

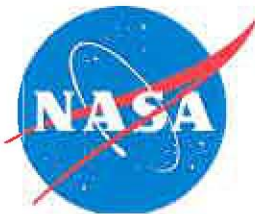
# **Goddard Space Flight Center**

## **Flight Operations Manual**

**830-FOM-0001**

**Release: Baseline**

**Effective Date: July 2013**



A handwritten signature in black ink, appearing to read "Shane G. Dover".

Shane G. Dover  
Chief of Flight Operations

26 July 2013  
Date

**National Aeronautics and  
Space Administration**

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

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TO VERIFY THAT THIS IS THE CORRECT VERSION*

**REVISION LOG**

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## Introduction

This Flight Operations Manual is mandated in compliance with NASA Procedural Directive (NPD) 7900.4 NASA Aircraft Operations Management, and NASA Procedural Requirement (NPR) 7900.3 Aircraft Operations Management Manual. It is issued pursuant to the authority of the Director, Goddard Space Flight Center (GSFC), and the Director, Wallops Flight Facility (WFF). It prescribes standard operating procedures and instructions pertaining to the operation of aircraft and Unmanned Aerial Systems (UAS) assigned to GSFC and to related operations involving GSFC and WFF.

This manual pertains to all GSFC flight operations. The information contained within this document is considered mandatory knowledge for all personnel involved with the execution of GSFC supported, directed or managed flight operations.

This manual will be used in conjunction with other governing instructions, regulations, and procedures. When the need arises, special instructions or waivers will be issued by the Chief of Flight Operations. Such special instructions will be incorporated in the manual as the situation dictates.

In accordance with NPD 7900.4 and NPR 7900.3, it is NASA's policy to operate in compliance with all applicable Federal and Foreign Aviation Regulations.

This manual is one in a set of flight manuals (830-FOM-0001 Flight Operations Manual, 830-FOM-0002 UAS Flight Operations Manual), segregated by manned and unmanned operations respectively.

For the purposes of consistency with NASA Procedural Requirements, internal and external documentation, and the Intercenter Aircraft Operations Panel, the terms Chief of Flight Operations; Chief, Aircraft Office; and Aircraft Office Chief are used with equivalence and interchangeably.

## **1. Preface**

### **P.1 Purpose**

The incorporated procedures establish guidelines and requirements for the management of GSFC aircraft, aircraft operations, aviation safety, and related subject matter.

### **P.2 Scope**

This procedure applies to the operation of all GSFC aircraft. In accordance with NPR 7900.3, NASA GSFC aircraft are defined as all aircraft that are bought, borrowed, chartered, rented, or otherwise procured or acquired--including aircraft produced with the aid of NASA funding--regardless of cost, from any source for the purpose of conducting NASA science, research, or other missions, and which are operated by NASA, or whose operation is managed by NASA. Unmanned aircraft are defined as "aircraft" by the FAA and are included in the definition of NASA aircraft, unless specified otherwise.

### **P.3 Applicability**

This procedure applies to GSFC aircrew. Additionally, this procedure applies to NASA contractors and other NASA or government aircrew operating GSFC assigned aircraft, as specified in contracts or agreements.

A requirement in this manual is identified by "shall," a good practice by "should," permission by "may" or "can," expected outcome or action by "will," and descriptive material by "is" or "are" (or another verb form of "to be").

Note: This procedure alone is not sufficient to stipulate requirements for a contractor or grant recipient. The contract, grant, or agreement must state the requirements(s) from NPD 7900.4 and/or NPR 7900.3.

### **P.4 Validation, Changes and Discrepancies**

Current version validation can be accomplished at <http://code830.wff.nasa.gov/>. If discrepancies exist between versions, the most up-to-date information will prevail. If unaddressed discrepancies exist between specific aircraft flight manuals and this manual, the most restrictive, safe course of action should be taken until the discrepancy can be addressed via special instruction. This document is not intended, and does not authorize, operations outside a published and approved aircraft flight manual.

### **P.5 Comments and Recommendations**

Comments and recommendations concerning this manual are encouraged and should be submitted to:

Aircraft Office Operations Manager  
Code 830, Hangar N-159  
NASA Wallops Flight Facility  
Wallops Island, VA 23337

## **P.6 Authority, Deviation and Waiver Authority**

NASA derives its authority through The National Aeronautics and Space Act of 1958, as amended, § 203(c)(1), 42 U.S.C. § 2473(a)(1 and 2), (c)(1) and National Aeronautics and Space Administration; 14 C.F.R. § 1201.102.

This manual derives its authority from NPD 7900.4 and is in compliance with NPR 7900.3.

The Chief of Flight Operations has waiver authority over requirements set forth in this document. Waivers may be submitted in writing, verbally, or by e-mail. Waivers are typically applicable for the duration of the operation for which submitted. Landing and other aircrew currency and proficiency waivers are submitted in writing and are retained in the aircrew training record for one year. Permanent waivers are retained until incorporated into this document.

When deviations from the procedures prescribed in NPD 7900.4 or NPR 7900.3 are required, the waiver process outlined in that document shall be used.

## **P.7 Management Records & Retention**

Records related to this procedure shall be preserved, maintained, and disposed of in accordance with NPR 1441.1, NASA Records Retention Schedules.

## **P.8 Relevant Documents and Forms**

Documents:

5 U.S.C., Chapter 53, Pay Rates and Systems.

10 U.S.C., § 2648, Persons and Supplies: Transportation.

49 U.S.C. § 40102, Definitions.

Public Law 106-181, Wendell H. Ford Aviation Investment and Reform Act for the 21st Century.

7 C.F.R. Chapter III, Animal and Plant Health Inspection Service.

9 C.F.R. Chapter I, Animal and Plant Health Inspection Service, United States Department of Agriculture (USDA).

14 C.F.R. § 21, Certification Procedures for Products and Parts.

14 C.F.R. § 39, Airworthiness Directives.

14 C.F.R. § 43, Maintenance, Preventative Maintenance, Rebuilding, and Alteration.

14 C.F.R. § 61, Certification: Pilots, Flight Instructors, and Ground Instructors.

14 C.F.R., § 65 Certification: Airmen Other Than Flight Crewmembers.

14 C.F.R. § 91, General Operating and Flight Rules.

14 C.F.R. § 91.203, Civil Aircraft: Certifications Required, Subparts (a) and (b).

14 C.F.R. § 139, Certification of Airports.

14 C.F.R. § 142, Training Centers.

40 C.F.R. § 260, Hazardous Waste Management System: General.

40 C.F.R. § 261, Identification and Listing of Hazardous Waste.

40 C.F.R. § 262, Standards Applicable to Generators of Hazardous Waste.

40 C.F.R. § 263, Standards Applicable to Transporters of Hazardous Waste.

40 C.F.R. § 264, Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities.

40 C.F.R. § 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities.

41 C.F.R. § 101-37, Government Aviation Administration and Coordination.

41 C.F.R. § 102-33, Management of Government Aircraft.

41 C.F.R. § 102-39, Replacement of Personal Property Pursuant to the Exchange/Sale.

41 C.F.R. § 105.5, Definitions.

41 C.F.R. § 300, Federal Travel Regulation System—General.

41 C.F.R. § 301, Temporary Duty (TDY) Travel Allowance.

49 C.F.R. § 175, Carriage by Aircraft.

NPD 1000.3, The NASA Organization.

NPD 4300.1, NASA Personal Property Disposal Policy.

NPD 7900.4, NASA Aircraft Operations Management.

NPR 1441.1, NASA Records Retention Schedules.

NPR 3792.1 Plan for a Drug-Free Workplace

NPR 4100.1, NASA Materials Inventory Management Manual.

NPR 4200.1, NASA Equipment Management Procedural Requirements.

NPR 4310.1, Identification and Disposition of NASA Artifacts.

NPR 7900.3 Aircraft Operations Management Manual

NPR 8000.4, Agency Risk Management Procedural Requirements.

NPR 8621.1, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping.

NPR 8715.1, NASA Occupational Safety and Health Programs.

NPR 8715.3, NASA General Safety Program Requirements.

NPR 8715.5, Range Flight Safety Program.

NASA STD 8719.11, Safety Standard for Fire Protection.

NASA STD 8719.12, Safety Standard for Explosives, Propellants and Pyrotechnics.

GPR-8715.2 Aviation Safety Program

800-PG-1060.2.2 Airworthiness Review Process

830-PG-1410.2.1, Aircraft/UAS Engineering and Configuration Management Process

RSM-2002-Rev B WFF Range Safety Manual

830-GMM-0001 General Maintenance Manual

830-MAMC-0001 Aircraft Office Mission Anomaly and Mishap Contingency Plan

830-FOM-0002 UAS Flight Operations Manual

830-MLCP-0001 NASA Aircraft/UAS Mission Life Cycle Process

WFF Airfield Operations Handbook

OMB Circular A-11 (revised), Preparation, Submission, and Execution of the Budget, June 30, 2006.

OMB Circular A-76 (revised), Performance of Commercial Activities, May 29, 2003.

OMB Circular A-126 (revised), Improving the Management and Use of Government Aircraft, May 22, 1992.

FAA Advisory Circular 20-142, CHG1, Eligibility and Evaluation of U.S. Military Surplus Flight Safety Critical Aircraft Parts, Engines, and Propellers.

MILSTD 1797 Flying Qualities of Piloted Aircraft

Individual Aircraft Flight Manuals / NATOPS

Forms:

NASA Form 1269 Flight Itinerary and Passenger Manifest

NASA Form 1653 Mission Management Flight Request

DD Form 175 Military Flight Plan

DD Form 1801 DoD International Flight Plan

FAA 7233-1 Flight Plan

830-AOF-0101 NASA GSFC Flight Medical Clearance Form

830-AOF-0111 Disclosure Statement for Crewmembers and Qualified Non-Crewmembers Flying on Board Government Aircraft Operated as Public Aircraft

830-AOF-0121 NASA GSFC Aircraft Flight Safety Form

830-AOF-0141 Application for Mission Management Flight

830-AOF-0211 WFF Flight Schedule

830-AOF-0212 Flight Irregularity Report

Aircrew Training Record

Check ride Form

In-flight Technician/Mechanic Form

## **P.9 Cancellation**



830-AOM-0002, Aircraft Operations Manual, October 2010.

## **2. Aircraft Use Policy and Authority**

### **2.1. Authority**

2.1.1. Management Authority. In accordance with NASA Procedural Requirements, Goddard Space Flight Center aircraft may be flown only when authorized by the Center Director or his designated representative.

2.1.2. Operational Authority. The Chief of Flight Operations under the cognizance of management authority approves or disapproves all Goddard Space Flight Center aircraft flight and ground operations and related activities. Their authority is final and is based on an assessment of safety, operational practices, and personnel or equipment limitations.

### **2.2. Aircraft Use Policy**

2.2.1. Aircraft Operating Policy. Aircraft assigned to NASA's Goddard Space Flight Center are flown by NASA Pilots, designated Support Service Contract Pilots, Guest Pilots, or by pilots employed by other federal or state agencies via agreement. They are operated as either public aircraft defined in CFR 14 Part 1.1 or under FAA jurisdiction under CFR 14 Part 91 and other related regulations.

2.2.2. Aircraft Categorization. NASA's active aircraft are generally used for research and development, program support, and passenger transportation, and many NASA aircraft fly under multiple categories. NASA GSFC operates only the number of aircraft needed to enable the Agency to meet its mission requirements linked to the NASA Strategic Plan. Categories include:

2.2.2.1. Research and Development (R&D). R&D operations are a means for NASA's Mission Directorates to conduct research at various altitudes and atmospheric conditions. R&D operations are flown to advance aeronautics research, to expand human knowledge of Earth and space science, and to support the Vision for Space Exploration.

2.2.2.2. Program Support (PS). PS operations enable the accomplishment of NASA's program objectives. Such use includes, but is not limited to, astronaut training, safety chase, photo chase, cargo transport, aircrew training, range surveillance, launch security, launch and landing weather reconnaissance, contingency support, and command and control.

2.2.2.3. Passenger Transportation. Use of NASA aircraft for passenger transportation allows NASA personnel to meet mission-required or other official travel needs, as defined in OMB Circular A-126 and NPR 7900.3, Chapter 4. Passenger transportation flights (referred to as mission management flights throughout NPR 7900.3) may only be classified as "Mission Required" only when failure to use a NASA aircraft would have a clear, negative impact on a NASA operational mission, prevent timely response to an aircraft or spacecraft accident, or

threaten the health and safety of NASA personnel, and only when such travel could not be conducted using commercial airlines, charter aircraft service, or ground transportation to fulfill that mission need. Mission management flights also may be designated as Mission Required for nontravel activities that support NASA's official responsibilities.

- 2.2.2.4. Inactive. Inactive aircraft generally fall into four classifications. An aircraft:
- a. That has completed active use in one of the categories above and is in nonoperational status either with potential for future use or awaiting disposition.
  - b. On loan from NASA
  - c. Used for spare parts to support active aircraft
  - d. Acquired for future use

2.2.3. Airworthiness. NASA has the authority and responsibility to self-regulate aircraft airworthiness. Aircraft modified from their original airworthiness certificate shall comply with 800-PG-1060.2.2 Airworthiness Review Process. Aircraft used for passenger carriage operations (mission management flights) must possess and display a valid FAA Airworthiness Certificate while conducting such operations.

2.2.3.1. Airworthiness Certification. All operational NASA aircraft shall be issued and display a current NASA Certificate of Airworthiness.

2.2.3.2. Aircraft Registration. NASA controlled aircraft are subject to Federal Aviation Regulations with respect to aircraft registration.

2.2.3.3. DoD Exemption. Aircraft on loan from the U.S. Armed Forces are not subject to civil registration.

2.2.4. Configuration Management. Research and Program Support aircraft configurations are managed in accordance with 830-PG-1410.2.1B, Aircraft/UAS Engineering and Configuration Management Process.

2.2.5. Passenger Operations. Aircraft used for passenger carriage operate in accordance with NPR 7900.3 Chapter 4.

2.2.6. Unmanned Aerial Systems. UAS are operated in accordance with 803-FOM-0002 UAS Flight Operations Manual.

2.2.7. Emergency Lifesaving / Humanitarian Operations. GSFC aircraft, UAS, aircrew, ground crew, ground support equipment, stored fuel, oil, spare parts and/or hangar facilities may be authorized by the Director, Wallops Flight Facility to support emergency lifesaving, humanitarian, or Homeland Security missions. The circumstances of such use shall be documented by the Aircraft Operations Department and reported to the Assistant Administrator to the Office of Infrastructure within 30 days.

## 2.3. **Performance Measurements, Accounting, and Reporting**

2.3.1. Annual Reporting. The AO Business Manager and Operations Manager shall annually review aircraft mission and program requirements (for those programs controlled/funded by GSFC), aircraft use, and associated costs, and project those requirements and costs over 5 years to support the Mission Directorate's annual report to the HQ AD, not later than September 30 of each year.

2.3.2. OMB Circular A-11. OMB Circular A-11. The AO Business Manager shall provide input for inclusion in the OMB Circular A-11, Exhibit 300 submission, as appropriate, for aircraft and aircraft programs funded by their Directorates.

2.3.3. Quarterly Costs. Aircraft operations and costs should be reported quarterly to Headquarters, as stipulated in NPR 7900.3, and specific passenger transportation reporting requirements detailed in the Mission Management section of that NPR.

2.3.4. Internal Order Codes. All reporting shall be in compliance with the Financial Management Requirements in the appropriate use and application of specific Internal Order codes (also called function codes) that are used to account for, track, and report aircraft costs.

2.3.5. Submissions. These submissions shall be coordinated with the appropriate Mission Directorate, the Office of Strategic Infrastructure, and the Office of the Chief Financial Officer.

## 2.4. Aircraft Acquisition

2.4.1. Business Case Approval. The Aircraft Office shall prepare a Business Case Analysis (BCA) in accordance with OMB Circulars A-11, A-76, and A-126 prior to the acquisition of aircraft/UAS and gain approval of the BCA by the cognizant Mission Directorate's Associate Administrator and the Assistant Administrator for the Office of Strategic Infrastructure.

2.4.2. GSFC Aircraft Business Oversight. The Aircraft Office will oversee the technical assessment, cost evaluation, acquisition, use, and disposition of all aircraft/UASs under GSFC's control. This includes the acquisition of aircraft/UASs used solely as wind tunnel, or other non-flyable test models. This includes charters or leases for periods of 30 days or less with 7 days prior notice to the HQ Aircraft Division (AD) in the Office of Strategic Infrastructure.

2.4.3. Acquisition and Disposal Proposal Submission. All aircraft acquisition and disposition proposals shall be submitted to the Assistant Administrator for the Office of Strategic Infrastructure for approval.

2.4.4. Acquisition and Disposal Reporting. The Aircraft Office Logistics Support Specialist shall be responsible for reporting all acquisition and disposal actions to the HQ AD to comply with Federal aircraft data-reporting requirements.

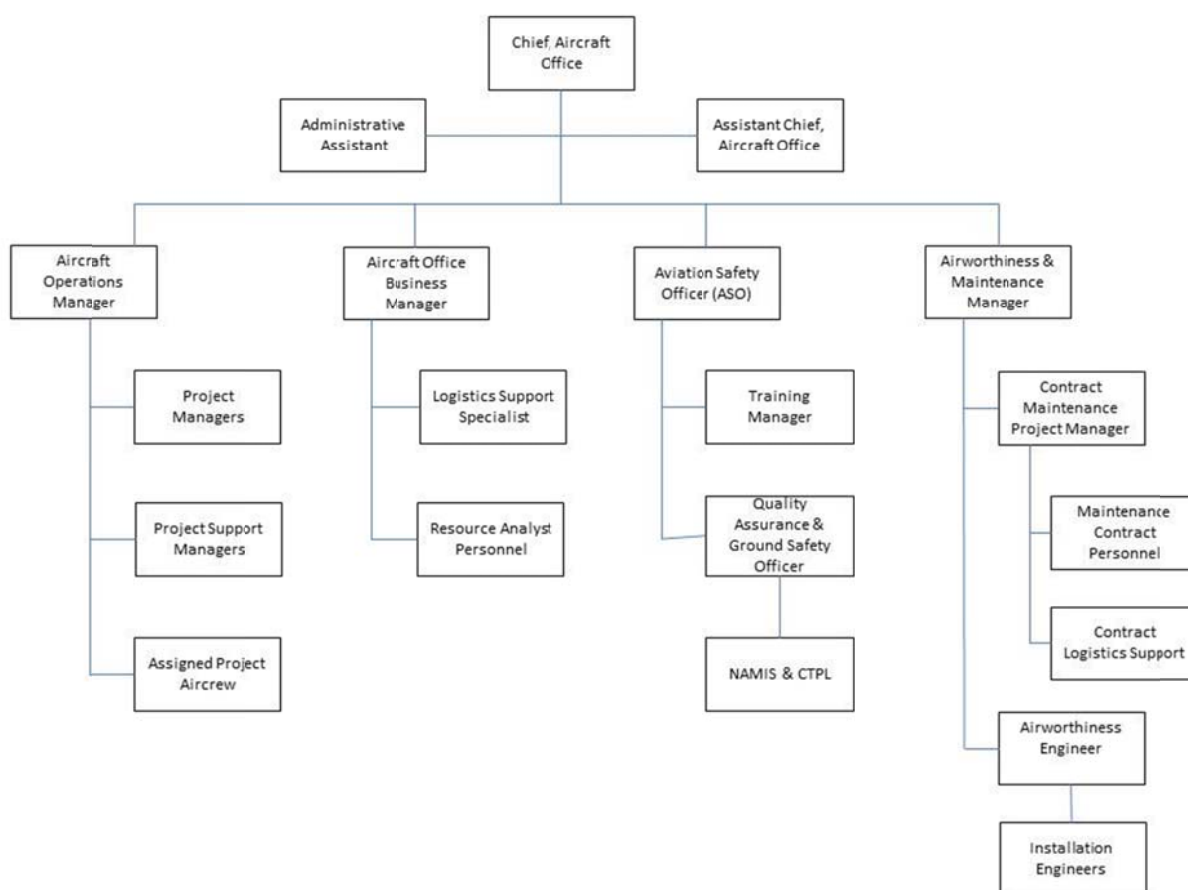
2.4.5. Aircraft Assignment. The Assistant Administrator for the Office of Strategic Infrastructure will designate aircraft classifications and assign aircraft to GSFC after consultation with the affected Mission Directorates and Center Directors.

## 2.5. **Mission, Organization and Structure**

2.5.1. Establishment of the GSFC Flight Operations Office. The NASA Goddard Space Flight Center's Flight Operations Office is geographically located at NASA's Wallops Flight Facility, Wallops Island, Virginia. The Flight Operations Department functionally referred to as the Aircraft Office, Code 830, is organizationally contained within the Suborbital and Special Orbital Projects Directorate (SSOPD), Code 800.

2.5.2. Mission. The mission of the GSFC Aircraft Office is to provide safe, reliable, and cost effective aircraft and Unmanned Aircraft Systems to the NASA Airborne Science Program (ASP) and to other GSFC Programs and Projects. This program-independent Flight Operations Office has the specific purpose to plan, organize, direct, and control the operations, maintenance, modification, safety, and support of all Center-assigned or -contracted aircraft and Unmanned Aerial Systems.

2.5.3. Organizational Chart.



## 2.6. Organizational Position Descriptions, Qualifications, and Responsibilities

2.6.1. Chief of Flight Operations (Chief, Aircraft Office or Aircraft Office Chief). In accordance with NPR 7900.3, Aircraft Operations Management, the Senior Line Manager of the Flight Operations Office is responsible for all Center-assigned and Center-contracted aircraft and Unmanned Aerial Systems, and is formally referred to as the Center's Chief of Flight Operations.

2.6.1.1. Authority. In accordance with NPD 7900.4, NASA Aircraft Operations Management, the Chief of Flight Operations is responsible for aviation activities at the Center and shall be assigned the resources and authority necessary to manage and conduct safe, effective, and efficient operations in accordance with NASA directives, guidance, and other applicable Federal regulations.

2.6.1.2. Aviation Contract Management. Any Center contract or agreement, including Space Act Agreements that include aviation operations shall be reviewed and concurred with by the Chief of Flight Operations prior to contract award or execution of the agreement.

2.6.1.3. Qualifications. The Aircraft Office Chief shall have a minimum of 10 years of relevant aviation-related experience, supervisory, or managerial experience in aircraft operations similar to the primary aircraft type operated at the Center, and a high level of familiarity with the organization's aircraft operations. He/she shall have current or previously held qualifications as a NASA PIC, a military rating as an Aircraft Commander, or a Federal Aviation Administration Airline Transport Pilot (ATP) certificate.

2.6.1.4. Responsibilities. The Aircraft Office Chief shall ensure the effective management of flight operations under that Center's cognizance, per NPD 7900.4. The position maintains appropriate communications with Center personnel, Headquarters, other centers, and outside groups with respect to aircraft operational matters. Responsibilities include:

- a. Authorizing personnel to operate and maintain NASA aircraft under GSFC control.
- b. Determining the number and types of aircraft/UAS for which an individual aircrew member may maintain qualification at any given time and annually review that determination.
- c. Recommending assignment of the GSFC Aviation Safety Officer, with the concurrence of the Center Chief of Safety and Mission Assurance, to the Center Director for approval.
- d. Administering flight operations and/or flying as an aircrew member or observer on all assigned aircraft, where practicable and as necessary, to observe performance of assigned aircrew.
- e. Directly supervising and managing the activities of all personnel assigned as Code 830 staff.
- f. Establishing operational policies and standards, which are conducive to safe, efficient flight research and related support activities. Assuring compliance with policies, procedures, and practices described in governing documents.
- g. Establishing process standards regarding airworthiness, configuration control, aircraft modifications, maintenance, ground support equipment, and associated procedures.
- h. Assigning pilots to research and research support missions based on individual competency, experience, and currency.
- i. Ensuring the currency, training, and proficiency of flying personnel is appropriate for the aircraft and mission assigned.
- j. Establishing individual initial training, checkout, and currency requirements.
- k. The GSFC Aircraft Office (Flight Operations Office), Chief of Flight Operations shall have the final operational flight release authority for any NASA aircraft operating from or under the cognizance of GSFC.

