GSO. The aircraft wash shall be documented in NAMIS.

## **C-8 Engine Trend Monitoring**

An engine trend monitoring program shall be used to track PT6A-65AR engine performance data. Engine readings are recorded at designated intervals on pre-printed cards. The information is entered into the web based trend analysis program for monitoring engine performance. Deterioration of engine performance is tracked and enables planning for corrective maintenance action.

## **C-9 Oil Sample Frequency**

Engine oil samples must be completed every 100 Hours.

## Appendix D: UH-1H

### D-1 Scheduled Inspection Requirements

The NASA UH-1H inspection program is based on the Bell Helicopter maintenance program and cross check with US Army maintenance procedures. The program includes inspections based on flight hours and calendar inspections IAW TM 55-1520-210-23-1. General Maintenance and inspections shall be completed in IAW TM 1-1500-204-23-1. The publications listed are a baseline reference. The master publication list is maintained in the QA office for the UH-1H helicopter. Maintenance actions will be performed IAW the applicable publication / Technical Manual for the task being performed.

### D-2 UH-1 Release Procedures

When launching from WFF the CMPM is responsible for reviewing the aircraft status in NAMIS to ensure all inspections are up to date and that there are no work requests/discrepancies that could affect the airworthiness of the aircraft. The CMPM shall also be responsible for the conducting of a Preflight Inspection in accordance with the UH-1 Bell maintenance program manual and is valid for 72 hours. Once the aircraft has been serviced and all logs are properly reviewed and updated, the CMPM, as authorized by the A&MM and in coordination with the QAM/GSO, will be responsible for closing out the preflight work request and printing and signing the Flight Preparedness Report (FPR).

The PIC will then review and sign the Preflight Checklist and accept the aircraft by signing the printed FPR. The aircraft remains in a “released status” the rest of the day or until a pilot initiates a NAMIS work request. The next day, the aircraft must be released again as per the same procedure.

During extended deployments, the PIC is responsible for the preflight inspection and ensuring the aircraft is properly serviced. When complete, the PIC will review NAMIS and ensure the aircraft is in an “up” status before signing the FPR electronically via NAMIS. The QAM/GSO is responsible for reviewing the aircraft status through NAMIS prior aircraft flight operations and in addition, shall ensure all appropriate data is entered into NAMIS post flight.

### D-3 UH-1 Minimum Equipment List (MEL)

Table D-1

	IFR Operations	VFR Operations	Night Operations
Airspeed Indicator	1	1	1
Altimeter	1	1	1
Clock	1	1	1
Crewmember Shoulder Harness	1	1	1



Fuel Boost Pump	1	1	1
Gyroscopic Bank and Pitch Indicator	1	0	1
Gyroscopic Direction Indicator	1	0	1
Magnetic Direction Indicator	1	0	1
OAT/Free Air Temperature Indicator	1	1	1
Slip-Skid Indicator	1	1	1
Vertical Speed Indicator	1	0	1
Search Light	0	0	1
Fuel Quantity Indicator	1	1	1
Transponder with Mode C	1	0	1
Radio / Commo	2	1	2
Anti-collision lights	1	1	1
Position lights	1	0	1
Navigation equipment	1	0	1
Pitot Heat	1	0	0

## D-4 Daily/Preflight Inspection

A Daily/Preflight Inspection is a scheduled inspection for preventive maintenance done IAW the UH-1H/V Aircraft Preventative Maintenance Daily Inspection Checklist and is valid for 72 hours. A current daily inspection is required prior to the first flight of the day, but the aircraft may be flown multiple times during the same day without completing another Daily/Preflight Inspection card. When the aircraft is idle for 15 days or more a Daily/Preflight inspection shall be conducted.