2.6.2. Assistant Chief, Aircraft Office. The Assistant Chief supports the day to day management of the GSFC Flight Operations Department and is the delegated manager of the office in the absence of the Chief of Flight Operations.

2.6.3. Chief Pilot. In accordance with NPR 7900.3, the Chief Pilot shall be designated in writing by the Chief of Flight Operations. This designation may be added or removed without change to a Pilot's official Position Description.

2.6.3.1. Vacancy. When the Chief Pilot position is vacant, the duties and responsibilities of the position reside with the Chief of Flight Operations and may be divided and/or dispersed as required.

2.6.3.2. Qualification. To qualify for assignment, the Chief Pilot shall hold and maintain qualification as a NASA PIC, have at least 3 years of experience within the past 6 years as PIC of an aircraft similar in category and class to at least one of the aircraft used in the types of operations being conducted at the Center and shall demonstrate satisfactory supervisory and managerial capabilities.

2.6.3.3. Responsibilities. The Chief Pilot fulfills duties as assigned by the Chief of Flight Operations.

2.6.4. Aviation Safety Officer (ASO). In accordance with NPR 7900.3, the Aviation Safety Officer (ASO) shall be designated in writing by the Chief of Flight Operations, with approval by the Center Director and the concurrence of the Center Chief, Safety and Mission Assurance.

2.6.4.1. Qualification. The ASO shall be a civil servant, hold qualification as a NASA PIC in at least one primary aircraft type used at the Center, and have (within 2 years of designation) graduated from a recognized Military Aviation/Flight Safety Officer Course, or an Academic Aviation Safety Certificate Program.

2.6.4.2. IRT Membership. The ASO must obtain, and maintain qualification as, a GSFC/WFF Interim Response Team (IRT) member in accordance with the requirements set forth by NPR 8621.1 and the GSFC/WFF Safety Office.

2.6.4.3. Specialized Training. The ASO must complete recurrent training as outlined in NPR 7900.3.

2.6.4.4. Responsibilities. The ASO shall manage the Center's aviation safety program as directed in NPR 7900.3. The ASO shall be assigned to the Flight Operations Department, serve as the Center's focal point for aviation safety, and act on behalf of the Center Director when discharging this responsibility.

2.6.4.5. Special Access Authority. Per NPR 7900.3, the GSFC ASO may be granted formal access to senior management when safety issues cannot be resolved at a lower level in the flight organization.

2.6.5. Aircraft Office Operations Manager (AOOM). The Aircraft Office Operations Manager is responsible for the long term planning, development and implementation of project processes and mission life cycles, and day-to-day management and scheduling of all aircraft operations at GSFC. This position involves planning, developing, directing, and coordinating the activities necessary to conduct national and international missions aboard GSFC aircraft. Such missions support other NASA programs, include aircraft operations for the sole carriage of



passengers, range surveillance, research and development, and employ aircraft as platforms for sensor development and for in situ and remote measurements in fields such as astronomy, earth resources, ocean processes, atmosphere, meteorology, materials processing, life sciences, and communications.

2.6.6. Airworthiness and Maintenance Manager (A&MM). Since actual maintenance activity is contractor controlled, the AMM functionally serves as the Chief of Maintenance and serves as the Chief of Flight Operations' focal point for all aircraft maintenance activities. The A&MM assures aircraft maintained by service contractors, to include sub-contractors or teaming contractors, conduct all maintenance actions as per specifications. This includes compliance with NPR 7900.3, NASA GSFC's Code 830 General Maintenance Manual (830-GMM-0001), and specific aircraft maintenance manuals. The A&MM provides written guidance for maintenance programs, practices and procedures that comply with standards set forth in NPR 7900.3 and are tracked in the NASA Aircraft Information Management System (NAMIS).

2.6.7. Aircraft Office Business Manager (AOBM). The Aircraft Office Business Manager provides budget formulation, accounting, analysis, and general business management expertise in support of AO objectives and projects, and is responsible for the application of resources and project support techniques. AOBM responsible for all aspects of estimating budgets, manpower, travel, and review of specific project budgets, procurements, and formulation of program activities. The business manager provides input to the development of aircraft support contracts, contract manpower requirements, contractor travel and other cost requirements / reports.

2.6.8. Training Manager (TM). The Training Manager tracks and maintains data associated with the required training of all GSFC assigned aircrew. The TM schedules annual, periodic and specialized training evolutions and coordinates with external entities for the use of specialized training equipment, instructors and facilities. The TM is also responsible for developing the Aviation Life Support Equipment required equipment matrix, as well as, ensuring that all aircrew are issued, and trained in the use of, positional appropriate survival gear.

2.6.9. Quality Assurance Manager / Ground Safety Officer (QAM/GSO). In accordance with NPR 7900.3, the Quality Assurance Manager serves as the quality assurance specialist for all GSFC aircraft. As a technical authority the QAM/GSO plans, develops, organizes, administers, evaluates, and coordinates a comprehensive aerospace quality assurance program for all quality assurance functional program areas and performs technical quality control inspections to evaluate all sub-areas of related equipment, systems and procedures. The QAM/GSO also monitors for compliance with all OSHA and NASA work standards.

2.6.10. Contract Maintenance Project Manager (CMPM). The Contract Maintenance Project Manager is the senior onsite representative of the Aircraft Maintenance and Operations Contract (AMOC). Directing and tracking the day-to-day activities of AMOC contract personnel, the CMPM develops contractor mission/project 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.



2.6.11. **Airworthiness Engineer.** In accordance with NPD 7900.4, The GSFC Airworthiness Engineer fulfills the role of the Chief of Engineering for flight operations. The Airworthiness Engineer manages all design, analysis, fabrication and ground testing associated with the modification of assigned aircraft. The Airworthiness Engineer (or designated representative) formally presents aircraft configurations and analysis to the Airworthiness and Flight Safety Review Board (AFSRB). Acting as the liaison between the Aircraft Office and the AFSRB chairperson, the Airworthiness Engineer (or designated representative) is responsible for initiating all aircraft modification work orders in NAMIS, ensuring that all AFSRB required action items are addressed, and validating that modification work orders have been completed.

2.6.12. **Logistics Support Specialist.** In accordance with NPR 4200 and 4300 series, regarding NASA Equipment and Property, The Logistic Support Specialist administers the property management program for the Aircraft Office. This specialist maintains an inventory and supporting documentation regarding all assigned aircraft and equipment.

### **3. GSFC Aircrew**

#### **3.1. Aircrew General**

3.1.1. **GSFC Aircrew.** NASA has a tradition of aeronautical excellence. In keeping with that tradition, GSFC seeks to employ the mostly highly skilled, well educated, thoroughly trained and experienced aviators that our nation has to offer. It is GSFC policy to ensure that all flying personnel are thoroughly qualified to operate aircraft, including UAS and experimental aerospace vehicles, within limitations imposed on them individually, and that a systematic program of aircrew checkout, training, certification, and currency is maintained at all times.

#### **3.2. Aircrew General Categories and Records**

3.2.1. **General Aircrew Categories.** For the purposes of defining medical guidelines, age limitations, and providing physiological and other training requirements, GSFC aircrew are divided into general categories.

#### **3.3. GSFC Primary Aircrew**

3.3.1. **GSFC Primary Aircrew Definition.** GSFC Primary Aircrew are defined as aircrew (civil service and contractor) that are authorized by official position descriptions, MOU, MOA, or contracts to perform flight duties in GSFC aircraft, and have positional designation, in writing, by the Chief of Flight Operations to perform one, or a combination, of the following duties:

- a. Fixed Wing and Rotary Wing Research Pilots (IP, FCF, PIC, or SIC)
- b. Fixed Wing and Rotary Wing Research Test Pilots (IP, FCF, PIC, or SIC)
- c. Flight Engineers & Flight Mechanics (FE, FM, or IFE)

3.3.2. **Primary Aircrew Under Instruction.** Primary Aircrew under instruction are considered Primary Aircrew.

3.3.3. Non-Directly Assigned GSFC Primary Aircrew. GSFC Primary Aircrew, not directly assigned to the GSFC/WFF Aircraft Office, who are authorized by position descriptions to perform flights in NASA aircraft are considered Primary Aircrew while performing those duties.

3.3.4. GSFC Primary Aircrew Training Records. Training records for Primary Aircrew contain all pertinent information relating to the aircrew members' required training, positional qualifications, and designations. Training records for Primary Aircrew are maintained by the TM and paper copies are retained by the assigned Aircraft Office Records Custodian.

### 3.4. **GSFC Secondary Aircrew**

3.4.1. GSFC Secondary Aircrew Definition. GSFC Secondary Aircrew are defined as aircrew (civil service and contractor) that are authorized by official position descriptions, MOU, MOA, or contracts to perform flight duties in GSFC aircraft. These aircrew members have assigned in-flight emergency procedures (as directed by the individual aircraft flight manual) and/or operate required on-board flight apparatus. Secondary Aircrew have positional designation, in writing, by the Chief of Flight Operations to perform one, or a combination, of the following duties:

- a. Navigator (NAV)
- b. Flight Maintenance Technician (FMT)
- c. Loadmaster (LM)
- d. Launch Panel Operator (LPO)

3.4.2. Secondary Aircrew Under Instruction. Secondary Aircrew under instruction are considered Secondary Aircrew.

3.4.3. Non-Assigned GSFC Secondary Aircrew. GSFC Secondary Aircrew, not directly assigned to the GSFC/WFF Aircraft Office, who are authorized by position descriptions to perform flights in NASA aircraft are considered Secondary Aircrew while performing those duties.

3.4.4. GSFC Secondary Aircrew Training Records. Training records for Secondary Aircrew contain all pertinent information relating to the aircrew members' required training, positional qualifications, and designations. Training records for Secondary Aircrew are maintained by the TM and paper copies are retained by the assigned Aircraft Office Records Custodian.

### 3.5. **Aircrew Age Limitations and Restrictions**

3.5.1. Requirement for Aircrew Age Limitations and Restrictions. Due to the high risks associated with research aircraft operations and the unpredictable and indeterminate nature of physical and cognitive decline with age, standardized, non-individually discriminatory age limitations must be established in an attempt to mitigate the potential for mishaps, injuries, or loss of life.

3.5.2. Aircrew Age Limitation. No person may act as primary or secondary aircrew onboard GSFC aircraft beyond their 65th birthday. GSFC pilots above 60 years of age may only be

scheduled to fly in multi-positional aircraft, with dual flight controls with another GSFC pilot under the age of 60 years.

### 3.6. **Aircrew Medical Requirements**

3.6.1. **Aircrew Medical Requirements.** GSFC is dedicated to operating aircraft to the highest possible standards of safety. Recognizing the physical demands placed upon aircrew, GSFC aircrew members are required to maintain the medical requirements as outlined below.

3.6.2. **Pilot Medical Requirements.** Pilots shall hold an FAA First Class medical certificate, military pilot flight physical, or obtain a NASA flight medical certification, renewed annually or more frequently, if specified by the Center Director or a competent medical authority. At the discretion of the Center's Chief of Flight Operations, records of aeromedical certification conducted by non-NASA Aviation Medical Examiners (AME) may be reviewed by a NASA Aeromedical Physician.

3.6.3. **Pilots 55 Years of Age and Older.** Pilots 55 years of age and older shall be medically certified every 6 months.

3.6.4. **Pilots of High Performance Aircraft.** Pilots of high performance jet aircraft or ejection-seat configured aircraft shall obtain a military pilot flight physical or NASA flight medical certification.

3.6.5. **Flight Engineers and Flight Mechanics.** Flight Engineers and Flight Mechanics shall hold either an FAA Second Class medical certificate, military flight physical, or obtain NASA flight medical certification, which must be renewed annually or earlier if specified by a competent medical authority.

3.6.6. **Secondary Aircrew.** Secondary Aircrew shall hold either an FAA Third Class medical certificate, military flight physical, or obtain NASA flight medical certification, which must be renewed biennially or earlier if specified by a competent medical authority.

3.6.7. **Aircrew Medical Disqualification.** In the event of an aircrew member becoming medically disqualified, The Chief of Flight Operations shall reassign the crew member to duties not involving flying as deemed appropriate to the individual's education, skill-set, training, and experience.

3.6.8. **Medical Qualification Records.** Copies of current medical certification shall be kept in the individual's Aircrew Training Record.

3.6.9. **Notification of a Change in Status.** Individual aircrew members shall notify the Chief of Flight Operations of any change in medical flight status.

3.6.10. **NASA Aerospace Medicine Board.** When requested by GSFC or the individual the medical examination results of pilots who do not meet the required standards may be reviewed

by the NASA Aerospace Medicine Board and NASA Medical Policy Board, in accordance with the board's charter.

3.6.11. FAA Medical Special Issuance or SODA. Primary Aircrew shall report Special Issuances (FAA Waivers) and FAA Statements of Demonstrated Ability (SODA) to the Chief of Flight Operations for review by a NASA Aeromedical Physician.

3.6.12. NASA Medical Waivers. Considerations for NASA-specific aeromedical waivers will be processed through the NASA Aerospace Medicine Board and the NASA Medical Policy Board, as appropriate.

3.6.13. UAS Aircrew. GSFC UAS Pilots shall comply with the medical qualification standards outlined in the NPR 7900.3 Appendix J.

### **3.7. Training Continuity, Expiration, Overdue, and Waivers**

3.7.1. Training Standards Continuity. Due to the wide variability in training methods and the expansive use of multimedia/on-line training portals, the TM, in concurrence with the ASO, shall act as cognizant qualifying authority as to suitability of any training intended to meet the following requirements.

3.7.2. Training Expiration Dates. For tracking purposes, expiration dates shall be on the last day of the month in which training was originally completed.

3.7.3. Overdue Training. Unless a grace period is specifically denoted, aircrew shall not be scheduled or otherwise assigned duties involving flying until the required training is complete.

3.7.4. Training Waivers. Waivers from training requirements contained in this section may be granted, in writing, by the Chief of Flight Operations. A written waiver recommendation, containing the specific reason for the request, shall be submitted by the TM, with written concurrence by the ASO. Training waivers shall be limited in duration, with a written expiration date, and retained in the individual's training record until the training deficit is resolved.

### **3.8. Aircrew Survival Training**

3.8.1. Aircrew Survival Training. The GSFC Survival Training Program exists to ensure that each aircrew member is adequately trained to perform assigned duties safely and proficiently. Mission specific training requirements may be mandated through mission risk review processes.

3.8.2. Aircrew Survival Training. Each primary aircrew member shall receive, or demonstrate completion of, basic survival training on a one-time basis. Aircrew shall receive classroom, hands-on and/or laboratory presentation of the specific survival equipment used on board the aircraft/equipment assigned.

3.8.3. Cold Weather Survival Training. Cold weather survival training shall be documented, on a one-time basis, for all aircrew assigned to operations where regional temperatures dictate such specialized training. Aircrew conducting regular operations inside the Arctic or Antarctic circles should complete hands-on training with special emphasis on above-the-tree-line survival techniques and equipment.

3.8.4. Water Survival Training. Water survival training shall be accomplished for aircrew members engaged in frequent over-water or remote-area flights. Due to the extensive use of military style water survival equipment, it is recommended that GSFC aircrew attend military water survival training, when feasible. Aircrew assigned to duties on board GSFC rotary wing aircraft should attend, or show documentation of completion of, a water survival training course that incorporates training devices capable of inverting upon submersion and the use of respirators, such as Helicopter Emergency Egress Device (HEEDs) bottles, when provided.

3.8.5. Prior Survival Training Exemption. Training received prior to NASA employment, such as military survival training courses, may be credited for the above requirements.

3.8.6. Survival Training Grace Period. Newly assigned personnel, or personnel who do not meet these requirements by the date this requirement is published, with no previous survival or water survival training, shall complete this requirement within 18 months of being assigned to aircrew duties.

3.8.7. PIC Assignment Survival Training Restriction. Pilots shall not be assigned as PICs onboard GSFC aircraft until all survival training requirements have been met.

### 3.9. **Aircrew Physiological Training**

3.9.1. Aircrew Physiological Training. The GSFC Physiological Training Program exists to ensure that each aircrew member is adequately trained to recognize and understand the effects of high altitude flight and perform assigned duties safely and proficiently. Mission specific training requirements may be mandated through mission risk review processes.

3.9.2. Physiological Training. Prior to initial designation, Primary aircrew members shall receive instruction in the physiological aspects of high-altitude flight, including altitude chamber indoctrination or recognized equivalent training; e.g., Reduced Oxygen Breathing Device training.

3.9.3. Prior Physiological Training Exemption. Altitude chamber training received prior to initial designation fulfills this requirement.

3.9.4. Refresher Physiological Training. Refresher physiological training academics shall be accomplished every 5 years.

3.9.5. Altitude Chamber Training Exemption. Refresher altitude chamber training is optional for primary aircrew members not conducting pressure suit operations. Aircrew conducting

pressure suit operations shall accomplish altitude chamber training, or the equivalent, every 5 years.

3.9.6. UAS Aircrew Exemption. GSFC Pilots who only operate UAS are exempt from all physiological training requirements.

### 3.10. **Aircrew First Aid & CPR/AED Training**

3.10.1. Aircrew First Aid and Cardiopulmonary Resuscitation (CPR)/Automated External Defibrillator (AED) Training. The following first aid and CPR/AED training requirements are established to prevent the unnecessary loss of life or the exacerbation of non-life threatening injuries.

3.10.2. First Aid Training. All GSFC aircrew shall complete, or have previously completed, First Aid training. Such training should include survival/combat first aid as well as self-aid/buddy-aid using survival equipment and improvised first aid items available to aircrew.

3.10.3. CPR/AED Training. All GSFC aircrew shall complete, or have previously completed, CPR/AED training.

3.10.4. Prior First Aid & CPR/AED Training Exemption. Training received prior to NASA employment, such as military training courses, may be credited for the above requirements.

3.10.5. Refresher First Aid & CPR/AED Training. Refresher First Aid & CPR/AED training shall be accomplished every 2 years.

### 3.11. **Aircrew Emergency Egress Training**

3.11.1. Aircrew Emergency Egress Training. Documented, aircraft specific, emergency egress training is required for all GSFC aircrew annually. This training may be accomplished in conjunction with annual proficiency checks.

### 3.12. **Aircrew Fire Extinguisher Training**

3.12.1. Aircrew Fire Extinguisher Training. All aircrew must receive and document training on the use of handheld fire extinguishers every 5 years.

### 3.13. **Aircrew Coordinated Emergency Training (ACET) Program**

3.13.1. Aircrew Coordinated Emergency Training (ACET). All aircrew assigned to aircraft which have Secondary Aircrew assigned, shall participate in and document ACET training, annually. At a minimum, the training shall consist of drills exercising Crew Resource Management (CRM) and coordination to simulate:

- a. Fire of Unknown Origin (FOUO)/fuselage fire, (with Uninterruptable Power Supplies (UPS) and the use of smoke masks)



- b. Preparing the cabin for a ditch or forced landing
- c. Cabin decompression at altitude
- d. Cabin emergency ground evacuation

### 3.14. **Pre-Deployment Training**

3.14.1. Configuration Training. Pre-Deployment Configuration Training shall be conducted prior to the first flight of all new aircraft configurations, the Airworthiness Engineer, Project Manager, and/or assigned Project Pilot will walk the aircrew through the specific aircraft configuration. Aircrew meeting a deployed aircraft in the field may conduct this training with the assigned PIC. The walkthrough shall include:

- a. A brief of the AFSRB approved, mission hazards
- b. An aircraft tour including the location of all UPS systems
- c. A physical demonstration of the disconnection mechanism of all UPS systems
- d. A review of the location and description of all Material Safety Data Sheet (MSDS) chemicals and associated hazards
- e. A demonstration of any changes to standard emergency exit operation, location of safety equipment, unique or obstructed exit paths, as well as head and tripping hazards

### 3.15. **Crew Resource Management (CRM) Training**

3.15.1. Crew Resource Management (CRM) Training. All GSFC aircrew shall receive Crew Resource Management training annually.

## 4. **Guest Aircrew**

### 4.1. **Guest Aircrew Requirements, Training, and Records**

4.1.1. Guest Aircrew. Guest Aircrew are Primary and Secondary Aircrew who support the GSFC mission on a part-time basis and are specifically designated as such.

4.1.2. Other NASA Center, U.S. Military or Other Agency Aircrew. Other NASA Center aircrew, civil servant or contractor, U. S. military aircrew, other agency aircrew covered by MOU, MOA, or other agreements; are considered GSFC Guest Aircrew for the purposes of approval and may be required to complete training directly related to their assigned research projects.

4.1.3. Guest Aircrew Tracking. Due to the aperiodic frequency of Guest Aircrew usage, Guest Aircrew are neither routinely tracked nor required to continuously meet any minimum currency requirement detailed in this document. However, they must meet all GSFC Aircrew requirements, training, and be fully current, qualified and designated for the assigned crew position occupied during the time they are fulfilling official aircrew duties for GSFC (to include an annual proficiency check, required egress, physiological, and survival training). Normally,

this is accomplished through use of ground and simulator training prior to assuming aircrew duties, or by maintaining currency and/or proficiency with other organizations.

4.1.4. Guest Pilots. Guest pilots are required to have completed an annual proficiency checkout in the aircraft to which they hold positional designation. Guest pilots shall only fly dual controlled aircraft with a fully qualified and current GSFC pilot occupying the other pilot seat. Guest pilots are considered primary aircrew while performing aircrew duties.

4.1.5. Guest Aircrew Training Records. Training records for Guest Aircrew are maintained separately from GSFC aircrew and updated by the TM on an as needed basis. Paper copies are retained by the assigned Aircraft Office Records Custodian.

## **5. UAS Aircrew**

### **5.1. UAS Aircrew Requirements, Training and Records**

5.1.1. UAS Aircrew Flight Operations Manual. UAS operations and aircrew qualifications and training are not fully covered in this document. Refer to 830-FOM-0002, for UAS Operations Specifications.

5.1.2. GSFC Pilots. Fully qualified GSFC pilots may be assigned as UAS pilots, but for UAS pilots to fly manned NASA aircraft, they shall meet NASA pilot qualifications.

## **6. Non-Aircrew & Qualified Non-Crewmembers (QNC)**

### **6.1. Non-Aircrew & Qualified Non-Crewmember Requirements and Records**

6.1.1. Qualified Non-Crewmembers (QNC). A Qualified Non-Crewmember (sometimes referred to as Non-Essential Aircrew) is a non-aircrew member that is needed to accomplish specific GSFC missions such as: Flight Test Engineers (FTE), experiment operators, research scientists, engineers, Project Managers (PM), Mission Managers (MM), photographers, or media representatives observing the mission. These specialized aircrew members shall not occupy a required crew position in accordance with the aircraft flight manual and shall not have emergency procedure responsibilities aboard GSFC aircraft (excluding personal safety procedures). QNC are not passengers.

6.1.2. Observers (OBS). Observers are non-aircrew persons conducting observation or familiarization flights onboard GSFC aircraft. These individuals shall not occupy a required crew position in accordance with the aircraft flight manual and shall not have emergency procedure responsibilities aboard GSFC aircraft (excluding personal safety procedures). With approval from the Chief of Flight Operations, OBS may occupy seats with flight controls that are not required to be occupied by a pilot (i.e. single piloted aircraft with multiple pilot positions). OBS may not log flight time on board NASA GSFC aircraft for such activities.



6.1.3. Non-Aircrew Medical Screening. All non-aircrew (QNC & OBS) shall obtain a medical screening conducted by a NASA GSFC/WFF Health Unit physician, FAA Aviation Medical Examiner, or NASA Flight Surgeon, as appropriate for the mission. Screenings are conducted by completion of form 830-AOF-0101 NASA GSFC Flight Medical Clearance Form, annually.

6.1.3.1. Deployed Non-Aircrew Medical Screening. While deployed, and the standard process for medical screening cannot reasonably be conducted, PICs may screen non-aircrew medical forms which indicate all 'negative' responses. Any 'affirmative' response requires approval from a competent medical authority.

6.1.4. Non-Aircrew Age Limitations. Non-aircrew (QNC & OBS) observers are not age limited, provided they have current medical clearance documentation.

6.1.5. Non-Aircrew Safety Briefing. The PIC shall ensure that all non-aircrew have received a safety brief which, at a minimum, includes: the GSFC no smoking policy; use of seat belts; location and operation of emergency and survival equipment; operation of doors and exits (egress); and any other Federally required information. This brief, renewed annually, may include information supplemented by printed information cards or prerecorded audio or video briefings, provided the sound reproduction is of high quality and a crew member is present during the briefing to answer passenger questions. It is highly encouraged that non-aircrew members receive hands-on training via appropriate training devices. The non-aircrew member will acknowledge this briefing by completion of form 830-AOF-0121 NASA GSFC Aircraft Flight Safety Form.

6.1.6. Non-Aircrew Government Aircraft Disclosure. In accordance with the NPR 7900.3, all Non-Aircrew embarked upon NASA aircraft must sign a Federal Government Aircraft Disclosure Form, 830-AOF-0111, acknowledging compliance with 41 C.F.R. 102-33, Management of Government Aircraft, section 102-33.165. This form is normally completed annually.

6.1.7. Non-Aircrew, QNC training records. Non-aircrew (QNC & OBS) training records are maintained by the Aircraft Office Operations Department via the assigned Project Manager and paper copies are retained by the assigned Aircraft Office Records Custodian.

## **6.2. Non-Aircrew Occupying Ejection Seats**

6.2.1. Ejection Seat Exception. Any individual occupying a crew position equipped with an ejection seat is, at a minimum, considered Secondary Aircrew.

# **7. Passengers**

## **7.1. Non-Aircrew Requirements and Records**

7.1.1. Passengers. Passengers are persons aboard a designated and duly approved mission management flight, for the sole purpose of officially approved transport. These flights are conducted in accordance with the NPR 7900.3 Chapter 4. The definition of passengers does not include crewmembers or qualified non-crewmembers who are directly associated with the conduct or purpose of the flight. Each passenger traveling aboard NASA mission management flights shall be a U.S. Government employee or contractor on official U.S. Government business and have either an approved NASA travel authorization, in accordance with NASA directives, or a travel authorization approved by another Federal agency or Congressional committee.

7.1.2. Aircrew as Passengers. Aircrew on mission management flights may be considered as passengers for cost-justification purposes when they have either an approved NASA travel authorization, in accordance with NASA directives, or a travel authorization approved by another Federal agency or Congressional committee for purposes or activities beyond their crew flight duties.

7.1.3. Passenger Transportation. Use of NASA aircraft for passenger transportation allows NASA personnel to meet mission-required travel needs, as defined in OMB Circular A 126 and NPR 7900.3. Passenger transportation flights (referred to as mission management flights) may be classified as "Mission Required" only when failure to use a NASA aircraft would have a clear, negative impact on a NASA operational mission, prevent timely response to an aircraft or spacecraft accident, or threaten the health and safety of NASA personnel, and only when such travel could not be conducted using commercial airlines, charter aircraft service, or ground transportation to fulfill that mission need.

7.1.4. Aircraft Which Carry Passengers. All aircraft used for passenger transportation purposes shall possess a "Normal" or "Transport" category FAA Certificate of Airworthiness.

7.1.5. Training Prohibited with Passengers. Conduct of flight crew training for simulated emergencies, or for abnormal situations with passengers on board, is prohibited.

7.1.6. Passenger Approval. All flights with passengers aboard NASA aircraft assigned to GSFC shall be conducted in accordance with NPR 7900.3 Chapter 4.

7.1.7. Passenger Medical Screening. No official medical screening is required for passengers.

7.1.8. Passenger Age Limitations. Passengers are not age limited.

7.1.9. Passenger Safety Briefing. The PIC shall ensure that all passengers have received a safety briefed prior to each flight which, at a minimum, includes: The GSFC no smoking policy, use of oxygen systems, use of seat belts, location and operation of emergency and survival equipment, operation of doors and exits (egress), and any other Federally required information. This brief may include information supplemented by printed information cards or prerecorded audio or video briefings, provided the sound reproduction is of high quality and a crewmember is present during the briefing to answer passenger questions.

7.1.10. Passenger Government Aircraft Disclosure. In accordance with NPR 7900.3, all passengers embarked upon NASA aircraft must acknowledge compliance with 41 CFR 300.3, 301.10, and 301.70, Federal Travel Regulation (FTR), Section 301-70.909.

7.1.11. Passenger Training Records. No training records are required for passengers.

## **8. Aircrew Standards**

### **8.1. Aircrew Conduct, Appearance, and Discipline**

8.1.1. Aircrew General. The GSFC/WFF Aircraft Office functions through the combined efforts of both civil servants and contracted personnel. We must always remember that it is a privilege to operate multi-million dollar, high performance aircraft and UAS on behalf of the American People. This great opportunity is voluntary and comes with many responsibilities. In keeping with the traditions established by those NASA flight crew which have preceded us, we must strive to exude the highest levels of professionalism and capability that the American Public has come to expect from their investment in NASA.

8.1.2. Personal Conduct and Discipline. GSFC aircrew and ground crew, civil servant and contractor, represent NASA and the United States of America and are expected to conduct themselves, on and off duty, in a professional manner that reflects well upon NASA. Inappropriate behavior, appearance, violations of customs, other laws, or violations of alcohol or drug restrictions can result in removal from flight status and disciplinary action up to and including removal.

8.1.3. Aircrew Appearance. NASA has the unique capability to acquire the highest qualified, most experienced, and professional personnel. Your behavior and appearance must consistently uphold and project those qualities. NASA aircrew are routinely in the public eye. GSFC aircrew will present themselves for flight well groomed and in the proper flight attire. Flight apparel will be kept neat and clean. The Pilot In Command (PIC) is responsible for and will ensure that their crewmembers meet the appearance standards outlined in this section prior to any flight evolution. The PIC may counsel, or recommend disciplinary action for aircrew members, when necessary, with respect to the standards of appearance.

8.1.4. Dress Code When Not Flying but On Duty. NASA GSFC aircrew, when reporting for any aircrew related, non-flying event (such as ground school, simulator etc.) are expected to maintain a professional appearance. Business-casual (slacks and collared shirt) is preferred. At no time are shorts, tee shirts, sandals, or other garments which appear nonprofessional permitted for such events.

8.1.5. Dress While on Official Travel On Duty. When aircrew are on official travel orders and the time spent on travel is being reimbursed by NASA GSFC (or through an established contract), the dress during those hours reimbursed by NASA is Business-casual (slacks and collared shirt) or similar attire. At no time are shorts, tee shirts, sandals, or other garments which appear nonprofessional permitted for such events.

8.1.6. **Aircrew Discipline.** Aircrew members may be disciplined, or restricted from functioning in certain roles, for non-compliance to the standards contained in this section. The appropriate and complete uniform will be worn when in the public view.

8.1.7. **Compliance Standards.** The Chief of Flight Operations has final authority in determining compliance with these standards. Flight crewmembers must have the approval of the Chief of Flight Operations to operate an aircraft in any attire other than the approved uniform.

## 8.2. **Aircrew Flight Attire**

8.2.1. **Flight Suits/Flight Gear Wear.** Flight attire (Aramid) is specially constructed to be fire retardant; it is used as a risk mitigation strategy and is not intended for everyday wear. Only NASA GSFC designated aircrew members and flight support personnel, as determined by the Chief of Flight Operations, may wear NASA supplied flight attire items. NASA furnished flight suits will be configured with: the flag of the United States of America on the left shoulder, an authorized nametag embossed with 'NASA Aircrew Wings' or military pilot wings (for which the individual is qualified) above the left breast pocket, the NASA logo above the right breast pocket, and when authorized, a programmatic, project-specific, or positional patch on the right shoulder. No other patches, pins or insignia are authorized.

8.2.2. **Green or Tan Flight Suit Coordination.** Green and tan flight suits shall be provided to all flight crewmembers. Due to the world-wide deployable nature of NASA flight operations, flight suit color selection should be based upon anticipated operational climate conditions and coordinated with all mission crewmembers. The PIC shall ensure that all aircrew have appropriate flight gear.

8.2.3. **Flight Suits in Public.** Flight suits may not be worn unless authorized by a flight scheduled event or scheduled training evolution. Short convenience stops between work and home are authorized. Wearing flight suits during regular meals at respectable establishments is authorized. Career day, tours, and interviews in a NASA flight suit can be authorized on a case-by-case basis, by the Chief of Operations and/or the Public Affairs Office.

8.2.4. **NASA Logo (Meatball).** All employees (civil service and contract) are reminded that NASA Statute (51 U.S.C. § 20141) and Regulations (14 CFR Section 1221.1) pertain to the use of the NASA name and insignia. Reference 18 U.S.C. § 1017 for provisions concerning penalties for use of the NASA Seal in a manner other than as authorized by 14 CFR Section 1221.1. Reference 18 U.S.C. § 701 for provisions concerning penalties for use of the NASA Insignia, NASA Logotype, or NASA Program Identifier in a manner other than as authorized by 14 CFR Section 1221.1.

8.2.5. **NASA Logo on Apparel.** The NASA logo is authorized to be worn by NASA designated aircrew members in accordance with the Code of Federal Regulations, Title 14, Part 1221.110. Care must be taken to ensure compliance with the regulations concerning the display of the NASA logo.

- 8.2.6. GSFC Flight Attire Appearance. GSFC aircrew shall comply with the following:
- Flight suits must be worn over the shoulders and zipped at least half-way, at all times when in public view.
  - No distasteful patches, hats, pins or other exposed articles may be worn, when in public view.
  - Only authorized patches and/or accessories to flight apparel may be worn, on flight duty.
  - To the maximum extent practicable, a black, crewneck tee-shirt (long or short sleeve) should be worn under the NASA flight suit.
  - Brown leather, steel toed, aviator boots are to be worn with the flight suit.
  - Approved coats/overcoats may be worn over the flight suit.
  - Approved cold weather gear may be worn when operational climates dictate their use.
  - Worn, stained, or dirty flight suits or outer garments are not authorized, and should be turned in for re-issue.
  - Casual shoes, tennis shoes (sneakers), or cowboy boots are not authorized.

### 8.3. **Aircrew Grooming Standards**

8.3.1. Aircrew Grooming Standards General. GSFC aircrew grooming standards are established, not only to promote a standardized professional appearance, but also for safety and risk mitigation purposes. The following rules apply when acting as an assigned aircrew member onboard GSFC aircraft. Exceptions shall be cleared through the Chief of Flight Operations.

8.3.2. Male Hair Grooming Standards. Hair must present a clean, neat and businesslike appearance. Hair will be trimmed so as not to extend below the top of the shirt collar or below the middle of the ear. Extreme styles and colors are not acceptable. Ponytails or braids are not authorized.

8.3.3. Male Sideburns. Sideburns will not extend below the middle of the ear and will be of an even width. Sideburns will end with a clean shaven line.

8.3.4. Male Mustache. Mustaches will be trimmed to reveal the entire upper lip line. They may not extend more than a ¼ inch beyond the corner of the mouth.

8.3.5. Male Beards. Full beards are not permitted. Short trimmed goatees which portray a neat business-like appearance may be worn provided they are trimmed in such a manner so as to allow a complete and total seal of an oxygen mask. The mustache portion of the goatee will be trimmed to reveal the entire upper lip line. See 'Facial Hair' within the Aircrew Rest, Health and Nutrition section for detailed information.

8.3.6. Male Jewelry. Earrings, facial and tongue studs are not permitted during work duties.

8.3.7. Female Hair Grooming Standards. Hair will be worn in a business-like and fashionable manner. Hair will be styled or secured so as not to interfere with duties in and around the aircraft.

Extreme styles and colors are not acceptable. During flight operations, female hair shall be styled in such a manner so as to minimize hair extending from underneath helmets or overlaying upon the flight suit.

8.3.8. Female Cosmetics. If makeup is worn; it must be worn to create a business-like appearance. Lipstick and cosmetics with grease must not be worn.

8.3.9. Female Jewelry. Dangling earrings, loose necklaces, facial and tongue studs are not permitted during work duties.

## **9. Aircrew Duty, Rest, Health, and Nutrition**

### **9.1. Aircrew Rest, Health, and Nutrition General Factors.**

9.1.1. General Factors. Numerous complex factors affect the performance of flight and support personnel. The assigned Project Pilot, the Mission Operational Risk Assessment Panel, and mission planners must assess the impact of factors that contribute to operational fatigue and reduce aircrew performance. The principle factors include: weather, extremes of temperature, nighttime operations, requirement of high gain tasks, use of vision imaging systems, mission delays, personal equipment and ALSE, duration of the duty period, quality and duration of sleep (prior to duty), number of hours flown during the previous several duty periods, time of day relative to the body's internal circadian clock, degree of circadian desynchrony (jet lag), physical health, additional duties, and adequacy of crew rest facilities. These factors must be assessed and appropriate countermeasures established to assure they do not reduce personnel readiness.

9.1.2. Individual Flight Readiness. Aircrew should report any physical indisposition to the Pilot in Command (PIC) and assume flight duty only when fit to do so. Since an individual may frequently be the poorest judge of personal fitness, the PIC shall ensure that aircrew members are adequately observed and appropriate temporary grounding action is taken when necessary. The following guidelines and requirements should be considered for all aspects of research aviation.

### **9.2. Aircrew: Crew Duty Day**

9.2.1. Aircrew Performance Degradation. As continuously awake duty time exceeds 16 hours, performance efficiency begins to drop. After 18 hours, performance efficiency rapidly declines to 75 percent of effectiveness or less. The loss of effectiveness is manifested by lapses in attention, increased reaction time, slowed information processing, decreased vigilance, and increased error frequency. Accident rates for just about every type of human activity increase after 18 hours of wakefulness, particularly during the night "circadian trough" when sleep would normally occur.

9.2.2. Crew Duty Day. Crew duty time is the total time an aircrew member is on duty before the final termination, of the final flight, of a given 24 hour flight day. Crew duty time accrues consecutively and begins when an aircrew member reports to a designated place of duty to start preparation for a flight (preflight inspection, flight planning etc.) and ends when post-flight



duties (including inspections, NAMIS entries etc.) are complete. Using personnel as aircrew members who commenced other duties, such as maintenance, before reporting for a flight is included in that individual's Crew Duty Day.

9.2.2.1. Crew Duty Day Limitations. Crew Duty Day should not be scheduled to exceed 16 consecutive hours.

9.2.2.2. Crew Duty Day Factors. Flight operations involving contour, Nap-of-the-Earth (NOE)/low level, night and Night Vision Devices (NVDs), and adverse environmental factors (dust, cloud cover, precipitation, etc.) are inherently more stressful and demanding than flying during daylight VMC. The resultant fatigue may have a profound physiological effect upon mission capability. Mission risk review processes should take this physiological impact into account in making modifications to normal crew rest/crew day guidelines.

9.2.2.3. Crew Duty Day Nominal Pre- and Post-Flight Times. Typically, aircrew should be afforded 1 hour of Crew Duty Day for preflight duties (2 hours for preflight of aircraft with gross weight capacities exceeding 100,000 lbs). Nominal post-flight Crew Duty Day allowances should include 1 hour for post-flight inspection, servicing, and NAMIS inputs.

9.2.2.4. Crew Duty Day Exceptions. The Mission/Flight Readiness Review process and/or the Mission Operations Risk Assessment process may yield further restrictions upon Crew Duty Day or require aircrew augmentation for fatigue management during any given mission or mission segment.

9.2.2.5. PIC Crew Duty Day Authority. The PIC, may elect to shorten a Crew Duty Day based upon actual aircrew fatigue and observed conditions. The PIC, when it is deemed necessary and prudent, may elect to exercise PIC authority to extend the Crew Duty Day, up to but not to exceed a scheduled 18 hour Crew Duty Day. Aircrew should not be scheduled for continuous alert and/or flight duty (required awake) in excess of 18 hours. If it becomes necessary to exceed a scheduled 18 hour Crew Duty Day, 15 hours of continuous off-duty time shall be provided prior to scheduling any subsequent flight duties.

### 9.3. **Aircrew Pregnancy**

9.3.1. Aircrew Pregnancy. Because of the medical hazards of flight, pregnant flight personnel shall consult with a NASA FS or FAA AME when they first suspect they are pregnant. Flight personnel are grounded during pregnancy unless a clearance to continue inflight status is granted by the Chief of Flight Operations. Consideration for such clearance should be based on desire of the pregnant aircrew member to continue flying; the formal recommendation and concurrence of her obstetrician, and the recommendation and concurrence of a NASA FS or FAA AME. The member shall submit her request to the Chief of Flight Operations with these endorsements. Her request should acknowledge an understanding of the potential risks of continued flying during pregnancy.

### 9.4. **Aircrew: Crew Duty Rest**

9.4.1. Crew Rest. Crew Rest is the non-duty time before a flight duty period begins. Crew Rest is required prior to reporting for a subsequent Crew Duty Day (aircrew preflight preparations). During consecutive Crew Duty Day flight operations, Crew Rest does not begin until after termination of the previous Crew Duty Day. Crew Rest periods include time for transportation to/from berthing, meals, and sleep. Under no circumstances, may a Crew Rest period be scheduled that does not afford aircrew the opportunity for 10 hours of uninterrupted sleep every 24-hour period.

9.4.1.1. Crew Rest Requirements. Crew Rest should be regularly scheduled as 12 hour periods.

9.4.1.2. Crew Rest Exceptions. The Mission/Flight Readiness Review process and/or the Mission Operations Risk Assessment process may yield additional Crew Rest requirements or require aircrew augmentation for fatigue management during any given mission or mission segment.

9.4.1.3. PIC Crew Rest Authority. The PIC may elect to lengthen a Crew Rest cycle based upon actual aircrew fatigue and observed conditions. The PIC, when it is deemed necessary and prudent, may elect to exercise PIC authority to shorten a Crew Rest cycle. However, under no circumstances, may a Crew Rest period be scheduled that does not afford aircrew the opportunity for 10 hours of uninterrupted sleep every 24-hour period.

9.4.1.4. Crew Rest and Deadhead Operations. GSFC aircraft may be used to facilitate the movement of aircrew members (not assigned as aircrew to that particular flight or mission), on official federal travel orders, to mission locations or areas in which they have official duties only when the flight has space available, the flight was approved through normal processes, and the transport of the aircrew member was approved by the Chief of Flight Operations. No additional stops or changes in aircraft destination may be made. Primary and secondary aircrew time spent in deadhead transportation, to or from a duty assignment, shall not be considered to be a part of a Crew Rest period.

## 9.5. **Aircrew: Duty Cycle**

9.5.1. Duty Cycle Limit. GSFC aircrew may work a total of 10 consecutive days, after which, a Hard Down Day is required. If a Hard Down Day is declared and executed prior to the 10th consecutive Duty Day, the Duty Cycle is considered reset with respect to the Duty Cycle Limit.

9.5.2. Hard Down Days. A Hard Down Day is a prescheduled day, in which no official duties are required or permitted. If executed prior to the completion of the Duty Cycle Limit, a Hard Down Day must be declared prior to the commencement of what would normally be a Crew Rest cycle. Flights which cancel the day of flight; for weather, maintenance, or any other exigency, even if prior to the commencement of the Crew Duty Day, shall not be considered Hard Down Days.

## 9.6. **Aircrew: Circadian Rhythm Adjustment**



9.6.1. **Circadian Rhythm.** Circadian rhythms are cyclic fluctuations of numerous body functions that are set like a “clock” by daylight exposure and sleep/awake periods. Changing local sleep/awake periods or rapidly crossing more than three time zones disrupts circadian rhythms and can cause a marked decrease in performance. This condition, commonly known as “jet lag,” is compounded by illness, fatigue, dehydration, alcohol use, poor nutrition, or drugs, and is resolved only by accommodation to the new local time or sleep/awake period. The accommodation period can be estimated by allowing 1 day for every time zone crossed in excess of 3. Accommodation begins when a new daily routine is established. During that period, aircrew are not grounded but can be expected to perform at a less than optimal level. Less intense flight profiles and close observation by the PIC during the accommodation period may be desirable. Night operations, where individuals are required to work during the night for extended periods, require even longer times for adaptation (up to 4 weeks). Individuals may never fully adapt to night operations unless completely isolated from daylight exposure, and additional controls may be necessary for safe operations. Specific fatigue countermeasures to adapt to and minimize disruption of circadian desynchrony may be mandated by the Mission/Flight Readiness Review process and/or the Mission Operations Risk Assessment process.

9.6.2. **Mandated Circadian Rhythm Adjustment Allowance.** Crew Duty Days that cross greater than 3 time zones shall schedule 24 hours free from flight duties before recommencing flight operations. Flights for the purpose of aircraft repositioning, delivering cargo, or logistical supply sorties which take place over consecutive days are permitted to complete the repositioning activity to its final destination, using the originating location’s “circadian cycle,” within Crew Duty Day and Crew Rest limitations, before initiating the mandated circadian rhythm adjustment period.

## 9.7. **Pilot: Flight Time Limitations**

9.7.1. **Pilot Flight Time Limitations.** Precise delineation of flight time limitations is impractical in view of the varied conditions encountered in research flight operations. However, it is prudent to establish generalized standards.

9.7.1.1. **Individual Daily Flight Time.** Individual pilot flight time on all aircraft should not normally exceed 14 hours in a nominal 24 hour day. This generalization assumes multiple sorties and an average requirement of 2-4 hours ground time for preflight, post-flight duties, briefing and debriefing. Flight time limitations are delineated in Table 1.

9.7.1.2. **Exceeding Flight Time Limitations.** When the tempo of operations requires individual flight time to exceed the limitations set forth in this document, flight personnel shall be closely monitored and specifically cleared by the Chief of Flight Operations; additional medical review or examinations may be required.

9.7.1.3. **Flight Time Distribution.** To the maximum extent possible, the Chief of Flight Operations should assure equitable distribution of flight time commitments among assigned flight personnel, commensurate with additional ground duties that each may be assigned.

PERIOD (DAYS)	SINGLE PILOTED AIRCRAFT	MULTI-PILOTED (PRESSURIZED) EJECTION SEAT AIRCRAFT	MULTI-PILOTED NON-PRESSURIZED AIRCRAFT	MULTI-PILOTED PRESSURIZED AIRCRAFT
90	165	200	265	360
365	595	720	960	1000

**Table. 1. Maximum Aircrew Flight Hours**

## 9.8. Aircrew: Health, Nutrition and Fitness

9.8.1. Nutrition. All aircrew should attempt to maintain good dietary habits. Failure to eat within 12 hours preceding a flight (or during when appropriate) may impair performance and ability to adequately control aircraft. Reducing diets should be under supervision of a doctor.

9.8.2. Exercise. Planned physical fitness programs promote health. All levels of aircrew are encouraged to establish personal physical fitness programs in accordance with limitations established by their personal doctor. Due consideration must be given to avoiding contact sports, skiing, etc. Adequate rest periods must be provided for aviators before flying following participation in competitive or particularly tiring sports activity. Twelve hours should normally be adequate.