## D-5 Post Flight Inspection

The post flight inspection is a conditional check of the aircraft accomplished after the last flight of the day. The inspection is a visual examination of the aircraft to assure that no defects exist that may affect the airworthiness of the aircraft for follow-on missions. It is completed by both the PIC and Lead Mechanic. The only documentation required is to create a NAMIS work request for any discrepancies noted during or after the flight and for any aircraft servicing done during post flight, such as fueling.

## D-6 Flight Hour (FH) Based Inspections

Flight Hour (FH) based inspections are conducted for maintenance requirements that are based on accrual of flight hours as an inspection interval. All inspections will be performed IAW the applicable manual and shall be documented in NAMIS. The following inspection cycle shall be followed:

Phase Inspection Check: 150 FH

## **D-7 Functional Check Flight (FCF) / Maintenance Test Flight (MTF) Procedures**

Guidance for helicopter FCF/MTF is contained in TM 1-1500-328-23 Aeronautical Equipment Maintenance Management Policies and Procedures.

## **D-8 Aircraft Wash**

Due to the nature of the missions of the NASA UH-1H, it shall receive a fresh water rinse or aircraft wash after each mission or as deemed necessary by the A&MM, AMOC or QAM/GSO. The aircraft wash shall be documented in NAMIS.

## **D-9 Engine Trend Monitoring**

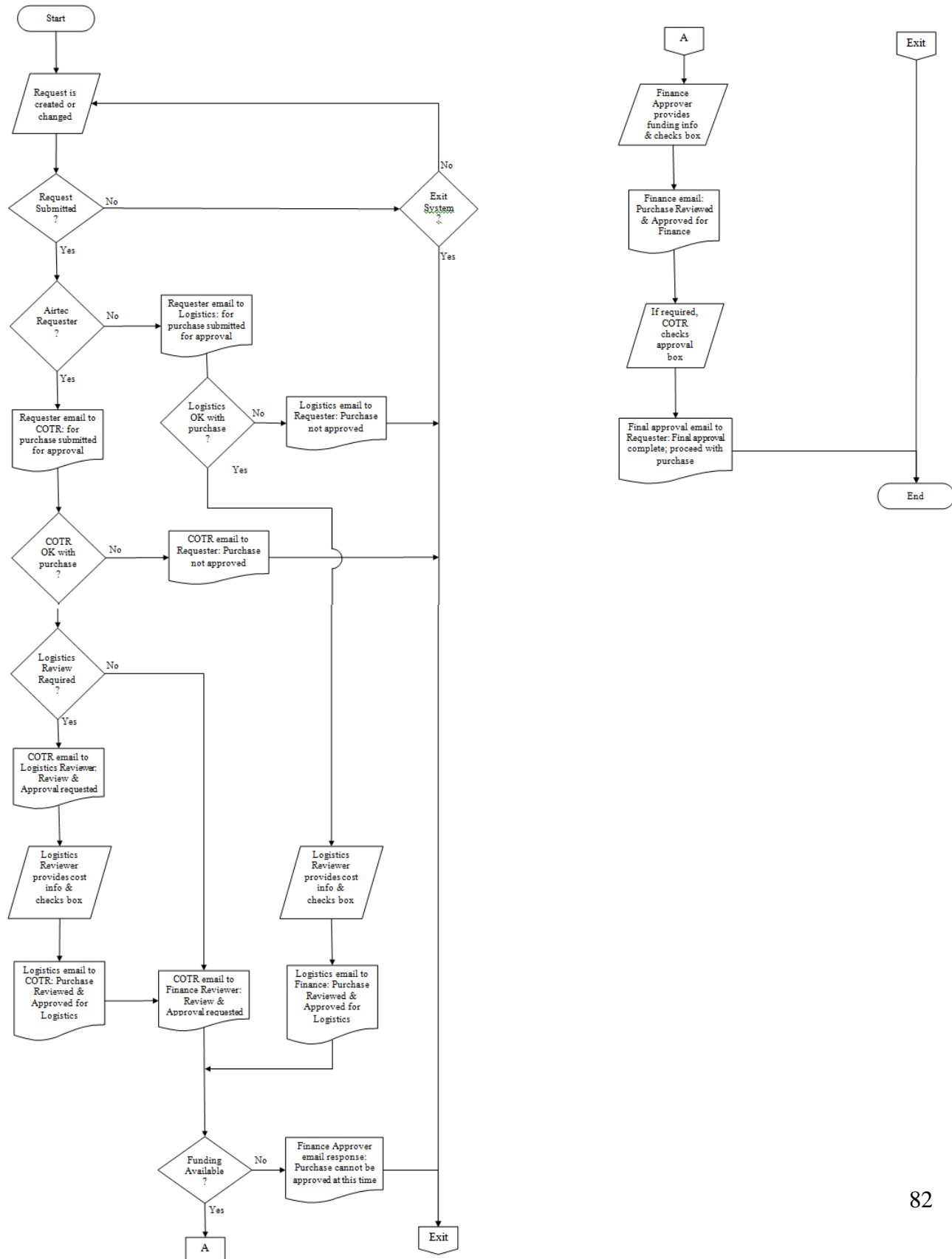
A Health Indicator Test (HIT Check) will performed IAW the operators manual (TM 55-1520-210-10) as an engine trend monitoring program. Engine readings are recorded at designated intervals on pre-printed HIT log in aircraft logbook.