9.8.3. Caffeine. Excessive intake of caffeine from coffee, tea, cola, etc., can cause excitability, sleeplessness, loss of concentration, decreased awareness, and dehydration. Caffeine intake of 450 mg per day (3 to 4 cups of coffee) is the recommended maximum intake. Caffeine use, when managed appropriately, can aid in maximizing performance during long sorties or periods of sustained operations; however, the caffeine effect is maximized in individuals who are not habituated to its effects as regular users.

9.8.4. Nutritional/Dietary Supplements and Products. The use of nutritional/dietary and other OTC supplements/products by aircrew personnel except those approved by a NASA Flight Surgeon (FS) or FAA Aviation Medical Examiner (AME) is prohibited.

9.8.5. Dehydration. Of all causes of fatigue, one of the most treatable is dehydration. Early stages of dehydration can lead to emotional alterations and impaired judgment. Ingestion of plain water throughout the day will reduce the probability of dehydration and resultant fatigue.

9.8.6. Illness. Acute minor illnesses, such as upper respiratory infections, vomiting, or diarrhea, can produce serious impairment of flight personnel. All illnesses shall be evaluated by competent medical authority. Recommendations for grounding shall be communicated to the Chief of Flight Operations immediately. Clearance to resume flight duties shall be issued only by a NASA FS or FAA AME. Where a NASA FS or FAA AME is not available, clearance may be gained through verbal or electronic communications with the GSFC WFF Health Unit. Flight personnel who are hospitalized shall be evaluated in accordance with FAA directives. Ground support personnel, although held to differing standards, should be similarly monitored for illness. Aircrew shall not fly for at least 48 hours after general, spinal, or epidural anesthetic. Return to

flying status thereafter shall be upon the recommendation of a NASA FS or FAA AME and at the discretion of the Chief of Flight Operations.

9.8.7. Dental Conditions & Procedures. Dental procedures that involve the use of local injectable drugs (e.g., Novocain) shall be cause for grounding for a period of 12 hours. Use of intravenous sedatives shall require grounding for 24 hours. Dental conditions, except for asymptomatic third molars, are generally considered grounding except on the advice of a NASA FS or FAA AME.

9.8.8. Emotional Upset/Excessive Stress. Stress is a component of normal living, but excessive stress levels can manifest as mood and behavior changes and lead to deteriorating performance and chronic health effects. PICs must remain alert to the emotional and physical status of assigned personnel and take corrective action as necessary for the individual's wellbeing (i.e., referral for professional evaluation, short stand-down from flight duties, rest, leave, etc.).

9.8.9. Immunizations and Injections. Aircrew shall not participate in flight duties for 12 hours after receiving an immunization or injection unless cleared sooner by a NASA FS or FAA AME. Those showing protracted or delayed reaction shall be grounded until cleared by a NASA FS or FAA AME.

9.8.10. Blood Donation. Although blood donated in small quantities is quickly replaced and does not adversely affect ground activities, the hazards of hypoxia and reduced barometric pressure make it desirable to limit such donations by flight personnel in accordance with the following:

- a. Minimum Interval. Flight personnel may donate blood occasionally. The minimum interval for all donors shall be 4 months.
- b. Exception. Flight personnel flying operational missions above Mission Risk Category I (Minimum) or flight tests above Category A (Low) shall not donate blood within 4 weeks prior to such flying.
- c. Limitations. Flight personnel shall not participate in flight duties or perform low-pressure chamber runs for 4 days following donation of 450 cc of blood (1 pint).
- d. Recovery Time. If subject to flying duties within 4 days of a blood donation, aircrew must obtain Chief of Flight Operations approval prior to donating.

9.8.11. Hypobaric Exposure. The following restrictions to flight apply following low-pressure chamber flights or accidental hypobaric exposure (e.g., rapid decompression in flight).

- a. Limitations. Flight personnel shall not perform flight duties for 12 hours after exposure to low-pressure chamber flight in excess of 30,000 feet. They may fly during the 12 hours as passengers in aircraft where cabin altitude does not exceed 10,000 feet.
- b. Decompression Reactions. Individuals who have experienced a reaction to decompression (vasomotor collapse, unconsciousness, Decompression Sickness (DCS), etc. in flight shall be immediately referred to a medical professional.

9.8.11.1. Hyperbaric Exposure Limitations. Under normal circumstances, flight personnel shall not fly or participate in low-pressure chamber flights within 24 hours following scuba diving, compressed air dives, or high-pressure chamber evolutions. With the approval of the Chief of Flight Operations, where an urgent operational requirement dictates, flight personnel may fly within 12 hours of scuba diving, provided no symptoms of pulmonary overinflation syndrome or DCS develop following surfacing and the subject is examined and cleared by a NASA FS or FAA AME.

9.8.11.2. Hyperbaric Exposure Exception. The hyperbaric exposure flight restriction is not applicable to routine ground pressurization checks conducted in pressurized aircraft, when completed without physiological incident.

## 9.9. **Drugs and Alcohol Limitations**

9.9.1. Federal Law. It is a violation of federal law under FAR part 91.17 to act or attempt to act as an aircrew member while under the influence of alcohol or drugs.

9.9.2. GSFC Alcohol and Drug Use Limitations. No person may attempt to act as an aircrew member of, or commence any Crew Duty Day assignment to, a GSFC aircraft:

- a. Within 10 hours after the consumption of any alcoholic beverage;
- b. While under the influence or residual effects of alcohol;
- c. While using any drug (illicit, prescription, or over-the-counter) that affects his/her facilities in any way contrary to safety, when not approved in writing by a NASA FS or an FAA AME;
- d. While having residual .02 percent by weight, or more, alcohol in the blood.

9.9.3. Aircrew Notification Requirement. GSFC aircrew shall report the use of any prescription or over-the-counter medications to the Chief of Flight Operations and provide written approval by a qualified NASA FS or FAA AME. The use of any drug by flight personnel is prohibited unless specifically approved by a NASA FS or FAA AME.

9.9.4. PIC Responsibility. The PIC shall refuse to carry any person, or accept any aircrew for duty, which appear to be intoxicated or under the influence of alcohol or drugs.

9.9.5. Implied Consent. Any aircrew member who knowingly permits another aircrew member to perform duties while under the influence of alcohol or drugs shall be in violation of this policy and may face disciplinary action.

## 9.10. **Alcohol**

9.10.1. Alcohol Effects. The well-recognized effects of excessive alcohol consumption are detrimental to safe operations (i.e., intoxication and hangover). Consumption of any type of alcohol is prohibited within 10 hours of any mission brief or flight planning. Adherence to the letter of this rule does not guarantee an aircrew member will be free from the effects of alcohol

after a period of 10 hours. Alcohol can adversely affect the vestibular system for as long as 48 hours even when blood alcohol content is zero.

9.10.1.1. Alcohol Special Caution. Special caution should be exercised when flying at night, over water, or in IMC. In addition to abstaining from alcohol for 10 hours prior to mission brief or flight planning, aircrew shall ensure that they are free of all alcohol effect (including hangover) prior to flight. The effect of alcohol on aircrew performance can be found at: <http://www.faa.gov/pilots/safety/pilotsafetybrochures/media/alcohol.pdf>

9.10.2. Consuming Alcohol On Duty. Aircrew are absolutely prohibited from consuming alcohol from any source (including food and medicines) after reporting for duty. This policy includes periods when aircrew may be assigned to be 'on call' for duty.

9.10.3. Consumption of Alcohol in Public. Aircrew members while wearing NASA flight suits, or other specifically identifiable NASA flight operations garment, on or off duty, shall not consume any alcoholic beverage in public.

9.10.4. Consuming Alcohol During Travel or Deadhead. The consumption of alcoholic beverages during any portion of time which is reimbursed by NASA GSFC (or through an appropriate contract) or on any scheduled deadhead is prohibited.

9.10.5. FAA Certificate Action. Reporting for duty or remaining on duty while having a blood alcohol concentration of .04 is a violation of the FAA alcohol limitation, and will likely lead to emergency revocation of one's airman, medical, and any other FAA-issued certificates (including a mechanic certificate).

9.10.5.1. FAA Alternate / Other Testing Enforcement. In accordance with FAA policy, a violation of the .04 blood alcohol concentration prohibition can be shown by means other than a Department of Transportation test. For example, if a pilot reports for duty and is subsequently tested for alcohol at the direction of a law enforcement officer and the results exceed a blood alcohol concentration of .04, that result can demonstrate a rule violation and be the basis of FAA enforcement action.

## 9.11. **Drugs**

9.11.1. Drug Definition. Drugs are defined as any chemical that, when taken into the body, causes a physiological response.

9.11.1.1. Illicit / Illegal Drugs. The use of illicit drugs is prohibited.

9.11.1.2. Legal drugs. Legal drugs are those medically prescribed or legally purchased for treatment of illness. Guidance and flight restrictions are provided at: [http://www.faa.gov/about/office\\_org/headquarters\\_offices/avs/offices/aam/ame/guide/pharm/](http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/pharm/)

9.11.1.3. Prescription Drugs. Taking drugs prescribed by competent medical authority shall be considered sufficient cause for recommendation of grounding unless their use is specifically approved by a NASA FS or an FAA AME. Consideration may be given to the removal of ground support personnel from critical duties for the duration of the drug's effects, if appropriate. Medicines such as antihistamines, antibiotics, narcotic pain relievers, etc., obtained by prescription for short-term use to treat a self-limited condition, may not be reused after the prescribed period without additional medical clearance.

9.11.1.4. Over-the-Counter (OTC) Drugs. Because of the possibility of adverse side effects and unpredictable reactions, the use of OTC drugs by flight personnel, while performing aircrew duties, is prohibited unless specifically approved by a NASA FS or FAA AME.

## 9.12. Tobacco

9.12.1. Tobacco Products. The use of any tobacco products onboard GSFC aircraft is prohibited.

9.12.2. Smoking. Smoking has been shown to cause lung disease and impair night vision, dark adaptation, and increase susceptibility to hypoxia. Smoking is hazardous to nonsmokers, as the effects occur whether smoke is inhaled directly or secondarily. Persons desiring to smoke shall show due consideration for the desires of nonsmokers in the vicinity and abstain from smoking if asked. Smoking is prohibited on any flight line, within any hangar, within 500 feet of any aircraft or fuel truck, or within 50 feet of any building entrance.

9.12.3. Lighters. The use of lighters onboard GSFC aircraft is prohibited.

9.12.4. Electronic Cigarettes. The use of electronic, simulated smoking materials (cigarettes, pipes, cigars) onboard GSFC aircraft is prohibited.

## 9.13. Drug & Alcohol Testing

9.13.1. Eligibility for Drug & Alcohol Testing. Aircrew and ground crew are subject to drug and alcohol testing. In accordance with NPR 3792.1, Plan for a Drug-Free Workplace, or applicable contractor policy. NASA may perform drug testing under the following conditions:

- a. Pre-employment Testing.
- b. Random testing of employees in Testing Designated Positions (TDPs).
- c. Reasonable-suspicion testing.
- d. Accident investigation or unsafe practice testing.
- e. Voluntary testing.
- f. Testing as part of, and as a follow up to, counseling or rehabilitation.

9.13.1.1. Testing Frequency. NASA management reserves the right to increase or decrease the frequency and testing percentage of any category of drug testing, consistent with the goal to achieve a drug-free workplace under EO 12564.



9.13.1.2. Testing Timeline & Failure to Test. Drug/alcohol tests may be conducted anytime personnel are considered “on duty.” Upon notification, personnel are required to report immediately to the testing site. If the individual refuses to test, including any non-medically excused failure to provide the required quantities of urine and/or breath, the individual shall be subject to the full range of disciplinary actions. Personnel subject to drug/alcohol testing that cannot provide sufficient urine and/or breath within 2 hours of notification will be taken to the WFF Health Unit (or local medical facility, if deployed) for a medical evaluation.

9.13.2. Causes for Disciplinary Action. The Chief of Flight Operations will immediately remove any assigned aircrew or ground crew from flight status upon:

- a. Receipt of a verified, confirmed positive drug test result;
- b. The aircrew member fails to report to a designated collection site as directed;
- c. Without adequate medical explanation fails to provide a sufficient quantity of urine (at least 45 milliliters) or breath;
- d. Tamperers, adulterates, or substitutes urine or hair samples.

9.13.3. Positive Test Results. Any aircrew or ground crew personnel reporting for duty who are found to be under the influence of an illegal substance, or prescription medication which has not been previously cleared by a NASA FS or FAA AME, or are subsequently found to have a verified positive alcohol test indicating a blood alcohol level of .02 or greater, will be permanently removed from flight status and referred to the Office of Human Capital Management (or contract management) for disposition in accordance with NPR 3792.1 Plan for a Drug-Free Workplace.

## 9.14. **Motor Vehicle License Action**

9.14.1. Motor Vehicle Action Notification. Aircrew are required to notify the Chief of Flight Operations of any motor vehicle action related to the use of a motor vehicle while intoxicated by alcohol or drugs, while impaired by alcohol or drugs, or while under the influence of alcohol or drugs. Additionally any aircrew who is convicted of operating a motor vehicle under these conditions or who has his/her license to operate a motor vehicle canceled, suspended, or revoked based on these conditions, or is denied a motor vehicle license based on these conditions, must report that event to the Chief of Flight Operations.

9.14.1.1. FAA Reporting of Motor Vehicle Action. Each person holding a certificate under FAR Part 61 is required to provide a written report to the FAA of each motor vehicle action in which that person is involved. The term motor vehicle action is related to the use of a motor vehicle while intoxicated by alcohol or drugs, while impaired by alcohol or drugs, or while under the influence of alcohol or drugs. The report is required by the FAA within 60 days after the motor vehicle action. Send report to: Civil Aviation Security Division in Oklahoma City (AAC-700) at P.O. Box 25810, Oklahoma City, OK 73125

9.14.1.2. FAA Reporting Motor Vehicle License Revocation. Any person who is convicted of operating a motor vehicle under these conditions or who has his/her license to operate a motor

vehicle canceled, suspended, or revoked based on these conditions, or is denied a motor vehicle license based on these conditions must file a report of that event with the FAA within 60 days.

9.14.1.3. **FAA Reporting Requirement.** The 60 day reporting requirement is independent of the disclosure on the airman medical certificate form. Failure to file the required report is a basis for denial of an application for any certificate or rating for a period of up to one year, or suspension or revocation of any certificate or rating.

## 9.15. **Aircrew: Facial Hair**

9.15.1. **Beards.** Beards interfere with the proper use of oxygen masks both for routine use (e.g., helmet and mask) and emergency use (e.g., quick-don masks, walk around bottles). Full beards are prohibited for those who use oxygen masks routinely in the performance of flight duties and for those aircrew who would use oxygen and are required to perform tasks during emergency duties. Short beards may be approved, by the Chief of Flight Operations, for personnel diagnosed with Pseudofolliculitis Barbae (PFB) or other similar medical condition by competent medical authority. Any aircrew member with PFB who needs to wear an oxygen mask shall have his mask tested by a trained aviation life support equipment (ALSE) technician. If a proper fit and function is not possible, the member shall be found not physically qualified for flight duties.

9.15.2. **Goatees.** Short trimmed goatees may be worn provided they are trimmed in such a manner so as to allow a complete and total seal of an oxygen mask. The mustache portion of the goatee will be trimmed to reveal the entire upper lip line. Any aircrew member choosing to grow a goatee shall have his/her mask tested by a trained aviation life support equipment (ALSE) technician. If a proper fit and function is not possible, the member shall have to adjust/shave the goatee or be found not physically qualified for flight duties.

## 9.16. **Corrective Lenses for Vision**

9.16.1. **Corrective Lenses for Vision.** Corrective lenses or soft contact lenses shall be worn as prescribed.

# 10. **Pilots**

## 10.1. **Pilot Screening, Eligibility and Standards**

10.1.1. **Pilot Eligibility and Hiring.** The screening process to determine eligibility for designation as a NASA GSFC pilot shall include reviewing total flight experience, FAA licenses/military designations, specialized training, education, and flight log books in relation to the requirements set forth in this manual.

10.1.2. **Pilot Screening Methods.** Pilot eligibility screenings are accomplished through three different methods:



10.1.2.1. Civil Servant Pilot Screening. Civil servant pilots shall be screened by the GSFC/WFF Office of Human Capital Management (OHCM).

10.1.2.2. Contractor Pilot Screening. Contract pilots shall be screened by the TM and the GSFC/WFF Aircraft Office's Contracting Officer's Representative (COR).

10.1.2.3. Other Agency Pilot Screening. Pilots obtained through letters of agreement with other agencies shall be screened by the AOOM and/or Chief Pilot.

10.1.3. Training Manager Review. In all of the above cases, the TM is required to validate and concur with each pilot's qualification prior to initial training / designation.

10.1.4. Qualifying Flight Time. To qualify for assignment as a NASA pilot of manned aircraft, only manned aircraft flight time (or high fidelity simulator time) shall apply.

10.1.5. Pilot Qualification Standards. All pilots must meet one of the following standards:

10.1.5.1. Aircraft Pilots. OPM code GS-2181, Aircraft Operations Series.

10.1.5.2. Research Pilots. OPM code GS-0861, Aerospace Engineering Series.

10.1.6. Supervisory Pilots and Managers. Meet the applicable series and grade requirements of the OPM qualification standard for a GS-2181, Aircraft Operations Series, in addition to the requirements outlined in NPR 7900.3.

10.1.7. New Hire Pilot Currency. New hires need not meet any recency of experience requirements at the time of hire, provided the candidate is otherwise qualified for the position and meets or exceeds all other OPM requirements.

10.1.8. Pilot Eligibility Waiver. Any waivers from OPM qualification standards shall be approved only by the Assistant Administrator for the Office of Strategic Infrastructure.

## 10.2. Pilot Categories

10.2.1. Pilot Category General. Due to the varied requirements of NASA research operations, it is necessary to categorize pilots so as to segregate research and flight test responsibilities to those pilots best suited to conduct those respective operations.

10.2.2. Pilot Category Designation. The Chief of Flight Operations will determine and designate in writing, a pilot category per aircraft, based upon qualification, total flight experience, experience in actual or similar aircraft type, specialized training, and demonstrated performance.

10.2.3. Airborne Research and Test Operations Description. Airborne research requires the frequent and extensive modification of a myriad of aircraft. To minimize the possibility of

mechanical failure, research aircraft and installations undergo comprehensive analysis and rigorous ground testing to demonstrate airworthiness. In order to validate changes to critical performance or handling characteristics, flight testing of modified aircraft is a fundamental component of the airworthiness process. Aircraft which are modified to the extent that aircraft capabilities may be significantly altered are flight tested to determine that aircraft performance, maneuverability, stability, control, and other flight characteristics meet prescribed safety standards. Such flights represent elevated levels of risk. Therefore, additional qualification standards are levied upon the pilots performing specified test flights in order to provide additional risk mitigation.

10.2.4. Research Test Pilot Assignments. Research Test Pilot assignments may involve aircraft with substantially modified systems and are characterized by an increased degree of hazard. Such assignments require the application of a very high degree of skill in determining aircraft performance and flight characteristics under critical flight conditions of loading, speed, and maneuvers. Substantial modifications are those which are significant enough to influence the flight characteristics of the aircraft to a pronounced degree. These assignments are performed, for example, to certify aircraft as meeting prescribed safety standards after substantial modifications. They require a wide background of experience and training to evaluate aircraft operational procedures and mechanical deficiencies and recommend new procedures or corrective action. Such assignments involve compiling reports on the suitability, functioning, and general practicability of the aircraft and components or systems. Flight test work characteristic of this degree involves performance of a number of tests under critical conditions of loading, speed, maneuvering, weather, close proximity to the ground, and aircraft configuration, including engines and controls being intentionally made inoperative. Extensive knowledge and experience is exercised to evaluate the operational procedures and mechanical and design deficiencies of modified aircraft and to recommend corrective action.

10.2.4.1. Fixed Wing Research Test Pilot Qualifications. The education requirement for a Research Test Pilot is successful completion of a standard professional curriculum in an accredited college or university and a bachelor's degree, or higher, with major study in an appropriate field of engineering, physical science, life science, or mathematics. Candidates must have a current FAA commercial pilot license with instrument, multi-engine, and/or single engine land ratings or a military pilot designation and instrument rating from the armed services. A minimum of 2,000 hours of total flight time is required, of which 1,500 hours must be pilot in command flight time of turbine powered aircraft, including at least 500 hours in jet aircraft having at least 3,000 pounds of thrust per engine. Documented training in flight test techniques (FAA or military test pilot school or similar curriculum, or at least one year of test piloting experience) is required. Research Test pilots may be checked out to conduct research test missions on any aircraft in the GSFC inventory with a documented training program.

10.2.4.2. Rotary Wing Research Test Pilot Qualifications. The education requirement for a Research Test Pilot is successful completion of a standard professional curriculum in an accredited college or university and a bachelor's degree, or higher, with major study in an appropriate field of engineering, physical science, life science, or mathematics. Candidates must have a current FAA commercial rotorcraft-helicopter pilot license with instrument rating, rotary

wing rating or a military rotary wing pilot designation and instrument rating from the armed services. A minimum of 2,000 hours of rotary wing flight time is required, of which 1,500 hours must be rotary wing pilot in command flight time of turbine powered rotary wing aircraft.

10.2.5. Research Pilots Assignments. Research Pilot assignments involve the worldwide deployment of highly modified research and development aircraft under experimental constraints in conditions and environments that necessitate elevated requirements for pilot experience, skill and knowledge. Such assignments require precision aircraft handling, coupled with an extensive understanding of aircraft performance and international flight operations. The demands and risks associated with these operations are greater than those of normal aircraft operations. Although Research Pilots do write test plans or perform Research Test Pilot duties, limited qualitative flight evaluations within a prescribed operational envelope may be conducted for modified aircraft within the risk categories established in this document. Approved modifications for such flights are those which have been developed and flight tested prior to being incorporated into the aircraft, or which make insignificant changes to the external mold line. During these flights, the pilot performs standard operational tests and maneuvers to determine whether the aircraft systems are functioning correctly, and to verify that predetermined flight and performance characteristics have been met. The extent of testing that must be conducted depends on the nature of the modification work performed. These assignments require a thorough knowledge of the operational capabilities and limitations of the aircraft.

10.2.5.1. Fixed Wing Research Pilot Qualification. The education requirement for a Research Pilot is successful completion of a standard professional curriculum in an accredited college or university and a bachelor's degree or higher. Candidates must possess an FAA commercial pilot license with instrument, multi-engine and single engine land ratings or possess a military pilot designation and instrument rating from the armed services. Also required is a minimum of 2,000 hours of total flight time that includes at least 1,500 hours as pilot in command of turbine powered aircraft.

10.2.5.2. Rotary Wing Research Pilot Qualification. The education requirement for a Rotary Wing Research Pilot is successful completion of a standard professional curriculum in an accredited college or university and a bachelor's degree or higher. Candidates must possess an FAA commercial rotorcraft-helicopter pilot license with instrument, multi-engine and single engine land ratings or possess a military rotary wing pilot designation and instrument rating from the armed services. Also required is a minimum of 2,000 hours of rotary wing flight time that includes at least 1,500 hours as the rotary wing pilot in command of turbine powered rotary wing aircraft.

10.2.6. Guest Pilot Categorization Exceptions. At the discretion of the Chief of Flight Operations; Guest Pilots from Other NASA Centers, U.S. military services, or other Federal Agencies, may be relieved from the above flight time requirements. Upon considering total pilot experience, training and education, a written waiver shall be entered into the individual pilot's training record. The pilot shall:

- a. Meet OPM Standards. Exceed the minimum requirements established in the Pilot Qualification Standards section of this document

- b. Have a current NASA Proficiency Check. Possesses a documented annual proficiency check administered by a GSFC Instructor Pilot with an endorsement to the Chief of Flight Operations acknowledging the experience shortfall

### 10.3. **Pilot Multiple Aircraft Qualification**

10.3.1. Multiple Aircraft Qualification. The Chief of Flight Operations, with concurrence from the ASO and Chief Pilot (when assigned), will determine the number of aircraft in which GSFC pilots are qualified. This decision will be based upon overall pilot experience, specialized training, prior qualification, demonstrated performance, and operational requirements.