## **D-10 Oil Sample frequency**

Oil samples must be completed within the specified periodicity for the following components:

Engine	12 Hours
42 deg. Gear Box	25 Hours
92 deg. Gear Box	25 Hours
Transmission	25 Hours
Hydraulic System	25 Hours

# Appendix E: Requisition Request Approval Tracking System (RRATS) Flow Chart



## Appendix F: Definitions

### F-1 The following aircraft definitions are commonly used in the conduct of aircraft maintenance:

- a. Acceptance Inspections – Inspections performed when an aircraft, engine, or unit of support equipment is being received from an outsourced maintenance facility, or is being permanently reassigned from another organization.
- b. Aircraft Ground Support Equipment (AGSE) – Equipment used in direct support of aircraft such as: start units, electrical units, servicing vehicles, tow tractors, jacks, work stands, ladders and wheel chocks.
- c. Aircraft Maintenance Manual (AMM) – Describes in detail the scheduled or unscheduled maintenance on an aircraft that is required to attain and to sustain a state of airworthiness. Such work is conducted in accordance with established requirements and standards as described in this manual and applicable maintenance manuals for particular equipment.
- d. Aircraft Modification – Any alteration, addition, or removal of aircraft structure, components, equipment, computer software, or primary instrumentation. Routine maintenance is exempted from this definition.
- e. Aircraft Operations – A general term used to describe the operational phase of an aircraft's activity that normally commences with an aircraft's release for flight and terminates with its return to maintenance status. Aircrew training, functional check flights, and mission operations are considered subsets of aircraft operations. "Aircraft maintenance operations" is a general term used to describe non-flight maintenance activity.
- f. Aircraft Maintenance and Operations Contract (AMOC) – The support service contractor providing aircraft services for the GSFC assigned aircraft.
- g. Aircraft Maintenance and Operations Contract Quality Assurance Plan (AMOC/QAP) – This plan is provided by the Aircraft Maintenance and Operations Contractor and establishes and documents the contractors Quality Assurance (QA) Plan for the maintenance of NASA GSFC assigned aircraft. It describes the AMOC's approach to the requirements of the Statement of Work and provides detailed instructions for managers, supervisors, inspectors, and employees to meet the highest standards of quality for the support of aircraft maintenance and operations.
- h. Airworthiness – Generally, the capability of an aircraft to be operated within a prescribed flight envelope in a safe manner. GSFC is totally responsible for assuring the airworthiness of all NASA assigned aircraft.

- i. Airworthiness and Maintenance Manager (A&MM) – In accordance with the NPR 7900.3, this position fulfills the requirement for and is equivalent to the Chief of Aircraft Maintenance. The A&MM is the primary NASA manager responsible to ensure all NASA and non NASA aircraft supporting NASA Goddard Space Flight Center’s aerial missions are properly engineered, modified, tested, and maintained in a condition which is safe for flight. The A&MM shall have aircraft releasing authority as designated by the Chief of Flight Operations.
- j. Bench Stock – Expendable material used in the performance of maintenance.
- k. Civil Aircraft – Aircraft other than public or military. Includes aircraft engaged in carrying persons or property for commercial purposes.
- l. Common Hand Tools – Tools found in common usage such as those applicable to or used on a variety of equipment and components. These items include, but are not limited to, wrenches, sockets, pliers, etc.
- m. Configuration Control – A process that ensures changes in an aircraft configuration are controlled and in conformance with design drawings and specifications. Configuration changes to aircraft with an FAA airworthiness certificate must be in conformance with Federal Aviation Regulations (FAR).
- n. Consumables – Items that are either in use or which lose their original identity during periods of use.
- o. Contracting Officer’s Representative (COR) – A person designated by the Contracting Officer (CO) to be responsible for the technical performance of a contract.
- p. Contracting Officer (CO) – A person with the authority to enter into, administer and/or terminate contracts and make related determinations and findings.
- q. Contractor-Furnished Material (CFM) – Equipment not provided by the Government such as, common hand tools (e.g., screwdrivers, wrenches, sockets, etc.).
- r. Contract Maintenance Project Manager (CMPM) - The CMPM is the senior onsite representative of the AMOC and reports directly to the A&MM. The CMPM is responsible for managing the daily work of assigned contract maintenance personnel, develops contractor missions, projects and task estimates, provides manpower planning and historical data, tracks accrued costs, manages scheduling, and assigns contractor assets and capabilities to enable the Aircraft Office mission. The CMPM is responsible for ensuring all maintenance activities, to include project installations, are conducted in accordance with The General Maintenance Manual, the contract, and any other applicable NASA Procedures and Guidelines. The CMPM will remain on site, though may deploy with an aircraft if necessary.

- s. Corrective Maintenance – Resolution of a maintenance discrepancy.
- t. Deferred Discrepancy – A fault on an aircraft or unit of equipment that is not serious enough to compromise safety and that cannot be corrected at the time of discovery due to non-availability of parts, facilities, equipment, or available time. A discrepancy is considered to be a concern but does not meet the definition of a nonconformance.
- u. Deployment – A temporary movement of aircraft and crew to a location other than the assigned base for the purpose of providing operational mission support.
- v. Depot Level Maintenance (DLM) – Maintenance activities requiring extensive shop facilities, equipment and personnel of specialized technical skills. DLM activities consists of repairing, modifying, overhauling, reclaiming, or rebuilding parts, assemblies, subassemblies, components, and end items.
- w. Discrepancy – A fault or concern not meeting the definition of a nonconformance.
- x. Engineering Check Flight (ECF) – ECF's are authorized by a NASA Engineering Test Flight Plan for the purpose of validating engineering modifications to a NASA research or program support aircraft. The ECF is usually required following installation of project equipment for a particular mission. Since the ECF validates predicted aircraft performance throughout the aircraft's operating envelope, as applicable, only essential aircraft operating and engineering personnel are permitted to be on-board during an ECF. The pilot-in-command assigned to an ECF must be Functional Check Flight/Engineering Check Flight (FCF/ECF) qualified. Refer to the Aircraft Office's Flight Operations Manual.
- y. Facilities Operations Manager (FOM) - An individual who is responsible for the safety and operation of a particular facility or building.
- z. Flight Envelope – Aircraft performance limits or limitations approved by the aircraft manufacturer, Department of Defense (DOD), Federal Aviation Administration (FAA), or by NASA through an airworthiness review board process; or by a responsible supervisory official.
- aa. Flight Mechanic (FM) – A flight engineer who performs aircraft maintenance in addition to those duties normally associated with a flight engineer.
- bb. Foreign Object Debris or Foreign Object Damage (FOD) – Objects such as stones, debris, or birds that are foreign to normal operating conditions and that can cause damage to personnel and equipment in an aircraft environment, or the damage to the aircraft as a result of such debris. FOD control is a vital part of an aircraft maintenance safety program.