10.3.2. Non-GSFC Multiple Aircraft Qualification. Non-GSFC pilots participating in GSFC research projects and flying GSFC aircraft will typically only fly those aircraft directly assigned to that project. The Chief of Flight Operations may allow non-GSFC pilots to fly additional aircraft, if required to meet GSFC mission requirements.

### 10.4. **Pilot Readiness**

10.4.1. General Concept. To assure an acceptable minimum level of readiness and to enhance aviation safety, the following section outlines a comprehensive pilot currency plan. In order to fulfill a complex myriad of research operations. GSFC hires highly trained and experienced aviators of diverse backgrounds. The outlined plan is designed with such select aviators in mind and should not be considered adequate for pilots without the prerequisite training and experience.

10.4.2. Pilot Readiness Terminology. For consistency the following terms are used to describe pilot readiness.

10.4.2.1. Proficiency. Pilot proficiency is tested annually or when otherwise directed. It consists of a written examination and a dedicated flight or simulator event. Proficiency checks are conducted by a GSFC IP, a military designation IP, or administered by an outside agency or commercial company engaged in the training and/or operations of a specific aircraft.

10.4.2.2. Currency. Refers to a pilot's experience with respect to time (or recency of experience).

10.4.2.3. Readiness. A pilot's readiness refers to both currency and proficiency in a given aircraft.

### 10.5. **Pilot Initial Qualification and Proficiency**

10.5.1. Aircraft Qualification Standards (AQS) Records. Specific aircraft initial qualification standards and continued qualification (annual proficiency check) are established by each Aircraft Lead, screened by the TM for fleet consistency and standardization, and approved by the Chief of Flight Operations. Each aircraft shall have a AQS training folder which outlines the required topics for initial academic study. These topics shall be covered and signed-off by a designated

GSFC IP in the specific aircraft. The AQS record shall contain a written examination which covers mandated knowledge items for the specified aircraft. These examinations shall be graded by a designated GSFC IP in the specific aircraft. All exam scores shall be recorded in the individual pilots training record, with a minimum passing score of 80%, and corrected to 100%. AQS shall also contain Maneuvers Validation (MV) items for initial qualification and annual proficiency checks. AQS records shall be maintained by the TM. Each specific aircraft AQS record shall contain the following:

- a. AQS training plan overview, approved by the Chief of Flight Operations
- b. Initial qualification required academic topics
- c. Maneuvers Validation items for initial qualification and annual proficiency checks
- d. Aircraft qualification examination
- e. Initial and Annual Proficiency Check

10.5.2. Initial Proficiency Check. A pilot's initial proficiency shall be performed in accordance with the aircraft specific AQS training requirements. Deviations from the standardized AQS syllabus require approval by the TM and the Chief of Flight Operations. Initial training consists of a standardized academic training syllabus. Each section must be signed off as completed by a designated GSFC IP. Upon completion of the academic syllabus, a written proficiency examination shall be conducted. The AQS required MV items shall be completed via dedicated flight(s) or simulator event(s). Proficiency tests and checks are conducted by a GSFC IP, a military designation IP, or administered by an outside agency or commercial company engaged in the training and/or operations of a specific aircraft. Aircraft initial proficiency training records and designation recommendation are submitted by the IP who conducted the final check flight/simulator, recorded by the TM, and approved by the Chief of Flight Operations.

10.5.3. Annual Proficiency Check. Pilot proficiency is tested annually or when otherwise directed, in accordance with aircraft specific AQS training requirements. Such training consists of a written examination and a dedicated flight or simulator event which covers the MV items in the AQS record. Proficiency tests and checks are conducted by a GSFC IP, a military designation IP, or administered by an outside agency or commercial company engaged in the training and/or operations of a specific aircraft. Aircraft specific proficiency training records are submitted by the IP, recorded by the TM, and approved by the Chief of Flight Operations.

## 10.6. Pilot General Aircraft Currency

10.6.1. Pilot 60 Day (General Aircraft) Currency. Within the previous 60 days, all GSFC Pilots shall have flown at least 1 flight hour as PIC or SIC on any aircraft or authorized simulator.

10.6.1.1. Lapse in Pilot 60 Day Currency. Any GSFC Pilot who has not flown as a PIC or SIC for at least 1 hour, in any aircraft, in the previous 60 days shall not be assigned as a PIC or SIC in any GSFC aircraft. In such circumstances, the pilot must fly a dedicated training flight (back in the saddle flight) with a qualified PIC, in any aircraft to regain aviation situational awareness and recency of experience.

10.6.2. Pilot 60 Day Rotary Wing (General Aircraft) Currency – Within the previous 60 days, all GSFC Rotary Wing Pilots shall have flown at least 1 sortie as PIC or SIC on any helicopter or tiltrotor aircraft or authorized simulator.

10.6.2.1. Lapse in Pilot 60 Day Rotary Wing Currency – Any GSFC Pilot who has not flown at least 1 sortie as a PIC or SIC, in any helicopter or tiltrotor aircraft or authorized simulator, in the previous 60 days shall not be assigned as a PIC or SIC in any GSFC aircraft. In such circumstances, the pilot must fly a dedicated training flight (back in the saddle flight) with a qualified PIC, in any helicopter or tiltrotor aircraft or authorized simulator, to regain aviation situational awareness and recency of experience.

10.6.3. Pilot 90 Day (Takeoff, Approach and Landing Currency). Within the previous 90 days, all GSFC Pilots shall, at a minimum, perform 3 takeoffs, 3 approaches (actual or simulated conditions), and 3 landings, in any aircraft or authorized simulator.

10.6.4. Pilot 90 Day Rotary Wing Currency. Within the previous 90 days, all GSFC Rotary Wing Pilots shall, at a minimum, perform 3 helicopter or tiltrotor sorties, 3 helicopter or tiltrotor takeoffs, and 3 helicopter or tiltrotor landings, in any Rotary wing aircraft or authorized simulator.

10.6.4.1. Lapse in 90 Day Currency. Pilots overdue for 90 day currency (fixed or rotary wing) shall not be assigned duties as PIC on GSFC aircraft.

10.6.5. Pilot 180 Day (Aircraft-Specific) Currency. Within the previous 180 days, any GSFC Pilot who has not flown at least 1 sortie as a PIC or SIC, in model (or authorized simulator, in model), shall not be assigned duties as PIC in that model aircraft.

10.6.6. Pilot 180 Day, Night Landing Currency. Within the previous 180 days, any GSFC Pilot who has not performed at least 1 landing as a PIC or SIC in an aircraft or authorized simulator, at night, shall not be assigned duties as PIC in any mission which is scheduled to terminate during hours of darkness.

10.6.7. Currency Exception Flights. Extraordinary circumstances may require a pilot, or multiple pilots, to fly in order to regain currency without meeting one of the above requirements. These situations should be avoided to the maximum extent practicable by dedicated training flights or simulator events. If such a flight is required to be scheduled, it shall be scheduled only after being reviewed, risk mitigated, and documented by the TSRB. The TSRB shall review such considerations as: the circumstances requiring the event, the pilot's recent experience in other aircraft, pilot's highest level of qualification in the prescribed aircraft (IP etc.), pilot's history and performance, and the characteristics and complexity of the aircraft being flown. Such flights shall be a dedicated training flight and performed with minimum crew (no QNCs, passengers, or any other non-aircrew members). No additional duties may be assigned to the flight (FCF, Test profiles etc.). Currency Exception Flights shall be approved, in writing, by the Chief of Flight Operations.



## 10.7. Pilot Consolidated Experience

10.7.1. Multi-Piloted Aircraft Consolidated Experience Requirement. In multi-piloted aircraft, when a PIC has less than 100 hours PIC experience in the type aircraft assigned, the scheduled SIC should have a minimum of 100 hours experience in type. High fidelity simulators (Level C or D) may be used toward this requirement.

10.7.2. Lack of Multi-Piloted Aircraft Consolidated Experience. In multi-piloted aircraft, when a PIC has less than 100 hours PIC experience in the type aircraft assigned, and the SIC has less than 100 hours experience in type, the minimum descent altitude (MDA) or the Decision Altitude (DA) and visibility landing minimums shall be increased by 200 feet and 1/2 mile (or the RVR equivalent). In no case shall the landing minimums be less than a 400-foot ceiling and 1-mile visibility. Takeoff minimums shall be adjusted to the above listed approach and landing minimums.

## 10.8. Pilot Annual Training Requirements

10.8.1. Annual Instrument Training. Pilot Instrument Training is conducted and tested annually or when otherwise directed. Such training consists of a written examination and a flight or simulator event, which may be combined with another training or evaluation event. Instrument tests and checks are conducted by a GSFC IP, a military designation IP, or administered by an outside agency or commercial company engaged in training and/or operations. Instrument training records are submitted by the IP, recorded by the TM, and approved by the Chief of Flight Operations. Annual Instrument training may be conducted in any aircraft or simulator and is valid for all GSFC aircraft.

10.8.2. Annual International Training (when required). In recognition of the span and scope of GSFC's aircraft operation, a dedicated International Operations training course has been established to provide crewmembers with an increased level of knowledge regarding such operations. Pilot International Training is conducted and tested annually or when otherwise directed, by pilots who conduct international flight operations. Such training consists of academic training and a written examination. International training and tests are conducted by, computer based training, the TM, a GSFC IP, a military designation IP, or administered by an outside agency or commercial company engaged in training and/or operations. Instrument training records are submitted by the TM, and approved by the Chief of Flight Operations.

10.8.3. Annual RVSM Training (when required). Pilot RVSM Training is conducted and tested annually or when otherwise directed by pilots qualified in RVSM certified aircraft. Such training consists of academic training and a written examination. RVSM training and tests are conducted by; computer based training, the TM, a GSFC IP, a military designation IP, or administered by an outside agency or commercial company engaged in training and/or operations. RVSM training records are submitted by the TM, and approved by the Chief of Flight Operations.

10.8.4. Annual WFF Airfield Operations Test. Pilot WFF Airfield Operations examination is conducted annually or when otherwise directed. The evaluation consists of a written examination. RVSM tests are conducted by; computer based training, the TM, a GSFC IP, a military designation IP, or administered by an outside agency or commercial company engaged in training and/or operations. WFF Airfield training records are submitted by the TM, and approved by the Chief of Flight Operations.

## 10.9. Pilot Annual Flight Time Requirements

10.9.1. Annual Pilot Flight Minima Criteria. Annual pilot flight time is accumulated and reported by the Fiscal Year (FY), October through September. Pilot time includes time credited as PIC and SIC. At least 50% of all the annual minimum pilot requirements must be gained through flying. Only high fidelity simulators (Level C or D) may be used toward this requirement. Flight time logged in any other crew position shall not count towards satisfaction of the annual pilot time requirements set forth in this instruction.

10.9.2. UAS Flight Time. UAS flight time shall be kept separate from NASA manned aircraft flight time, by type, in NAMIS.

10.9.3. Pilot Flight Time Minima. All GSFC Research Pilots must, in any aircraft, meet or exceed:

- a. 100 flight hours, in all aircraft, per FY (October 1st - September 30th)
- b. 12 Instrument Approaches (6 precision & 6 non-precision under actual or simulated conditions)
- c. 3 Night Landings
- d. 40 flight hours, semi-annually, March 30th of each FY

10.9.4. Rotary Wing Pilots Sortie Minima. All GSFC Research Pilots qualified in helicopter or tiltrotor aircraft must meet or exceed the Annual Pilot Flight Time Minima above and additionally:

- a. 26 Sorties, in helicopter or tiltrotor aircraft, per FY (October 1st - September 30th)
- b. 8 Sorties, semi-annually, March 30th of each FY

10.9.5. Critical Pilot Tracking. A GSFC Pilot that does not fulfill the semi-annual flight time requirement may continue to be assigned flight duties however, shall be tracked weekly to ensure annual compliance.

10.9.6. Prorating Minimums for New Hires. Any newly assigned pilot is exempt from the 100 flight hour minimum their first FY flying for GSFC. In such cases, a prorated annual flight hour minimum shall be calculated from the date of their initial qualification in any GSFC aircraft until the end of the FY.

10.9.7. Monthly Flight Hour Tracking. Flight hour screenings shall be conducted during the first week of each month by the TM. Individual flight hours shall be graphically tracked for quick trend analysis.



10.9.8. Lapse in Annual Flight Hour Qualification. Pilots who fail to meet annual flight time requirements are disqualified for assignment as PIC or SIC in any GSFC aircraft. The Chief of Flight Operations shall document the lapse and notify the Assistant Administrator for the Office of Strategic Infrastructure, via Headquarters (HQ), Aircraft Division (AD).

10.9.9. Regaining Qualification after Annual Lapse. If a GSFC pilot does not meet one of the required annual minimums described above, the pilot is considered unqualified in all aircraft and all positions. The Chief of Flight Operations will initiate a Training and Standardization Review Board (TSRB). The TSRB will review the deficit areas and recommend a corrective course of action to best mitigate the requirement shortfalls for approval by the Chief of Flight Operations. Regaining flight qualification after an annual flight requirement lapse shall require, at a minimum, a dedicated training flight or training period. The Chief of Flight Operations shall document the method to regain qualification in the pilot's training record and notify the Assistant Administrator for the Office of Strategic Infrastructure, via HQ Aircraft Management Division, of this action in a letter forwarded through the Center Director.

10.9.10. Training and Standardization Review Board (TSRB). A TSRB can be formed at any time by the Chief of Flight Operations to modify or remediate an individual pilot's training requirements, alter a specific aircraft training syllabus, or review/alter aircraft standardized procedures or operations. A TSRB may consist of various members, as deemed appropriate by the Chief of Flight Operations however, the board shall encompass at a minimum:

- a. The Chief of Flight Operations, Chairperson
- b. The Chief Pilot (when assigned), Alternate Chairperson
- c. The Aviation Safety Officer
- d. The Training Manager
- e. The Aircraft Lead

## 10.10. **Aircrew Performance Review**

10.10.1. Performance Review Board (PRB). When it is deemed necessary, within 90 days of removing an aircrew member from flight status, The Chief of Flight Operations may initiate, select membership and, when appropriate, Chair a PRB for any aircrew member who has:

- a. Demonstrated questionable performance (including matters of judgment),
- b. Failed to meet or make any required qualification timeline,
- c. Failed to pass any examination, written, flight or simulator event,
- d. Shown lack of general or specific flight skills.
- e. Failed to comply with mandated procedures or requirements.
- f. Revealed traits of character, emotional tendencies, or lack of mental aptitude or motivation that make it questionable to continue the member in assigned flying duties.
- g. Any other reason which may bring doubt upon safe operations.

10.10.2. Removal from Flight Status for Performance. The Chief of Flight Operations may, after consultation with the Center's Legal and Human Resources offices, remove any aircrew member from flight status for 30 days or less. The Center Director, in accordance with human

resources procedures, shall review and approve any non-medical-related proposal for removal from flight status in excess of 30 days.

10.10.2.1. Contract Aircrew. Contract aircrew members will be treated in accordance with the terms of the contract under which they are employed.

10.10.2.2. Notification. The Chief of Flight Operations will formally notify the aircrew member, in writing, of the circumstances leading to the PRB action and prior to any action to remove the aircrew member from a flight status.

10.10.2.3. Position Description Impact Review. The Center Director and the Chief of Flight Operations, in close coordination with the Center's human resources office will determine how this action affects the member's ability to perform the duties, per the position description.

10.10.3. Precipitous and Indicative Events. Removal from flight status can result from either a single event or multiple events that indicate the aircrew member is no longer fit to serve in a flight status.

10.10.4. Center Director Convening Authority. When the Chief of Flight Operations is the direct supervisor of the individual that is the subject of the removal, the convening authority will be at the discretion of the Center Director. The convening authority will consult with the Center's Legal and Human Resources offices, and HQ AD prior to establishing the board. Advisors may be assigned to the board at the discretion of the convening authority. Advisors will perform such duties as the board may require and may be included in deliberations at the board chair's discretion. At a minimum, one from each of the following specialties should be assigned as advisors:

- a. Flight surgeon.
- b. Legal counsel.
- c. Aviator from the Center's flight operations.

10.10.5. Close Call Exception. No Performance Board should be formed for events that are properly classifiable as a Close Call.

10.10.6. PRB Findings. If a Flight Performance Board is convened, a flight status recommendation shall be delivered to the Center Director. In the event that the board recommends removal from flight status, the recommendation should include a discussion on extenuation and mitigation factors that address the member's rehabilitation value. Prior to permanent removal from flight status, an opportunity should be provided, if safely possible, to the member for correcting deficiencies noted by a Flight Performance Board.

10.10.7. Mishap and Violation Records. Mishap and violation data shall be retained in the individual pilot's training record. This is a quantitative record of all substantiated violations of flying regulations and of all aircraft mishaps for which the individual has been assigned responsibility in any degree. Only those aircraft mishaps in which aircrew error was a factor shall

be entered. Entries of mishaps or violations shall be authenticated by the Chief of Flight Operations.

## **11. Aircrew Positional Qualification**

### **11.1. Positional Designation and Assignment**

11.1.1. Aircrew Positional Designations. Aircrew designations are made, in writing, by the Chief of Flight Operations and will be documented for each individual aircrew (primary and secondary) by specific aircraft type and level of qualification. Designation letters shall be retained in the individual training record. The Chief of Flight Operations, will ensure each aircrew possesses an adequate level of training and experience to perform the duties of the designated position. Overall qualifications for the designations are made based on aircrew overall flight experience, experience in similar types of aircraft, experience in the actual aircraft type, experience in the specific crew position, specialized training, and demonstrated performance.

11.1.2. Positional Assignment. Positional assignment and authority is indicated on the daily flight schedule. Aircrew may be assigned to act in a lower qualification status (such as an Instructor Pilot serving as Copilot) but, under ordinary circumstances, may not exceed the highest level of qualification for which they are designated in that aircraft type.

11.1.2.1. Positional Cross Training. When it is deemed appropriate by the Chief of Flight Operations, assigned aircrew may be trained to perform duties associated with other aircrew positions, as required, to meet GSFC aircraft and mission requirements.

11.1.3. Other Center Positional Aircrew Designations. GSFC recognizes the qualifications and positional designations of other NASA Centers which have a standardized flight operations department and are formal members of the Intercenter Aircraft Operations Panel (IAOP) without the requirement to re-designate. GSFC reserves the authority to request additional training or evaluation of other Center's aircrew when it is deemed necessary by mission requirements or differences in qualification standards.

### **11.2. Positional Qualifications and Responsibilities**

11.2.1. Instructor Pilot (IP). The Chief of Flight Operations will designate pilots with appropriate qualifications and experience as Instructor Pilots for each aircraft type. Instructor Pilots must hold current qualification as PIC in any aircraft to which they are designated as an instructor.

11.2.1.1. Standard IP Duties. Instructor pilots will evaluate initial qualification and annual proficiency check flights for Pilots, Flight Engineers, and Flight Maintenance Technicians, in aircraft for which they are instructor qualified.

11.2.1.2. Non NASA IP. A civilian training facility approved by the FAA or appropriate military training facility may also be recognized to perform GSFC annual proficiency checks. An FAA pilot examiner may also perform such proficiency checks.

11.2.1.3. Additional IP Duties. In addition to normal aircraft and simulator instruction, an IP will be required for any flight conducted in dual controlled aircraft when a pilot, unqualified in that aircraft type, occupies the front seat (tandem seat cockpit aircraft), the left seat of a side-by-side seat aircraft certified for single pilot operation, or either seat in an aircraft requiring two pilot operation. Instructor pilots will fly chase on single seat aircraft when a pilot not checked out in that aircraft is flying the aircraft.

11.2.2. Functional Check Flight (FCF) Pilots. The Chief of Flight Operations will designate pilots with appropriate qualifications and experience as FCF pilots for each aircraft type. FCF Pilots must hold current qualification as PIC in any aircraft to which they are designated as an FCF Pilot. Functional Check Flights, also referred to as a Post Maintenance Test Flights, are performed after repair or replacement of certain damaged or worn components, or extensive maintenance has been performed, or when deemed necessary by the Airworthiness and Maintenance Manager. For the sake of this positional designation, 'Repair or replacement' is defined as: like components used to replace faulty items or a repair which involves restoration of the aircraft to its original configuration. Aircraft modifications are specifically precluded from this definition.

11.2.3. Pilot in Command (PIC). Also referred to as an Aircraft Commander (AC) or Helicopter Aircraft Commander (HAC). PIC refers to the pilot of an individual aircraft. The PIC is responsible for the safe, orderly flight of the aircraft and well-being of the crew. The PIC may also be the mission commander or formation leader when so designated. The designation of PIC signifies full qualification in that aircraft. The Chief of Flight Operations will determine, on a case-by-case basis, the individual process necessary to train and evaluate pilots for designation as PIC based upon overall flight experience, experience in similar types of aircraft, experience in the actual aircraft type, experience in the specific crew position or duty designation, other training, and demonstrated performance. This positional designation does not presume a given seat position and/or determination as to which pilot is physically at the controls flying.

11.2.4. PIC Window of Responsibility. The PIC is responsible from the moment of aircraft acceptance until the moment the aircraft is safely parked, after the last sortie of the duty day, and has disembarked to complete the post-flight NAMIS entries

11.2.5. PIC during Critical Phases. The PIC shall occupy a flight control station during critical phases of flight (i.e., takeoff, landing, formation flight, Functional Check Flight (FCF), degraded aircraft performance regimes, etc.).

11.2.6. PIC during Instructor Under Training (IUT) Events. During an instructor under training (IUT) flight in a multi-piloted aircraft, the PIC or a qualified/qualifying IUT instructor pilot shall occupy one of the flight control stations during critical phases of flight, provided the PIC remains in the flight station.

11.2.7. PIC as Formation Leader. A formation of two or more GSFC aircraft shall be under the direction of a formation leader who is authorized as PIC. The status of each member of the formation shall be clearly briefed and understood prior to takeoff. The formation leader is responsible for the safe and orderly conduct of the flight.

11.2.8. PIC Maintenance Release. When it is deemed necessary for mission completion, and during certain RON situations, the PIC may exercise maintenance self-release authority. This is a non-normal procedure.

11.2.9. PIC as QA Authority. When there is no other means of Quality Assurance inspection, and it is deemed necessary for mission completion, the PIC may exercise temporary Quality Assurance authority. The aircraft shall be flown under the 'PIC as QA' condition for the minimum number of sorties and flight hours practicable. Upon aircraft return to a location where properly certified quality assurance maintenance representatives can inspect the aircraft, the aircraft shall be placed into a down status until properly inspected.

11.2.9.1. PIC Designation Process. The following shall be completed before a designation letter can be made by the Chief of Flight Operations:

- a. The TM shall screen the pilot's training record to ensure compliance with all NASA and GSFC PIC requirements
- b. The PIC candidate must complete a proficiency check with a GSFC IP who must recommend/endorse the candidate, in writing, to the Chief of Flight Operations

11.3. The PIC candidate must complete a board/interview. The content and the staffing of the board/interview will be determined by the Chief of Flight Operations to adequately ascertain pilot experience, specific aircraft knowledge, aviation situational awareness, flight safety, and pilot maturity.

11.3.1.1. PIC Assignment. The PIC is specifically identified on the daily flight schedule and indicates acceptance of responsibility by signing the NAMIS aircraft release/acceptance block.