- cc. Functional Check Flight (FCF) – Synonymous with a post-maintenance check flight. Refer to the 830-FOM-0001 for qualifications and restrictions.
- dd. Functional or Operational Check – Testing and checking the function and operation of a component on an aircraft or in a shop using equipment, procedures, and limits in the applicable technical directives.
- ee. Government Furnished Material (GFM) – Government-provided materials; e.g., sheet metal, metal stocks, fabrics, plastics, special modification to tools, etc.
- ff. Hazard Analysis – The technique used to systematically identify, assess, evaluate, and resolve hazards.
- gg. Inactive – Aircraft in a non-operational status. This status includes aircraft with potential for future use; aircraft awaiting disposition; aircraft on loan from NASA or used for spare parts; or aircraft acquired for future use.
- hh. Inter-Center Aircraft Operations Panel (IAOP) – Performs periodic functional reviews of NASA aviation organizations and is composed of aviation personnel from NASA Centers that operate aircraft, representatives from the Aircraft Management Division, advisors, and from the Office of Safety and Mission Quality, as well as personnel from other NASA Headquarters Offices.
- ii. Isochronal Scheduled Inspection System (ISIS) – A US Navy maintenance program containing the minimum phased maintenance requirements to inspect the P-3 aircraft for material degradation and to perform essential preventative maintenance.
- jj. Chief of Maintenance – Reference ‘Airworthiness and Maintenance Manager’.
- kk. Maintenance Planning Document (MPD) – This is a document created by the OEM defining the inspection schedule and hard time requirements that apply to the airframe and aircraft components.
- ll. Material Safety Data Sheets (MSDS) – Describes material that has hazardous characteristics or that requires special or restricted handling.
- mm. Mission Management Aircraft (MMA) – Aircraft owned and operated by NASA to transport personnel in the conduct of official business. These aircraft are sometimes referred to as administrative aircraft and are authorized by Congress for NASA to conduct mission management support. MMA are operated and maintained in accordance with Federal Air Regulations.
- nn. Mission Operations Directive (MOD) – A GSFC document that describes and approves a research or program support operation or mission. An MOD is required for all aircraft

- missions except mission management aircraft missions and training or maintenance-related flights.
- oo. Mission – An aircraft flight or series of flights other than routine pilot proficiency, aircraft maintenance, or logistics flight.
  - pp. NASA Aircraft Inventory – All NASA-controlled aircraft, in both active and inactive status, will be recorded on property control inventories.
  - qq. NASA-Controlled Aircraft – Aircraft that are bought, borrowed, leased, bailed or otherwise procured or acquired, regardless of cost, from any source for the purpose of conducting NASA science, research, and/or other missions, and which are operated by NASA and/or whose operation is managed by NASA. Aircraft loaned by NASA to another agency/organization are not considered as NASA-controlled aircraft unless so stated by agreement.
  - rr. Non-Conformance – Non-fulfillment of a specified requirement.
  - ss. Non-Conformance Report (NCR) – A structured report within the Center's Quality Management System (QMS) that describes a nonconformance. A Corrective Action (CA) is required to eliminate a nonconformance.
  - tt. Organizational-Level Maintenance – Maintenance activities normally consisting of inspecting, servicing, adjusting, and replacing parts, assemblies, and subassemblies.
  - uu. Overhaul – The disassembly, cleaning, inspection, repair, or replacement of parts and components. Reassembly and test of any item or accessory in accordance with applicable directives, or authorized manufacturer's publications to provide an operationally safe, serviceable, and reliable item is inclusive within an overhaul.
  - vv. Preventive Maintenance – Activities aimed at precluding problems or enhancing up-time.
  - ww. Program Support Aircraft – Aircraft used primarily for direct support of NASA programs and projects including, such activities as astronaut space-flight readiness training, science applications, special-purpose cargo airlift, range surveillance, microgravity research, launch security, search and rescue, chase, support of tracking and remotely located sites, and pilot proficiency.
  - xx. Project Check Flight (PCF) – An initial project-related flight in a program support aircraft that is flown to check the functionality of project equipment. This flight is authorized in an MOD and is staffed with project personnel who operate and check project equipment.
  - yy. Public Aircraft – Aircraft used only in the service of a government or political subdivision.



- zz. Quality Assurance (QA) – Actions taken to assure that work is performed to a required standard. QA is a verification process of attaining certainty that aircraft maintenance meets airworthiness standards, regulations, and procedural requirements. Additionally, QA may refer to the NASA QAM/GSO.
- aaa. Quality Assurance Manager and Ground Safety Officer (QAM/GSO) - This position reports directly to the Code 830 Aviation Safety Officer. The QAM/GSO ensures all QAR maintenance personnel are qualified and designated to inspect or designate aircraft systems for the Safety of Flight. In addition, the QAM/GSO ensures that all work is performed to a required standard and all ground evolutions (both maintenance and flight operations) are conducted in accordance with applicable maintenance and safety practices while managing NASA maintenance programs.
- bbb. Quality Assurance Representative (QAR) – A maintenance person qualified and designated as a representative of QA that can inspect all or designated aircraft systems including Safety of Flight.
- ccc. Quality Assurance Surveillance Plan (QASP) – The QASP defines the Aircraft Office process for Quality Assurance Surveillance of the AMOC at NASA GSFC.
- ddd. Quality Assurance Plan (QAP) – Reference ‘AMOC/QAP’.
- eee. Repair – Restoration or replacement of material parts and components as necessitated by wear and tear, damage, or failure in order to maintain equipment in proper operating condition.
- fff. Research and Development Aircraft – Aircraft used primarily for research and development in aeronautics, applications, the study of the atmosphere, and space-oriented programs.
- ggg. Safety Equipment – Equipment used to prevent injury while performing specific tasks.
- hhh. Scheduled Maintenance - Periodic, prescribed inspections and/or servicing of aircraft or equipment which is accomplished on a calendar or hourly basis.
- iii. Serviceable – Capable of meeting a designed functional requirement.
- jjj. Special Tools –Tools that are designed and developed to perform a specific maintenance task. These tools include, wheel or bearing pullers, special cradles, alignment devices, vacuum pumps, floor jacks and cranes, engine slings, and those special tools listed in applicable equipment technical orders.
- kkk. Standard – Acknowledged measurement of performance as determined by the Government.

- lll. Standard Aircraft Technical Directive (TD) – A maintenance-related instruction that directs specific actions. A TD may originate from an aircraft component manufacturer or a military organization.
- mmm. Tools – Items used in the performance of maintenance and inspection of equipment, aircraft systems, subsystems, or components.
- nnn. Tow Supervisor – A maintenance technician trained in the towing operations and requirements of the assigned aircraft and designated as a Towing Supervisor by the AMOC in accordance with the AMOC/QAP.
- ooo. Transient Aircraft – Unassigned aircraft that land at a base (visiting aircraft).
- ppp. Unilateral Stop Authority – Authority granted to individual workers that permits them to declare temporary work stoppage for a safety reason.
- qqq. Unscheduled Maintenance - Unpredictable maintenance requirements that had not been previously planned or programmed but require prompt attention and must be added to or integrated with previously scheduled workloads.