11.3.1.2. PIC Qualification. To qualify as a NASA GSFC PIC, a pilot shall:

- a. Hold a current FAA commercial pilot certificate, or higher, appropriate for the type of aircraft; or
- b. Hold a military designation as PIC, in type; or
- c. Have satisfactorily completed a course of training and evaluation administered by an outside agency or commercial company engaged in the training and/or operations of a specific aircraft; or
- d. Have satisfactorily completed a NASA specific course of training and evaluation administered by a designated NASA Instructor Pilot, in type
- e. Have a minimum of 2,500 hours of total flight time, in all types and categories (including high fidelity simulators)
- f. For international operations, have an FAA type rating, excluding single-engine aircraft under 12,500 lbs. maximum gross weight

- g. Have a minimum of 100 flight hours, in type (including high fidelity simulators)

#### 11.3.1.3. PIC Responsibilities. A NASA GSFC PIC shall:

- a. Accept ultimate responsibility, at all times (ground and flight operations), for the safe operation of the aircraft and the safety of its occupants during the PIC Window of Responsibility, and is the final authority as to whether a scheduled flight will occur or continue
- b. Deliver final authority as to whether a flight will be delayed or diverted for reasons of weather, aircraft conditions, or other safety-related considerations
- c. Be physically occupying one of the flight control seats, with flight controls immediately available, during all critical phases of flight
- d. Provide on-site supervision of all assigned aircrew, non-aircrew, passengers, and ground crew members during the PIC Window of Responsibility
- e. Ensure that all departure requirements have been met including weight and balance, aircraft performance calculations (TOLD Data), flight plans, weather briefings, airport reservations, route selection, NOTAMS, customs arrangements on international flights, and other items necessary for specific mission completion
- f. Ensure that aircrew, non-aircrew, passengers, and ground crew members are adequately briefed on the mission plan, intended operations, safety procedures, and emergency information, including emergency egress
- g. Demonstrate knowledge of the operating rules and procedures of the FAA FARs and the ICAO Rules of the Air, before operating in international airspace
- h. When entering a foreign country, be responsible for the custody and care of disembarking aircrew, non-aircrew, passengers, and ground crew members from the time they leave the aircraft until they are accepted for examination for entry into a State
- i. Ensure that appropriate post flight entries are made into tracking databases and flight reports including flight times, landing, approaches, and aircraft discrepancies
- j. Perform post-flight inspections and checks
- k. Document all in-flight anomalies, via the Pilot's Irregularity Report, when required

11.3.2. Second in Command (SIC). The designation of Second in Command signifies qualification as a copilot in multi-piloted aircraft. Some publications refer to the SIC as First Officer, or Second Pilot. The Chief of Flight Operations will determine, on a case-by-case basis, the individual process necessary to train and evaluate pilots for designation as SIC based upon overall flight experience, experience in similar types of aircraft, experience in the actual aircraft type, experience in the specific crew position or duty designation, other training, and demonstrated performance. This positional designation does not presume a given seat position and/or determination as to which pilot is physically at the controls flying.

11.3.2.1. SIC Designation Process. The following shall be completed before a designation letter can be made by the Chief of Flight Operations:

- a. The TM shall screen the pilot's training record to ensure compliance with all NASA and GSFC SIC requirements



- b. The SIC candidate must complete a proficiency check with a GSFC IP who must recommend/endorse the candidate, in writing, to the Chief of Flight Operations

11.3.2.2. SIC Assignment. A pilot responsible for SIC duties is specifically identified on the daily flight schedule. When multiple SICs are assigned to a flight evolution, the precedence order of responsibility is designated by the order in which the SICs are listed on the flight schedule. (i.e. a US Navy third pilot or 3P would be listed on the GSFC flight schedule as SIC in the third pilot position etc.)

11.3.2.3. SIC Qualification. To qualify as a NASA GSFC SIC, a pilot shall:

- a. Hold a current FAA commercial pilot certificate, or higher, appropriate for the type of aircraft; or
- b. Hold a military designation as SIC, in type; or
- c. Have satisfactorily completed a course of training and evaluation administered by an outside agency or commercial company engaged in the training and/or operations of a specific aircraft; or
- d. Have satisfactorily completed a NASA specific course of training and evaluation administered by a designated NASA Instructor Pilot, in type
- e. Have a minimum of 2,000 hours of total flight time, in all types and categories (including high fidelity simulators)

11.3.2.4. SIC Responsibilities. A NASA GSFC SIC shall:

- a. Carry out delegated duties in accordance with the aircraft flight manual at the discretion of the PIC
- b. Fulfill the duties of the PIC in the event of the incapacitation of the PIC
- c. Assists the PIC in all assigned flight duties including operation and control of the aircraft
- d. Become proficient in the duties and responsibilities required of a PIC
- e. All other duties assigned by the PIC.

11.3.3. Special SIC in Single-Piloted Aircraft. In single-piloted aircraft, affixed with dual flight controls, it is an appropriate risk mitigation strategy to schedule a NASA GSFC pilot to act as SIC, although not specifically qualified, in type. Although not specifically required by the aircraft flight manual, the addition of a pilot to aid in aviation situational awareness, operate radios, read and accomplish checklists, operate mission equipment, and provide pilot instrument and visual scan assistance; is considered an overall benefit to flight safety.

11.3.3.1. Special SIC Assignment. When operating in such capacity, the GSFC flight schedule will indicate the Special SIC pilot as SIC. The Special SIC pilot must meet all Primary Aircrew medical, physiological and training requirements - as if qualified, in type. However, for the purposes of fulfilling annual and periodic currency requirements, the Special SIC may only log SIC time during flight time in which the assigned PIC is a GSFC designated IP and the Special SIC is physically manipulating the controls. Since the Special SIC position is not a required crew position, a GSFC Special SIC need not meet currency requirements.



11.3.3.2. Special SIC Qualification. To act as a GSFC Special SIC, a pilot shall:

- a. Be a designated GSFC pilot in any aircraft
- b. Have satisfactory completed an aircraft systems review, cockpit orientation, and egress training administered by a type designated NASA PIC

11.3.3.3. Special SIC Responsibilities. A NASA GSFC Special SIC shall:

- a. Carry out delegated duties in accordance with the aircraft flight manual at the discretion of the PIC
- b. Assists the PIC in all assigned flight duties including operation and control of the aircraft, when deemed appropriate, and when the PIC is a designated GSFC IP, in type
- c. All other duties assigned by the PIC

11.3.4. NASA Flight Engineer (FE)/Flight Mechanic (FM). A Flight Engineer is designated by the Chief of Flight Operations to perform duties in aircraft requiring a flight engineer. A Flight Mechanic is a Flight Engineer who possesses an FAA A&P license and may hold maintenance responsibilities in addition to flight responsibilities.

11.3.4.1. FE/FM Assignment. The FE/FM is specifically identified on the daily flight schedule.

11.3.4.2. FE/FM Qualification. To qualify as a NASA GSFC FE/FM, a Flight Engineer shall:

- a. Hold a current FAA Flight Engineer Certificate with an appropriate rating for the assigned aircraft; or
- b. Hold a qualification from the U. S. Armed Forces, in type; or
- c. Have satisfactory completed a course of training and evaluation administered by an outside agency or commercial company engaged in the training and/or operations of a specific aircraft; or
- d. Have satisfactorily completed a NASA specific course of training and evaluation administered by a designated NASA Instructor Pilot or NASA Instructor FE, in type

11.3.4.3. FE/FM Responsibilities. A NASA GSFC FE & FMs shall:

- a. Perform pre- and post-flight inspections and checks in accordance with the aircraft flight manual or applicable NASA directive
- b. Carry out delegated flight duties in accordance with the aircraft flight manual, at the discretion of the PIC
- c. Assists the PIC in all assigned flight duties
- d. Carry out all other ground duties assigned by the PIC

11.3.5. Instructor Flight Engineer (IFE). The Chief of Flight Operations will designate those FEs with appropriate qualifications and experience as Instructor Flight Engineer (IFE). In addition to normal aircraft instruction, an IFE may evaluate initial NASA FE qualification and annual proficiency check rides in the aircraft or simulator. A GSFC IFE may also perform annual proficiency checks for Flight Maintenance Technicians, in aircraft for which they are qualified. A qualified FE is required in the engineer position during all critical flight regimes (takeoff and landing) unless an IFE is present and giving instruction.

11.3.6. Navigator (NAV). A navigator is designated by the Chief of Flight Operations to perform navigator duties in GSFC aircraft.

11.3.6.1. NAV Assignment. The NAV is specifically identified on the daily flight schedule.

11.3.6.2. NAV Qualification. To qualify as a NASA GSFC Navigator, a Navigator shall:

- a. Hold a qualification from the U. S. Armed Forces ; or
- b. Completed a satisfactory flight check administered by an outside agency engaged in training and/or operation of a specific aircraft.

11.3.6.3. NAV Responsibilities. A NASA GSFC NAV shall:

- a. Perform preflight mission planning
- b. Perform pre- and post-flight inspections and checks of navigational systems
- c. Ensure compliance with all clearance and airspace restrictions
- d. Carry out delegated flight duties in accordance with the aircraft flight manual, at the discretion of the PIC
- e. Assist the PIC in all assigned flight duties
- f. Carry out other duties as assigned by the PIC.

11.3.7. Flight Test Engineer (FTE). Assigned GSFC engineers are designated by the Chief of Flight Operations to perform flight test engineer duties on engineers check flights and flight test sorties, in specified aircraft, as non-aircrew.

11.3.7.1. FTE Assignment. The FTE is specifically identified on the daily flight schedule.

11.3.7.2. FTE Qualifications. To qualify as a NASA GSFC FTE, an FTE shall:

- a. Possess basic educational requirements. The basic requirement is successful completion of a standard professional curriculum in an accredited college or university and have been awarded a bachelor's degree, or higher, with a major study in an appropriate field of engineering, physical science, life science, or mathematics
- b. Be a GSFC engineer, by position description, assigned to the Aircraft Office, or other technically qualified candidate
- c. Have fundamental training in flight test techniques and/or be checked out for particular test flight duties in specified aircraft by a qualified Research Test Pilot

11.3.7.3. FTE Responsibilities. A NASA GSFC FTE shall:

- a. Develop flight test plans in consort with GSFC research test pilots, project pilots, aircraft leads, and project engineers
- b. Coordinate flight test requirements with research test pilots
- c. When necessary, brief developed test plans to the AFSRB
- d. Ensure the health and status of required test equipment
- e. Operate flight test equipment and data recorders
- f. Operate scientific or experimental equipment, as required to fulfill the flight test plan
- g. Perform engineering analysis, as required
- h. Perform post flight data analysis, as required

- i. Write post mission flight reports or assists the Research Test Pilot in writing reports when the mission dictates

11.3.8. Flight Maintenance Technician (FMT). Sometimes referred to, and assuming the duties of, an Aft Crewmember; assigned GSFC Mechanics and Technicians may be designated by the Chief of Flight Operations to perform duties on specific GSFC aircraft. Maintenance technicians perform in-flight maintenance functions and specific duties involving non-aircrew and passenger safety aboard certain GSFC aircraft. Where assigned, these Secondary Aircrew members shall be specifically trained to fulfill emergency duties within the cabin area of an assigned aircraft. Prior to initial designation, each maintenance technicians shall receive training in such areas as traffic awareness and “see-and-avoid” techniques, general aircraft servicing, and general weight and balance principles.

11.3.8.1. FMT Assignment. The FMT is specifically identified on the daily flight schedule.

11.3.8.2. FMT Qualifications. To qualify as a NASA GSFC FMT, an FMT shall:

- a. Possess an FAA A&P Certificate; and
- b. Hold a qualification from the U. S. Armed Forces as an aircrew member, in type ; or
- c. Have satisfactorily completed a course of training and evaluation administered by an outside agency or commercial company engaged in the training and/or operations of a specific aircraft; or
- d. Have satisfactorily completed a NASA specific course of training and evaluation administered by a designated NASA Instructor Pilot or NASA Instructor FE, in type.

11.3.8.3. FMT Responsibilities. A NASA GSFC FMT shall:

- a. At the discretion of the assigned FE/FM, perform pre- and post-flight inspections and checks in accordance with the aircraft flight manual or applicable NASA directive
- b. Carry out delegated flight duties in accordance with the aircraft flight manual, at the discretion of the PIC
- c. Assists the PIC in all assigned flight duties, and provide continuous communication to the flight deck
- d. While operating in visual conditions in heavy traffic areas, remain at their duty station throughout the climb and descent - cabin duties are considered of secondary importance during these times
- e. Provide researcher electrical power and monitor distribution system for correct loading, when applicable
- f. Monitor non-aircrew and/or passengers for hypoxia, illness, or suspicious behavior
- g. Assist non-aircrew and/or passengers in the event of cabin decompression
- h. Protect the flight deck from unauthorized intrusion
- i. Detect, electrically isolate, and combat in flight fires
- j. When necessary, remove power from UPS systems
- k. Secure the cabin in the event of a ditch or forced landing
- l. Launch assigned life rafts and aid non-aircrew and/or passengers in embarking into life rafts

- m. At the discretion of the PIC, in the event of a ground emergency, aid in the safe and expeditious evacuation of the aircraft

11.3.9. Non-Aircrew/Qualified Non-Crewmember (QNC). Mission required personnel that are non-essential aircrew such as principle investigators, scientists, researchers, experiment operators, sensor operators, or other unique positions. No designation is required.

11.3.9.1. QNC Assignment. A QNC is specifically identified on the daily flight schedule.

11.3.9.2. QNC Qualification. None.

11.3.9.3. QNC Responsibilities. None.

## 12. Aircraft Operations

### 12.1. Operational Goals and Priorities

12.1.1. The GSFC Aircraft Office Mission. The mission of the GSFC WFF Aircraft Office is to provide safe, reliable and cost effective manned and unmanned aircraft systems for airborne science research, technology development and project support.

12.1.2. Mission Accomplishment (Safe Success). As NASA's premiere airborne science research Center, we must sustain superior mission performance while simultaneously redefining our processes for greater efficiency and vigorously pursuing new opportunities for expanding NASA's airborne research and support capabilities.

12.1.3. Mission Accomplishment Hierarchy. Sustained superior mission performance is accomplished through the application of these priorities, at all levels of decision making, in the following order:

- a. **Safe** – As NASA GSFC's only manned research platform, we are committed to the achievement of NASA's strategic goals while placing the highest emphasis on accomplishing those objectives safely.
- b. **Reliable** – It is important to understand that reliability is critical to our continued success. Even the perception of an unreliable operation will result in decreased trust. Therefore, daily decisions should be made with an eye downstream for potential impacts. We must make decisions today with due consideration to placing ourselves in the best position to safely accomplish our mission tomorrow.
- c. **On-time** – Each mission year, for each aircraft, is purposefully scheduled without margin. Deficiencies in on-time mission performance have ramifications, not only in scheduling, but also mission cost and man-power planning. We must make concerted efforts to stay within scheduled mission milestones and weigh the schedule risks to follow-on missions.
- d. **Cost Effective** – We will strive for financial efficiency whenever and wherever it is feasible to do so. Cost savings results in repeat business and future stability through increased aircraft parts and operational infrastructure availability.

12.1.4. Measured Intelligent Response to Requirements. The pilots and staff of the GSFC Aircraft Office (Flight Operations Department) are uniquely qualified and positioned to ensure these goals are met for each assigned mission. In the dynamic flight environment of airborne research, these goals can only be met consistently by intelligent responses to particular circumstances surrounding individual flight evolutions.

## 12.2. **FAA Compliance**

12.2.1. FAA Compliance. NASA controlled aircraft are subject to Federal Aviation Regulations with respect to the use of airspace, the control of air traffic, and aircraft registration. NASA aircraft pilots shall secure diplomatic clearance approval prior to entry into the airspace of a foreign country except for brief use of foreign airspace adjoining the United States, as directed by air traffic control (ATC).

12.2.2. CFR Exceptions. NASA aircraft shall be operated in accordance with applicable provisions of the FAA Federal Aviation Regulations (14 CFR) except:

- a. Where NPR 7900.3 or this manual prescribes more stringent requirements.
- b. Where deviations from the FAA regulations have been approved by the FAA, a Center airworthiness/flight readiness review board, or NASA policy.

## 12.3. **Flight Authorization**

12.3.1. Flight Authorization Process. Each flight conducted by GSFC shall be authorized, by the Chief of Flight Operations, through a published daily flight schedule. GSFC aircraft shall not be flown by any person unless authorized via the daily flight schedule or an amendment thereto.

## 12.4. **Flight Scheduling and Staffing**

12.4.1. The Daily Flight Schedule (DFS). The DFS shall be published by the close of business the preceding day and forwarded to all responsible parties within GSFC. The DFS serves as the notification of the next days intended flight activities, but does not preclude, cancellations, changes or additions. Adjustments shall be made, in writing, by the Operations Department or by an assigned PIC. The DFS is retained via the Records Custodian for historical data.

12.4.1.1. Required Flight Schedule information. As a minimum, the document shall contain the following elements:

- a. Names and aircrew positional assignment all flight personnel
- b. Assign PIC and/or formation leader as appropriate
- c. Formation flights order of precedence, in the event of an abort by the designated flight leader
- d. Aircraft model assigned
- e. Mission or requirement code
- f. Point of departure, destination, and en route stopover points
- g. Date and estimated time of departure (ETD)

h. Estimated time en route (ETE) or estimated time of arrival (ETA)

12.4.1.2. SAR and Alert Exception. For missions such as strip alert, SAR alert, etc., the words as to be assigned (TBA) may be entered for ETD and ETE/ETA.

12.4.1.3. DFS Required Signatures. The DFS shall be signed by:

- a. The scheduling member of the Operations Department
- b. The Airworthiness and Maintenance Manager, or designee
- c. The Aircraft Office Operations Manager, or designee
- d. The Chief of Flight Operations, or designee

12.4.1.4. DFS Signature & Authorization. DFS signatures may be obtained by any combination of the above required parties. Signing the DFS verifies that all flights upon NASA GSFC aircraft are properly approved and documented, allowing for contingencies such as deployed aircraft operations and aircraft ferry approvals.

12.4.2. Minimum Aircrew Staffing/Scheduling. The minimum aircrew requirements for GSFC aircraft are typically set forth in the applicable Aircraft Flight Manual (AFM or NATOPS) for individual aircraft models. When insufficient manual guidance is provided, The Chief of Flight Operations shall establish minimum aircrew requirements per aircraft platform. The Chief of Flight Operations may modify any aircrew requirement for testing, mission necessity or training purposes.

12.4.2.1. Secondary Aircrew Staffing. The minimum number of secondary aircrew assigned to any given flight shall be based upon MORAP findings or the specific aircraft flight manual when MORAP findings are not available.

12.4.2.2. Secondary Aircrew Staffing onboard Heavy Aircraft. Onboard GSFC aircraft with gross weight capabilities greater than 100,000 pounds at least one aircrew member shall be assigned, via the flight schedule, to perform dedicated secondary aircrew duties. In the event of extended over water flights, at least one dedicated secondary aircrew member shall be assigned per required life raft, as calculated with normal life raft capacity limits vs. total number of souls on board. When practical, secondary aircrew should be located near a required floor level exit and should be uniformly distributed throughout the aircraft.

12.4.2.3. Supplemental Secondary Aircrew. It is not desired to carry more aircrew members onboard GSFC aircraft during R&D or PS missions than are required for the safe conduct of the flight. Arbitrarily adding aircrew exposes personnel to unnecessary risk, adds to the congestion of the cabin during evacuations, decreases the amount of supplemental oxygen available per person, and adds gross weight thus decreasing aircraft performance. However, observation, familiarization and training flights are permissible on a case-by-case basis through coordination and approval of the AOOM and TM.

12.4.2.4. Elevated-Risk Flight Staffing. Engineering Check Flight, Test Flight and Functional Check Flight staffing should be kept to a minimum. These evolutions expose crew to inherently



higher levels of risk and should not have any unnecessary personnel assigned. Any additional occupants, above minimum, to these flights require permission from the Chief of Flight Operations.

## 12.5. Flight Time Reporting

12.5.1. Block Time Reporting. Block time is defined as the period of time beginning when an aircraft first makes movement for the purpose of flight and ends when the aircraft comes to a rest for the final time during the scheduled event or chain of events. Multiple flight events may be considered continuous, for the purposes of block time, when all engines have not been secured. In cases where de-icing procedures are in effect, block time includes such activities.

12.5.2. Flight Time. At GSFC 'Flight Time', as used for pilot proficiency and currency, is defined as the time of first movement of an aircraft for the purpose of flight until it comes to a rest at the point of landing.

12.5.3. Flight Time Reporting – Commercial Flying. It is GSFC's policy that a GSFC pilot conducting commercial flying in addition to GSFC operations report that commercial flying to the Chief of Flight Operations immediately after conducting the commercial flying. No pilot may perform any other commercial flying if that commercial flying plus his/her flying at GSFC will exceed any flight time limitations in this document.

## 12.6. Ground Handling

12.6.1. Procedures Prior To Aircraft Movement. The following items must be completed by and/or reported to the PIC prior to placing the aircraft in motion (taxi, pushback etc.):

- a. All occupants must be seated.
- b. All occupants' seat belts (shoulder harness when applicable) are fastened.
- c. Verify all loose objects are secured or placed in a stowed position.
- d. All emergency exits and/or emergency exit lighting must be armed upon closure of the main cabin door used for boarding.
- e. Verify final count vs. manifest.
- f. Secondary aircrew should verify cabin safety checks (emergency exits, emergency equipment etc.) are complete.

12.6.2. Tow-In Procedures. In some cases flights may require being towed short distances into a hangar or hard-stand area for operational reasons (i.e., restricted clearances, ramp condition, etc.).

12.6.3. Ground Handler Communications. All ground handlers shall use standard international hand signals or a headset to communicate with the flight station.

12.6.4. Aircrew during Fueling. When fueling with non-aircrew members on board, one aircrew member should remain on board the aircraft and remain in the cabin to aid in evacuation.



When non-aircrew members are onboard, the cabin should be observed by aircrew members to ensure against tampering.

## 12.7. English Language

12.7.1. English Language. The English language is designated as the common language for use by all GSFC aircrew for communication during operations on the flight deck and others. English shall also be used for all flight training including training materials, ground and flight training, and evaluations. Each pilot's certificate must include an English Proficient endorsement.

## 12.8. Starting, Turning, and Taxiing

12.8.1. Authorized Personnel. Engines shall not be started without a pilot or turn-qualified and designated mechanic, in the pilot seat.

12.8.2. Starting or Turning Aircraft Engines. The following conditions apply:

- a. Before starting an engine, the wheels of the aircraft shall be chocked or the parking brake set unless a deviation from this requirement is specifically authorized by the applicable model aircraft flight manual.
- b. Prior to starting engines, intakes and surrounding ground/deck shall be inspected to eliminate the possibility of FOD ingestion.
- c. When an engine is started by non-pilot personnel for testing or warm-up purposes (except large transport and patrol class aircraft with parking brakes), the aircraft shall be tied down.
- d. Whenever an engine is started, personnel with adequate fire extinguishing equipment, if available, should be stationed in the immediate vicinity of the engine but safely clear of intakes or propellers. Engines may be started without an observer, at PIC discretion.

12.8.3. Starting or Turning Helicopters/Tiltrotor Engines. When the engine of a helicopter/tilt rotor is started, the controls should be manned by a qualified helicopter/tilt rotor pilot. The Chief of Flight Operations may authorize certain specially qualified personnel, other than pilots, to ground test helicopter/tiltrotor engines when a pilot is not available; however, prop-rotors and rotors of a tilt rotor shall not be engaged except by a qualified pilot. Aircraft security requirements (e.g., tiedowns, chocks, parking brakes, etc.) shall be in established accordance with applicable aircraft flight manual.

12.8.4. High Power Maintenance Turns. Before starting an engine for a high power turn-up, aircraft other than transport and patrol class aircraft shall be tied down and placed in such a manner that the propeller or jet blast will not cause damage to other aircraft, equipment, or property. During any ground run-up, an outside observer shall be stationed in such a location as to be in view of the person at the controls at all times.

12.8.5. Taxiing. When taxiing in the close vicinity of obstructions or other aircraft, a qualified taxi director shall attend the taxiing aircraft as well as other ground personnel necessary to ensure safe taxiing. The PIC is responsible for safe taxi clearance from obstacles and other aircraft. When uncertain of safe taxi clearances, stop and utilize appropriate ground personnel prior to continuing to taxi.

## 12.9. **Airspeed**

12.9.1. Aircraft Speed. To reduce midair collision hazards associated with high aircraft speeds at low altitudes, FAR part 91.117, imposes a maximum airspeed limitation of 250 knots indicated airspeed (KIAS) on all aircraft operating below 10,000 feet mean sea level (MSL) and a maximum of 200 KIAS for aircraft operating:

- a. At or below 2,500 feet above the surface within 4 nm of the primary airport of a class C or D airspace area;
- b. In the airspace underlying a class B airspace area designated for an airport or in a VFR corridor designated through such a class B airspace area.

12.9.1.1. Aircraft Speed Exceptions. Regulation grants exception for operations that cannot safely be conducted at airspeeds less than the prescribed maximum airspeed. The FAA may authorize NASA to exceed 250 KIAS below 10,000 feet MSL for certain requirements. Operations within special use (segregated) airspace or beyond 12 NM from the coastline within the US FIR below 10,000 feet MSL, are not speed restricted.

12.9.1.2. Speeds on Aeronautical Charts. Check aeronautical publications for specific country of destination airspeed restrictions.

12.9.1.3. Maximum Holding Speeds. Failure to observe maximum holding airspeeds in mountainous terrain may place the aircraft dangerously close to terrain.

12.9.2. Supersonic Flight Policy. Supersonic flight operations shall be strictly controlled and approved by the Chief of Flight Operations. Supersonic flight over land or within 30 miles offshore shall be conducted in specifically designated areas. Such areas must be chosen to ensure minimum possibility of disturbance. As a general policy, sonic booms shall not be intentionally generated below 30,000 feet of altitude unless over water and more than 30 miles from inhabited land areas or islands. Deviations from the foregoing general policy may be authorized only under one of the following:

- a. Research, test, and operational suitability test flights requiring supersonic speeds
- b. Phases of formal training syllabus flights requiring supersonic speeds
- c. When specifically authorized by the Chief of Flight Operations

12.9.2.1. Shock Wave Awareness. PICs of aircraft capable of supersonic speeds shall be familiar with the shock wave phenomenon peculiar to supersonic flight. Serious damage, annoyance, and mental stress have resulted from sonic booms. It is incumbent on every pilot flying aircraft capable of generating sonic booms to avoid such disturbances and damage.

12.9.2.2. Sonic Wave Reports, Inquiries, and Investigations. NASA GSFC must accept responsibility for restitution and payment of just claims for damage resulting from sonic booms determined to have been caused by GSFC aircraft. To assist in determining the validity of claims, all supersonic flights conducted over the CONUS or within 50 miles offshore shall be logged as to time, date, location, speed, and altitude of occurrence and retained by the Records Custodian for 24 months.

## 12.10. **Altitude**

12.10.1. Minimum Altitude. Except when necessary for takeoff, approach, landing, or test point, on an approved test plan, no pilot may operate an aircraft below the following altitudes:

12.10.1.1. Minimum Altitude over Congested Areas. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.

12.10.1.2. Minimum Altitude over other than Congested Areas. An altitude of 500 feet above the surface, except over open water or very sparsely populated areas. Lower altitudes must be authorized by approved test plan or duly reviewed mission profile. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

12.10.1.3. Minimum Altitude over Designated Mountainous Terrain. When mountainous terrain is designated on appropriate publications, an aircraft shall not be flown less than 2,000 feet above the highest terrain or obstacle within 22 miles of the intended line of flight. Lower altitudes must be authorized by approved test plan or duly reviewed mission profile.

12.10.1.4. Minimum Mountainous Terrain Peak Transient Clearance. When mountainous terrain is designated on appropriate publications and an aircraft is being operated at lower altitudes by an approved test plan or duly reviewed mission profile, the PIC may visually clear terrain peaks. Such transients shall not pass less than 200 feet AGL.

12.10.1.5. Minimum En-route Altitude (MEA). In controlled airspace, an aircraft shall not be flown at less than the minimum en route altitude or the altitude specified by the agency exercising control over the airspace concerned when operating in IFR conditions.

12.10.1.6. Helicopters Minimum Altitudes. If the operation is conducted without hazard to persons or property on the surface a helicopter may be operated at less than the minimums prescribed above, provided the helicopter complies with any routes or altitudes specifically prescribed for helicopters by the FAA.

## 12.11. **Fuel**

12.11.1. General Fuel Policy. Pilots are tasked to operate with the fuel required to be safe. PICs are reminded that operating with excess fuel may degrade safety, and will always degrade

efficiency and aircraft performance. The fuel load to be carried shall only be determined by the PIC.

12.11.2. Minimum Fuel Requirements. For the purposes of safety, no GSFC aircraft may operate below minimum fuel levels established within aircraft flight manuals, or as follows. Deviations require permission from the Chief of Flight Operations.

12.11.2.1. Fuel Planning. All aircraft shall carry sufficient usable fuel, considering all meteorological factors and mission requirements. Aircraft with minimum fuel values directed in the aircraft flight manual shall follow those fuel requirements. In aircraft without specific fuel minimum directives, the following minimum fuel computations apply.

12.11.2.1.1. No Alternate Fuel. If alternate is not required, fuel to fly from takeoff to destination airfield, plus a reserve of 10 percent of planned fuel requirements.

12.11.2.1.2. Alternate Fuel. If alternate is required, fuel to fly from takeoff to the approach fix serving destination and thence to an alternate airfield, plus a reserve of 10 percent of planned fuel requirements.

12.11.2.1.3. All Cases. In no case shall the planned fuel reserve after final landing at destination or alternate airfield, if one is required, be less than that needed for 20 minutes of flight, computed as follows:

- a. Reciprocating engine-driven aircraft. Compute fuel consumption based on maximum endurance operation at normal cruise altitudes.
- b. Turbine-powered fixed-wing/tiltrotor aircraft. Compute fuel consumption based on maximum endurance operation at 10,000 feet.
- c. Turbine-powered helicopters. Compute fuel consumption based on operation at planned flight altitude.

12.11.2.2. Delays. Any known or expected traffic delays shall be considered time en route when computing fuel reserves. If route or altitude assigned by ATC causes or will cause planned fuel reserves to be inadequate, the pilot shall inform ATC of the circumstances, and, if unable to obtain a satisfactory altitude or routing, alter destination accordingly.

12.11.2.3. Redispatch Fuel Flight Plans. Redispatched flights are authorized for GSFC aircraft. Redispatched flights are flights that require re-filing with a new destination, in flight. Usually dependent on a certain set of circumstances (such as fuel reserves) at an intermediate destination, these flights should be undertaken only when required by operational requirements. The conditions allowing for redispatch shall be predetermined and included on the flight schedule for approval. Only aircraft with fully operational, with fuel quantity verified, fuel quantity indicator systems are illegible for redispatch operations.

12.11.3. Ground Operation / Fuel Economy. Ground operations represent a potentially significant opportunity for fuel efficiency. Taxiing (in- and out- bound) with a reduced number of engines operating, when feasible, is encouraged for fuel efficiency. When extensive ground

delays are encountered consider temporary engine shut downs to conserve fuel. To the maximum extent practical, aircrew should adhere to engine warm-up and cool-down time recommendations.

12.11.3.1. APU Operation / Fuel Economy. It is GSFC policy to make the most efficient use of our fuel and equipment. The APU should only be used when the use other external power is either not feasible or inconsistent with mission requirements.

12.11.4. In-Flight Refueling. Aircraft shall carry sufficient usable fuel to fly from the takeoff point to air refueling control point(s) (ARCP), thence to a suitable recovery field in the event of an unsuccessful refueling attempt. In no case shall the fuel reserve at rendezvous point be less than 10 percent. For multiple in-flight refuelings, the aircraft must have the required reserve at each rendezvous point. After the last in-flight refueling is completed, the fuel reserve required for the remainder of the flight shall be in accordance with the Minimum Fuel Requirements section above.

12.11.5. Declaring "Minimum Fuel." Minimum fuel is an advisory term indicating that in the judgment of the pilot the fuel state is such that no undue delay can be accepted en route to the destination. It is not an emergency situation, but undue delay may result in an emergency. If at any time the remaining usable fuel supply suggests the need for traffic priority to ensure a safe landing, the pilot shall declare an emergency and report fuel remaining in minutes. Both minimum fuel advisories and emergency fuel state shall be reported each time control is transferred to a new controller. Pilots declaring minimum fuel should not expect special handling from FAA controllers. A Pilot's Irregularity Report is required.

## 12.12. **Weather**

12.12.1. Weather Reports. GSFC pilots shall acquire a weather synopsis prior to flight, which he/she deems appropriate for the given mission and conditions. The weather information obtained should, at a minimum, contain:

- a. Latest surface observations for origin, destination, and alternate stations.
- b. Terminal weather forecasts for origin, destination, and alternate stations.
- c. Enroute area forecasts for selected flight route.
- d. SIGMETs applicable to selected flight route.
- e. Convective SIGMETs applicable to selected flight route.

12.12.2. Flight Plan Filing Weather Criteria. Weather Criteria for Filing Flight plans shall be filed based on all the following:

- a. The actual weather at the point of departure at the time of clearance.
- b. The existing and forecast weather for the entire route of flight.
- c. Destination and alternate forecasts for a period 1 hour before ETA until 1 hour after ETA.

12.12.3. VFR Flight Planning Weather Minimums. The PIC shall ascertain that actual and forecast weather meets the FAA specified criteria prior to filing a VFR flight plan. The minimum

weather conditions for ceiling and visibility for VFR flights are defined in FAR Part 91.155, and vary depending on the type of airspace in which the aircraft is operating, and on whether the flight is conducted during daytime or nighttime. However, typical daytime VFR minimums for most airspace is 3 statute miles of flight visibility and a cloud distance of 500' below, 1,000' above, and 2,000' feet horizontally. Flight conditions reported as equal to, or greater than, these VFR minimums are referred to as Visual Meteorological Conditions (VMC).

12.12.4. IFR Flight Planning Weather Minimums. Regardless of the weather, IFR flight plans shall be filed and flown whenever it is deemed practicable as a means of reducing midair collision potential. In any case, forecast meteorological conditions must meet the weather minimum criteria shown in Table 2 for filing IFR flight plans and shall be based on the pilot's best judgment as to the runway that will be in use upon arrival. IFR flight plans may be filed for destinations at which the forecasted weather is below the appropriate minimums provided a suitable alternate airfield is forecast to have at least 1,000-foot ceiling and 3-statute-mile visibility during the period 1 hour before ETA until 1 hour after ETA.

12.12.4.1. IFP Filing Weather Criteria. Pilots shall use the following criteria:

DESTINATION WEATHER ETA plus and minus 1 hour	ALTERNATE WEATHER ETA plus and minus 1 hour	
0 – 0 up to but not including Published minimums	1000 – 3 or better	
Published minimums up to but not including 1000 – 3 (single – engine & single - pilot absolute minimums 200 – ½) (single – piloted helicopter / tilt – rotor absolute minimums 200 – 1/4	NON- PRECISION	PRECISION
	*Published minimums plus 300 - 1	*Published minimums plus 200 – 1/2
1000 – 3 or better	No alternate required	
*In the case of single – piloted or other aircraft with only one operable UHF / VHF transceiver, radar/airport surveillance approach (PAR / ASR) minimums may not be used as the basis for selection of an alternate airfield		

**Table 2. IFR Filing Criteria**

12.12.4.2. IFR Filing Alternate Airfield. An alternate airfield is required when the weather at the destination is forecast to be less than 1,000-foot ceiling and 3-statute-mile visibility during the period 1 hour before ETA until 1 hour after ETA.



12.12.5. Takeoff Weather Minimums: ME Aircraft Flown w/ Two Pilots. For multi-engine aircraft flown with two current and qualified pilots, no takeoff ceiling or visibility minimums apply. Takeoff shall depend on the judgment of the pilot and urgency of flight. Executing a takeoff below published landing minimums is permitted at the airport of departure, with a qualifying Takeoff Alternate.

12.12.6. Takeoff Weather Minimums: SE Aircraft or ME Aircraft Flown w/ a Single Pilot. Published minimums for the available Non-Precision Approach (NPA) at the point of departure, but not less than 300-foot ceiling and 1-statute mile visibility. When a precision approach compatible with installed and operable aircraft equipment is available, with published minimums less than 300/1, takeoff is authorized provided the weather is at least equal to the precision approach minimums for the landing runway in use, but in no case when the weather is less than 200-foot ceiling and 1/2-statute-mile visibility/2,400-foot runway visual range (RVR).

12.12.7. Takeoff Alternate Requirements. If the weather conditions at the airport of takeoff are below the landing minimums for that airport, no pilot may takeoff from that airport unless a preselected Takeoff Alternate airport is available and located within the following distances from the airport of takeoff:

- a. Aircraft having two engines. Not more than one hour from the departure airport at normal cruising speed in still air with one engine inoperative.
- b. Aircraft having three or more engines. Not more than two hours from the departure airport at normal cruising speed in still air with one engine inoperative.

12.12.7.1. Takeoff Alternate Weather Requirements. The Takeoff Alternate airport weather conditions must be at least 1,000-foot ceiling and 3-statute-mile visibility during the period 1 hour before ETA until 1 hour after ETA.

12.12.8. Departure Procedures (DP). At locations where DPs are available, pilots are encouraged to utilize them for each IFR departure, provided no unacceptable flight degradation will ensue. An appropriate DP procedure should be selected during preflight planning for pilots to realize the greatest benefit from standardization of instrument departures and to have a clear course of action to follow in the event of communication failure.

12.12.8.1. Special Engine-Out Procedures. At some airports, special engine out departure procedures are specified. These procedures can be very complex and require a thorough review prior to departure and arrival. Special engine out procedures are applicable to engine out missed approaches as well as an engine out departures. At airports with a special engine out procedure, both the standard and engine out missed approach should be briefed prior to beginning the approach. Be aware of the turn radius and the best angle and rate of climb airspeeds of your aircraft at high altitude airports.

12.12.9. Icing and Thunderstorm Conditions. Flights shall be planned to circumvent areas of forecast atmospheric icing and thunderstorm conditions whenever practicable.



12.12.10. Severe Weather Watch (WW) Bulletins. The Service Storm Prediction Center (SPC), Norman, OK, issues severe WW bulletins in CONUS. They are responsible for issuing these threats in text as well as graphical formats. WW bulletins are issued for areas where conditions are favorable for development of severe weather and warnings are issued by local National Weather Service forecast offices where these conditions are actually occurring. Severe thunderstorm and tornado warnings should be treated similar to WW bulletins when flight planning. Except for operational necessity, emergencies, and flights involving all-weather research projects or weather reconnaissance, pilots shall not file into or through areas for which the SPC has issued a WW unless one of the following exceptions apply:

- a. VFR filing is permitted if existing and forecast weather for the planned route permits such flights.
- b. IFR flight may be permitted if aircraft radar is installed and operative, thus permitting detection and avoidance of isolated thunderstorms.
- c. IFR flight is permissible in controlled airspace if VMC can be maintained, thus enabling aircraft to detect and avoid isolated thunderstorms.
- d. Performance characteristics of the aircraft permit an en route flight altitude above existing or developing severe storms.

### 12.13. **Electronic Flight Bag and Aeronautical Publications**

12.13.1. Flight Planning and Filing Electronically. Flight plans are normally prepared by computer or Electronic Tablet which gives the pilot efficient flight planning for considering a given set of wind and weather conditions and also supplies a great deal of detailed information.

12.13.2. Types of Aeronautical Charts and Publications. Paper charts may be carried for primary or backup data. All full-time GSFC pilots should be issued an Electronic Tablet for aeronautical charts and flight publications. Pilots are responsible for updating the charts before each flight, just as paper charts.

12.13.3. PIC Responsibility. PICs are responsible to ensure that appropriate aeronautical charts and publications are available for each flight.

12.13.4. Electronic Tablet Restriction. GSFC Pilot Electronic Tablets with GPS systems may be activated inflight for situational awareness purposes but shall not be used for navigation.

12.13.5. Data and Software Location and Configuration. Standard Department of Defense (DoD) Flight Information Publications (FLIP) are located on the shared NASA network server for all pilots to download for Electronic Tablet inclusion or printing (including the pilot planning room). The Electronic Tablet application, PHAERO from the National Geospatial-Intelligence Agency (NGA), is available for international flight purposes. Additionally, certain Electronic Tablets receive Jeppesen charts for international travel. The Electronic Tablet application 'Good Reader' should be installed on all Electronic Tablets for ease of referencing material. Non-ITAR controlled aircraft flight manuals may be installed on Electronic Tablets for reference.

12.13.6. Electronic Flight Bag (EFB) in Lieu of Paper. In accordance with FAA AC 91-78, the in-flight use of an EFB system to depict images in lieu of paper reference material is the decision of the aircraft operator and the PIC.

12.13.6.1. Flight Operations Manual. This FOM shall be installed on all Electronic Tablets for reference.

12.13.7. PIC Backup Requirement. In accordance with FAA AC 91-78, a secondary or backup source of aeronautical information or paper reference material necessary for the flight shall be available to the pilot in the aircraft. The secondary or backup information may be either traditional paper-based material or displayed electronically by other means. This could include the system built into the aircraft navigational systems if the system is capable of providing the data.

## 12.14. Instrument Approach Procedures

12.14.1. Non-Precision Approaches. GSFC aircraft are authorized to conduct non-precision approaches. Instrument approaches not employing a glideslope are considered non-precision approaches. These types of approaches include LDA, VOR, NDB, ASR, DME, ILS Back Course, ILS without glideslope, GPS, RNAV, and circling approaches.

12.14.1.1. Non-Precision Visibility Requirements. Visibility requirements for straight-in non-precision approaches depend largely upon the availability of specified lighting aids. If any of the lighting aids are not available, the minimum visibility is usually increased. Minimums for various lighting configurations are stated in the approach procedure.

12.14.2. Circling Approaches. GSFC aircraft are authorized to conduct circling approaches. Circling approaches have a higher than normal frequency of resulting in an un-stabilized approaches. Therefore, the following procedures have been established as pertinent to the execution of a circling approach:

- a. Check the instrument approach plate for notes and /or restrictions on circling approaches.
- b. The approach is commenced using any published instrument approach procedure for the airport that provides circling minimums. The aircraft follows the published procedure until in position to make a normal descent to the runway and complete a safe landing.
- c. If visual reference is not established upon circling landing minimums, the aircraft will continue on the final approach course maintaining that altitude until either the visual reference to the runway of intended landing is established or until reaching the missed approach point for the approach being used, whichever occurs first. If visual reference is not established by the time the aircraft reaches the missed approach point, a missed approach is executed.
- d. The circling maneuver may not be commenced until the pilot has actual visual reference to the runway of intended landing. If visual reference is established at an altitude above MDA, it is not necessary to descend to the MDA prior to commencing

the circling maneuver. Ensure that the altitude used for the circling maneuver allows a normal rate of descent to the runway.

- e. Aircraft operating under IFR during all circle-to-land maneuvers are required to remain clear of clouds. In addition, a missed approach must be made whenever visual reference to the airport is lost while conducting a circle-to-land maneuver.
- f. Any pilot that accepts a circle-to-land clearance must remain under IFR and comply with all procedures and altitudes listed.

12.14.2.1. Missed Circling Approaches. To become established on the prescribed missed approach course, the pilot should make an initial climbing turn (if required) toward the landing runway and continue the turn until established on the missed approach course or as directed by ATC.

12.14.3. Side-Step Maneuver. GSFC aircraft are authorized to accept and conduct side step maneuvers. When a straight-in approach serves one of two parallel runways that are separated by not more than 1200 feet, ATC may authorize an aircraft to maneuver visually for a landing on the adjacent runway. The pilot is expected to accomplish this maneuver as soon as possible after the runway or runway environment is in sight. Minimums on the adjacent runway, if published, are higher than the minimums for the primary runway, but normally lower than circling minimums. If minimums of the adjacent runway are not published, circling minimums apply.

12.14.3.1. Side-Step Specific Minima. Occasionally specific side step minimums are published on the applicable approach page.

12.14.3.2. Side-Step Clearance Requirement. A side-step clearance may not be accepted until the runway of intended landing is in sight and the aircraft can make a normal descent to a landing within the touchdown zone.

12.14.4. Visual Approaches. GSFC aircraft are authorized to accept and conduct "Visual Approaches". A visual approach is conducted on an IFR flight plan and authorizes a pilot to proceed visually and clear of clouds to the airport. ATC may authorize an aircraft to conduct a "Visual Approach" to an airport or to follow another aircraft when flight to and landing at the airport can be accomplished in VMC weather, i.e., reported weather at the airport must have a ceiling at or above 1,000 feet and 3 miles visibility or greater. The aircraft must be within 35 nautical miles and have the airport or the identified preceding aircraft in sight before the clearance is issued. If the aircraft has the airport in sight but cannot see the aircraft he / she is following, ATC may still clear the aircraft for a visual approach; however, ATC retains both separation and wake vortex separation responsibility.

12.14.4.1. Visual Approach to Follow Traffic. When visually following a preceding aircraft, acceptance of a visual approach clearance constitutes acceptance of pilot responsibility for maintaining a safe approach interval and adequate wake turbulence separation. When operating to an airport with an operating control tower, aircraft may be authorized to conduct a "Visual Approach" to one runway while other aircraft are conducting IFR or VFR approaches to another runway.

12.14.4.2. Visual Approach in VMC Only. When operating to an airport without an operating control tower, ATC may authorize a “Visual Approach” only if the aircraft reports that descent and flight to the destination airport can be made in VFR conditions.

12.14.4.3. Visual Approach Responsibilities. Authorization to conduct a “Visual Approach” is an IFR authorization and does not alter IFR flight plan cancellation responsibility. As such, pilots may log a “Visual Approach” as a simulated non-precision approach in NAMIS for currency purposes, at pilot’s discretion.

12.14.4.4. Missed Visual Approach. A visual approach is not an Instrument Approach Procedure, and therefore, has no missed approach segment. If a go-around is necessary for any reason, aircraft operating at controlled airports will be issued an appropriate advisory /clearance/ instruction by the tower. At uncontrolled airports, aircraft are expected to remain clear of clouds and complete a landing as soon as possible. If a landing cannot be accomplished, the aircraft is expected to remain clear of clouds and contact ATC as soon as possible for further clearance. Separation from other IFR aircraft will be maintained under these circumstances.

12.14.4.5. Visual Approach Glide Path. During a visual approach, the aircraft’s flight path must be maintained at or above the glideslope or VASI if the runway of intended landing is so equipped.

12.14.4.6. Visual Approach Airfield Identification. All available radio navigation aids will be used to positively identify the airport of intended landing.

12.14.5. Contact Approach. Contact approaches are not authorized for GSFC aircraft.

12.14.6. Monitored Approach Procedure. A monitored approach is a procedure which allows each pilot to concentrate on his/her specific tasks. It utilizes the Quiet Flight Deck method that eliminates all unnecessary conversation. Any calls other than the normal Monitored Approach calls should indicate that an abnormal exists or that a performance limit was exceeded. Usually, the one pilot is assigned the task of flying the approach and executing the missed approach, if necessary. The other pilot monitors the approach and scans externally for the runway environment and lands the aircraft if able. Normally, the PIC will brief the applicable items and duties, and both pilots will brief the approach from the approach chart. Although some approaches do not require use of the monitored concept, it can be utilized for any two-engine approach.