## Appendix G: Abbreviations

### G-1 The following are commonly used abbreviations:

A/C or ACFT	Aircraft
A&P	Airframe & Powerplant
ADB	Aircraft Discrepancy Book
AGSE	Aircraft Ground Support Equipment
A&MM	Airworthiness and Maintenance Manager
AMM	Aircraft Maintenance Manual
AMO	Aircraft Maintenance Office
AO	Aircraft Office
AOM	Aircraft Operations Manual
APU	Auxiliary Power Unit
ARB	Airworthiness Review Board
ASAP	As Soon As Possible
AMOC	Aircraft Maintenance and Operations Contractor
AMOCQAP	Aircraft Maintenance and Operations Quality Assurance Plan
ASR	Assurance Status Report
AWM	Awaiting Maintenance
AWP	Awaiting Parts
BN CK	Bench Check
CA	Corrective Action
CC	Crew Chief
CFE	Contractor Furnished Equipment
CFR	Code of Federal Regulations
CM	Corrective Maintenance
CMPM	Contract Maintenance Project Manager
CO	Contracting Officer
CP	Copilot
COTR	Contracting Officer's Technical Representative
CS	Civil Service
CTO	Control Tower Operator
CW	Complied With
DLM	Depot Level Maintenance
DN	Document Number
ECF	Engineering Check Flight
EPA	Environmental Protection Agency
ESD	Electrostatic Discharge
ETA	Estimated Time of Arrival
ETR	Estimated Time of Return/Equipment Temporarily Removed
FAA	Federal Aviation Administration
FAR	Federal Acquisition Regulation
FAR	Federal Aviation Regulation

FCF	Functional Check Flight
FDC	Flight Data Capture
FM	Flight Mechanic
FOD	Foreign Object Debris or Foreign Object Damage
FOM	Facility Operations Manager
GFP	Government Furnished Property
GFE	Government Furnished Equipment
GOV	Government Owned Vehicle
GPG	Goddard Procedures and Guidelines
GPU	Ground Power Unit
GSFC	Goddard Space Flight Center
GSM	Ground Safety Manager
HAZMAT	Hazardous Materials
HQ	Headquarters
IAOP	Inter-center Aircraft Operations Panel
IAW	In Accordance With
IMTE	Inspection, Measuring, Test Equipment
ISIS	Isochronal Scheduled Inspection System
ISO	International Organization for Standardization
MC	Mission Capable
MEL	Minimum Equipment List
MMA	Mission Management Aircraft
MSDS	Material Safety Data Sheet
NA	Not Applicable
NADEP	Naval Aviation Depot
NASA	National Aeronautics and Space Administration
NAMIS	NASA Aircraft Management Information System
NATEC	Naval Air Technical Data & Engineering Service Command
NAVAIR	Naval Air
NCR	Nonconformance Report
NDI	Non Destructive Inspection
NDT	Non Destructive Test
NMC	Not Mission Capable
NMCM	Not Mission Capable Maintenance
NMCS	Not Mission Capable Supply
MPD	Maintenance Planning Document
NSN	National Stock Number
OEM	Original Equipment Manufacturer
OJT	On-Job Training
OPCK	Operational Check
OPS	Operations
OSD	Operations and Safety Directive
OSHA	Occupational Safety and Health Administration
PDM	Phase Depot Maintenance
PDR	Preliminary Design Review

PG	Procedures and Guidelines
PIC	Pilot-in-Command
PM	Preventive Maintenance
PPE	Personal Protective Equipment
PSA	Program Support Aircraft
QA	Quality Assurance
QAM/GSO	Quality Assurance Manager / Ground Safety Officer
QAP	Quality Assurance Plan
QAR	Quality Assurance Representative
QASP	Quality Assurance Surveillance Plan
QEC	Quick Engine Change
SIC	Second in Command
SN	Serial Number
SOP	Standard Operating Procedures
TD	Technical Directive
TDY	Temporary Duty
USA	Universal Stop Authority
WO	Work Order
WOA	Work Order Authorization
WR	Work Request
WUC	Work Unit Code