12.14.6.1. Engine Inoperative Monitored Approaches. Because of the requirement for transfer of aircraft control, the Monitored Approach Procedure is not authorized in GSFC aircraft with an engine inoperative. Therefore, the pilot flying an approach with an engine inoperative should also make the landing.

12.14.7. Land and Hold Short Operations (LAHSO). Land and Hold Short (LAHSO) clearances are optional (may be rejected by the PIC), but produce the benefit of increased traffic flow.

When a pilot is issued a Land and Hold Short clearance, it is incumbent upon the pilot to determine whether or not the aircraft can be landed safely and in compliance with regulatory performance requirements in the available landing distance. Wind, weather and general operating conditions should also be evaluated when determining if the clearance can be accepted.

12.14.7.1. LAHSO Authorized. GSFC pilots are only authorized to conduct LAHSO operations when a LAHSO plate is provided for that airport land / departure configuration. LAHSO requires a specified lighting configuration, located at the hold short point, to be used in conjunction with the hold short point for night LAHSO. This lighting system, where installed, will also be used for daytime operations. It should be noted that when LAHSO is in effect, mixed operations might occur on the runway. Crew using the full length of the runway where LAHSO is in effect will observe the LAHSO lights. These lights will not be turned on and off for each separate activity.

12.14.8. ILS/PRM and LDA/PRM Approaches. GSFC aircraft are authorized to conduct ILS/PRM and LDA/PRM Approaches. Where parallel runway centerlines are 4,300 feet apart or less, but no less than 3,000 feet, simultaneous ILS approaches may be conducted. These are referred to as ILS / PRM approaches. Similarly, where parallel runway centerlines are 3,000 feet apart or less, but no less than 750 feet, simultaneous offset instrument approaches (SOIA) may be conducted with ILS approaches. These are referred to as LDA / PRM approaches.

12.14.9. No Transgression Zone (NTZ). ATC provides an air traffic controller using special high update radar with high-resolution radar displays during these approaches. That controller is known as the final monitor controller and will ensure that aircraft do not enter the “No Transgression Zone” (NTZ) between the final approach courses.

12.14.10. RNAV Approach Procedures RNAV (GPS) And RNAV (RNP). Appropriately equipped GSFC aircraft are authorized to conduct RNAV approaches. The following procedures apply to all RNAV approaches:

- a. If ANP exceeds RNP inside the IAF, the crew will proceed visually or execute a missed approach
- b. Approaches must be selectable from database
- c. Primary altimeters are within 100 feet of one another.
- d. 10 mile scale or less must be used from IAF inbound.
- e. LNAV must be used from IAF inbound.
- f. “Unable required Nav performance” or “Nav Fail” or FMC equivalent message does not appear from IAF inbound.
- g. Vertical deviation must not exceed 75 feet below path from IAF inbound.
- h. Crew should display appropriate FMC page to monitor cross and vertical track error from IAF inbound.

12.14.11. Multi-Piloted Aircraft Approaches At or Below Minimums. In multi-piloted GSFC aircraft, when reported weather is at or below published landing minimums for the approach to be conducted, an approach shall not be commenced unless the aircraft has the capability to proceed to a suitable alternate in the event of a missed approach.

12.14.12. Single-Piloted Aircraft Approaches at or Below Minimums. Flights in single-piloted GSFC aircraft are not authorized to begin the final approach segment of an instrument approach unless the reported visibility (and ceiling, if required) is at or above the published minimums. If a report is received which indicates a below minimums condition once the flight has begun the final approach segment the flight may continue to minimums.

12.14.13. Single-Piloted Aircraft Exception. Single-piloted aircraft that are configured with side-by-side seating occupied by the PIC and an assisting qualified SIC may operate as multi-piloted aircraft in this section provided the cockpit configuration is such that the assisting pilot can:

- a. Monitor the pilot flight instruments.
- b. Monitor and control communication.
- c. Assist the pilot in acquiring the runway visually.

12.14.14. Criteria for Continuing Instrument Approaches to a Landing. Pilots shall not descend below the prescribed MDA or continue an approach below the decision height (DH) unless they have the runway environment in sight and in their judgment a safe landing can be executed, either straight in or from a circling approach, whichever is specified in their clearance.

12.14.14.1. Precision Approaches. A missed approach shall be executed immediately upon reaching the DH unless the runway environment is in sight and a safe landing can be made. On precision radar approaches, the pilot may expect control instructions until over landing threshold; course and glidepath information given after DH shall be considered advisory in nature.

12.14.14.2. Non-Precision Approaches. A missed approach shall be executed immediately upon reaching the MAP if visual reference is not established and/or a landing cannot be accomplished. If visual reference is lost while circling to land from a published instrument approach, the missed approach specified for that particular procedure must be followed. To become established on the prescribed missed approach course, the pilot should make an initial climbing turn toward the landing runway then maneuver in the shortest direction to become established on the missed approach course.

12.14.15. Visual Descent Point. In the case of a straight in, non-precision approach, descent to landing should not begin until reaching the visual descent point (VDP) if its location will permit the use of normal rates of descent and operating procedures.

12.14.16. Execution of the Missed Approach. Aside from mandated missed approaches. Pilots may execute a missed approach at their own discretion at any time.

12.14.17. Practice Approaches. The provisions of this section are not intended to preclude a single-piloted aircraft from executing practice approaches (no landing intended) at a facility where weather is reported below published minimums when operating with an appropriate ATC clearance. The facility in question must not be filed destination or alternate and the weather at



the filed destination and alternate must meet the filing criteria for an instrument clearance as set forth in this instruction.

## 12.15. **Uncontrolled Airfield Operations**

12.15.1. Uncontrolled Airfield Landing Minima. Landing minimums do not change simply because a tower is closed or any approach aid is unmonitored. Landing minimums may be altered due to lack of locally reported weather, lack of approach radar or because approach lights have been set to an intermediate intensity which results in strobes being turned off.

12.15.2. Uncontrolled Airfield Special Procedures. Special procedures may be required when operating to a destination or alternate airport that has reduced ATC control tower operating hours. Instrument approaches may be legally executed to a non-tower, non-radar and unmonitored environment.

12.15.3. VFR Operations at Uncontrolled Airports. GSFC aircraft are permitted to operate at uncontrolled fields or airports when the tower is closed. Although IFR approaches may be used to access the airfield, operations should be conducted under Visual Meteorological Conditions (VMC) during the terminal phase of flight. When possible, the pilot should remain in direct communication with an air/ground radio communications facility capable of providing airport traffic advisory service.

## 12.16. **Manifesting, Planning, Filing, and Tracking Flight Plans**

12.16.1. General. It is critical for the purposes of safety, that GSFC flights have appropriate safeguards to ensure timely activation of Search and Rescue (SAR)/mishap response capabilities, should an aircraft become downed or disabled. This requirement is exacerbated by the remote locations and adverse climates in which many of our missions are accomplished. With this aim, the following section allows for multiple layers of flight tracking and notification mechanisms.

12.16.2. Filing a Flight Plan. In order to maintain a record of each individually filed flight plan, all GSFC flight plans filed electronically should add the following email address to the receipt line: Wff-AOPilots@mail.nasa.gov. A flight plan appropriate for the intended operation shall be submitted to the local ATC facility for all flights of GSFC aircraft except the following:

- a. Flights of operational necessity in which the delay of filing of a flight plan would lead to potential loss of life, increased risk of serious injury to personnel, or damage to critical property.
- b. Local area flights which are tracked by GSFC WFF radar facilities and an onsite Operations Monitor.

12.16.2.1. Preflight Planning. Before commencing a flight, the PIC shall be familiar with all available information appropriate to the intended operation. Such information should include, but is not limited to, available weather reports and forecasts, NOTAMs, fuel requirements, terminal



instrument procedures, alternatives available if the flight cannot be completed as planned, anticipated terrain, and any traffic delays.

12.16.2.2. IFR Filing and Positive Control. All flights in GSFC aircraft shall be conducted in accordance with IFR to the maximum extent practicable. This shall include all point-to-point and round-robin flights using airways and other flights or portions thereof, such as flights to and from operating areas accessible through IFR filing. All other flights shall be conducted under positive control to the maximum extent possible.

12.16.2.3. Instrument or Composite Flight Plan. An instrument or composite (VFR/IFR) flight plan shall be filed for all flights that may reasonably expect to encounter in-flight IFR

12.16.2.4. VFR conditions during any portion of the planned route. The VFR portion of the flight shall meet VFR criteria set forth in the FARs.

12.16.2.5. VFR Filing. When IFR filing is impractical, every effort should be made to file a VFR flight plan. GSFC should maximize ATC services such as VFR flight following for the purposes of tracking and traffic awareness.

12.16.2.6. Required Information on Flight Plans. It is imperative that the Operations Monitor phone number, (757)-894-2223, be included on any flight plan that is filed for notification purposes. Care should be taken to list the actual survival equipment available to the aircrew onboard the aircraft, as this information may be used to determine survivability in certain regions and thus acceptable SAR asset risk levels.

12.16.2.7. Closing of Flight Plan. It is the responsibility of the PIC/formation leader to ensure that the proper agency is notified of flight termination.

12.16.2.7.1. NASA and Military Installations. At NASA and military installations, the pilot either shall verbally confirm the closing of the flight plan with tower or base operations personnel or close the flight plan via phone.

12.16.2.7.2. Non-NASA and Non-military Installations. At nonmilitary installations, the pilot shall close the flight plan with flight service through any means of communication available. When appropriate communication links are known or suspected not to exist at the point of intended landing, a predicted landing time in lieu of the actual landing shall be reported to an appropriate aeronautical facility while airborne.

12.16.2.8. IFR Cancellation. Cancellation of an instrument flight plan DOES NOT meet the requirement for closing out the flight plan. When a landing report has been properly delivered, the flight plan will be considered closed out.

12.16.3. GSFC Aircraft Tracking Devices. Certain missions and flight in certain regions may be required to carry an aircraft tracking device. This device allows Aircraft Operations personnel to track the location and certain aircraft parameters in near real time. When required for the

mission, these devices shall be powered on before aircraft takeoff and powered down during post flight procedures. Due to the over-the-horizon nature of these tracking devices, the information provided to potential SAR assets could prove critical in reducing aircrew total exposure time.

12.16.4. Manifest Requirements. It is the PIC's responsibility to ensure that all person assigned to his/her aircraft are documented prior to departure. The PIC of GSFC aircraft shall ensure that a copy of the manifest is on file with a responsible party/agency at the point of departure prior to takeoff. The manifest shall include an accurate list of personnel aboard the aircraft, showing names, and status aboard the aircraft (QNC or aircrew position etc.). Excluding MMA operations, aircraft operating from, and returning to, GSFC WFF which have updated and verified the accuracy of the daily flight schedule may use that document as fulfillment of this requirement.

## 12.17. Transponder Operations and Equipment Suffixes

12.17.1. Transponder Operation. The transponder should be turned to the ON (Normal Operating) position as late as practicable before takeoff, and to OFF or STBY as soon as practicable after completing the landing roll, unless otherwise requested by ATC.

12.17.2. Equipment Suffixes. All GSFC aircraft use one of the following equipment suffixes for ATC purposes. This designation indicates to the controller the equipment capabilities of the aircraft. All aircraft have transponders with encoding altitude capability.

### Equipment Capability Suffix

#### **NO DME**

/X No Transponder

/T Transponder with no Mode C

/U Transponder with Mode C

#### **DME**

/D No Transponder

/B Transponder with no Mode C

/A Transponder with Mode C

#### **TACAN ONLY**

/M No Transponder

/N Transponder with no Mode C

/P Transponder with Mode C

#### **AREA NAVIGATION (RNAV)**

/Y LORAN, VOR/DME, or INS with no Transponder

/C LORAN, VOR/DME, or INS, Transponder with no Mode C

/I LORAN, VOR/DME, or INS, Transponder with Mode C

#### **ADVANCED RNAV WITH TRANSPONDER AND MODE C**

(If an aircraft is unable to operate with a transponder and/or Mode C, it will revert to the appropriate code listed above under Area Navigation.)

/E Flight Management System (FMS) with DME/DME and IRU position updating

/F Flight Management System (FMS) with DME/DME position updating

/G Global Navigation Satellite System (GNSS), including GPS or WAAS, with enroute and terminal capability.

/R Required Navigational Performance. The aircraft meets the RNP type prescribed for the route segment(s), route(s) and/or area concerned.

### **Reduced Vertical Separation Minimum (RVSM)**

Prior to conducting RVSM operations within the U.S., the operator must obtain authorization from the FAA or from the responsible authority, as appropriate.

/J /E with RVSM

/K /F with RVSM

/L /G with RVSM

/Q /R with RVSM

/W RVSM

## **12.18. GPS Availability Prediction ANP Contingencies**

12.18.1. GPS Availability Prediction. The Global Positioning System (GPS) is based on over 24 orbiting satellites. Individual satellites may be off the air for limited periods while they are being remotely worked on. This information is publicly available on a regular basis. With this kind of information, how many working satellites will be in view over a geographic area at any specific time can be determined. This information further provides the predictability of satellites that support the Required Navigation Performance (RNP) of a specific procedure during a specific time. A computer program to determine the likelihood that the Actual Navigation Performance (ANP) will be adequate for the Required Navigation Performance (RNP) of a RNAV (RNP) procedure should be performed when such an approach is required during mission operations.

12.18.2. ANP Contingency Planning. Lack of computed ANP requires contingency planning. Such contingency plans can include extra fuel to hold until arriving with adequate ANP, delaying the departure time to accomplish the same, or considering another instrument procedure that does not require the ANP. ANP forecast requirements are only for RNAV (RNP) approach procedures and certain departure procedures.

## **12.19. Airfields for Stop-and-Go, Refueling and Remain Overnight (RON)**

12.19.1. DoD Airfield Facilities. GSFC aircraft are authorized to operate at and land at all U.S. military and joint civil-military airfields. When planning to operate at other than GSFC WFF, PICs shall ensure that they are aware of and meet airfield operating requirements and, when necessary, have satisfied prior permission required (PPR) requirements. PPRs need not be obtained for planned alternate fields or emergency divert airfields. When returning to the United

States from abroad, PICs shall ensure that they will be able to satisfy U.S. Customs Service clearance requirements at their point of entry airfield.

12.19.2. Aircraft Fuel Purchase. Because the cost of fuel from non-contract commercial sources is considerably higher than that from military or contract sources, PICs shall make every effort to purchase fuel from military or government contract sources.

12.19.3. Non-Standard Facilities. When planning for operations at non-standard airfields, PICs shall ensure that runway length, width and runway and taxiway load-bearing capabilities are adequate. If fueling and or servicing are anticipated, PICs shall ensure that DoD and/or contract services are available.

12.19.4. PIC Responsibilities. PICs are responsible to ensure that adequate rescue support is available for the specific number of occupants.

12.19.5. Operations at Other Airfields. All flights that terminate at an airfield other than Wallops Flight Facility should carry a signed copy of the Daily Flight Schedule signifying authorization to operate GSFC aircraft.

12.19.6. Fuel Samples at Non-Fuel-Surveillance Airfields. Aircraft diverted to a airfield not served by NASA or the DoD and which has a fuel vendor currently providing routine fuel service to an FAR 121 air carrier with a surveillance program, no further action required. If the fuel vendor is not providing routine fuel service to an FAR 121 Air Carrier, the PIC or FE/FM will conduct the following clear and bright fuel quality test to detect possible water or solid contaminants in the fuel by visual inspection:

- a. The fuel provider will be notified that a fuel sample (taken from the truck and / or hydrant cart) providing the fuel must be submitted to the PIC immediately prior to beginning the fueling operation. The sample must be provided in a clean, clear glass container.
- b. The PIC or FE/FM shall let the fuel sample settle for one minute to remove air bubbles. The fuel sample will be inspected to determine that it is clear and bright in appearance and color and free of any water or contaminants.

12.19.7. Fuel Quantity Verification. Fuel quantity verification is performed during certain aircraft routine inspections. Interim fuel quantity verification should be performed for missions or flight segments in which fuel quantity is deemed critical. Outside regularly scheduled verification, fuel quantity systems shall be verified at the discretion of the PIC.

12.19.8. Aircraft Security - Remain Overnight Operations. The PIC shall ensure that appropriate security and aircraft protection plans can be implemented whenever an aircraft is left unattended away from GSFC WFF. The GSFC WFF Security Office should review and authorize planned RON stops at civilian airfields if the PIC believes that security protection requirements set forth in applicable directives cannot be satisfied.

## 12.20. **Weight and Balance**

12.20.1. Weight and Balance Control Requirements. All aircraft are subject to weight and balance control requirements. Certification that the aircraft will remain within weight and balance flight clearance requirements for the duration of flight is signified by the presence of an authorized PIC signature on the NAMIS aircraft release form. Aircraft weight and balance forms and previous weight and balance data shall be retained for each aircraft in Maintenance Control and shall be made available to the PIC for reference. Maximum operating weights, restrictions, and center-of-gravity limitations are delineated in the applicable aircraft flight manual.

## 12.21. Formation Flying

12.21.1. General. Formation flying is authorized only for types of aircraft for which a valid requirement exists.

12.21.2. Preflight Planning and Filing. The formation leader shall execute one flight plan for the entire formation and shall:

- a. Sign the flight plan form as PIC, when applicable
- b. Ensure that all pilots are briefed on en route weather and navigational aids, when applicable
- c. Ensure that each pilot holds a valid instrument rating, and is instrument current, if any portion of the flight is to be conducted under IMC, when applicable
- d. Ensure that a flight leader formation brief is conducted to include, but not to be limited to, loss of sight, lost communication, inadvertent IMC, and emergency procedures. Formation participants shall brief in accordance with Appendix A.
- e. Ensure that necessary aeronautical charts and publications (paper or electronic) are in the possession of each pilot, when applicable
- f. Ensure that formation integrity is maintained in flight for the pre-planned duration

12.21.3. Formation Flight Lighting. To the extent necessary for safety, lighting configuration for formation flights may be varied according to aircraft model and mission requirements. Normally, all aircraft in the flight shall have external lights on and at least one aircraft in the flight shall have lights on bright and the anti-collision light on when aircraft lighting is required.

12.21.4. Formation Takeoffs. Section takeoffs are authorized by the Chief of Flight Operations only when mission requirements dictate such activity. Aircraft must be of similar design and have an identical configuration. All other takeoffs shall be commenced such that the lead aircraft (or preceding aircraft) is airborne prior to the next aircraft commencing takeoff roll. This will eliminate the possibility of simultaneous takeoff aborts.

12.21.5. Formation Ground Roll Lateral Separation. On ground roll, safe lateral separation shall be maintained (in case of the event of a blown tire, aborted takeoff, etc.) with leading aircraft on downwind side (if crosswind exists). Differences in flying characteristics especially stall speeds because of gross weight, and/or configuration shall be considered. Lateral separation for required minimum interval takeoff (MITO) shall be governed by the Chief of Flight Operations.

12.21.6. Formation Instrument Departures. Two-plane formation for subsequent flight into instrument conditions is authorized provided the weather (ceiling and visibility) is at or above the published circling minimums for the runway in use. In the event a circling approach is not authorized, ceiling and visibility must be at least 1,000 feet and 3 statute miles. The flight lead shall maintain VMC until the wingman is safely joined.

12.21.7. Radar Trail Departures. Two-plane formations for subsequent flight into instrument conditions are authorized provided the weather (ceiling and visibility) is at or above the published circling minimums for the runway in use. In the event a circling approach is not authorized, ceiling and visibility must be at least 1,000 feet and 3 statute miles. The wingman will commence takeoff roll after the lead aircraft is airborne and establish a 1nm radar trail until the flight has reached VMC. At this time the wingman may continue to join on the lead aircraft.

12.21.8. Joining Formations. Unless specifically addressed by the MORAP process or the M/FRR process, and approved by the Chief of Flight Operations, the following rules shall apply to joining formations:

- a. Unless specifically briefed, a single aircraft shall not join a formation in the air or one formation shall not join another formation. The order for joining formation in the air shall be given prior to takeoff of the aircraft concerned or by radio. Deviations from this policy are authorized for in-flight emergencies.
- b. When about to join a formation, the pilot of a single aircraft or leader of other formations shall approach the formation position from a safe altitude and from the side. They shall not take their final position until their presence has been acknowledged by the leader of the formation to be joined.
- c. Whenever a lead change is required in a formation of two or more aircraft, it will be accomplished in an unambiguous manner. Pilots shall ensure that both aircraft exchanging the lead are aware of the change through positive acknowledgment by visual hand signals or voice transmissions.

12.21.9. Approach Criteria for Aircraft in Formation. Section approaches in IMC shall only be conducted when necessitated by operational requirements. The following criteria apply:

- a. Instrument approaches, with or without intent to land in IMC, by formations of more than two aircraft are not authorized. Penetration of IMC to obtain VMC by formations of more than two aircraft is not authorized.
- b. Formation flights shall not commence an instrument approach when the reported weather is less than circling minimums for the particular instrument approach in use. In the event a circling approach is not authorized, the ceiling and visibility must be at least 1,000 feet and 3 statute miles. Once an approach has been commenced, leaders may, at their discretion, continue the approach in formation to the minimums prescribed for the type aircraft being flown.
- d. Whenever feasible, aircraft making section instrument penetrations/approaches should transition to landing configuration above the overcast whenever existing weather is below VFR minimums. Formations shall achieve sufficient interval by placing the flaps in a mid-range setting and flying 10 knots above approach speed until



approximately 2 nm from the approach end of the runway. At this point, the lead will detach the wing aircraft, the wingman will transition to full flaps and slow to approach airspeed. Lead may accelerate by approximately 5 KIAS, if necessary but shall ensure that the aircraft is on-speed prior to crossing the runway threshold. If safe landing interval cannot otherwise be obtained, a waveoff shall be executed.

- e. Each aircraft in the formation shall land on runway centerline and then maneuver to the side of the runway closest to the appropriate taxiway once speed is under control and stopping within runway remaining is assured. This will allow each wingman to pass subsequent aircraft if an extended rollout becomes necessary.
- f. Formation approaches by aircraft of markedly different approach performance characteristics are prohibited.
- g. Formation touch-and-go landings are prohibited.

12.21.10. Dissimilar Formation Flight. Pilots involved should perform a preflight brief delineating all aspects of the pending formation flight. Items to be briefed in addition to those identified above shall include items peculiar to either aircraft community (e.g., limitations/capabilities/hazards affecting the flight/rendezvous/join-up/separation).

12.21.11. Formation with Non-NASA or Military Pilots. If a formation is planned to join in flight with non-NASA or non-Military pilots (pilots without specific formation flight training), the flight should be planned such that the stable platform is the non-formation trained pilot.

12.21.12. Unplanned Formation Flight. In the event unscheduled formation flight becomes necessary (such as in-flight emergency inspection), every attempt shall be made by the aircrew involved to conduct a sufficient in-flight brief prior to join-up.

12.21.13. UAS Chase Aircraft Position and Communication. The chase plane should fly in a position roughly 500 feet aft and 500 feet to either side of the UAS being chased so as to ensure clearance in all quadrants, unless operational constraints require otherwise. Positive communication must be maintained at all times between the aircraft, the UAS and any controlling agency.

## 12.22. **Flight Deck Access and Security**

12.22.1. Restriction of Access to the Flight Controls. At least one pilot must have full access to the flight controls and maintain constant vigilance during flight. All aircrew members shall be in their assigned seats for critical phases of flight.

12.22.2. Absence from Primary Aircrew Station. Absence from a primary aircrew station is not permitted during critical phase of flight (takeoff, departure, approach and landing). At other times no more than one Primary Aircrew member may leave their station, and then only when necessary to perform duties in connection with the operation of the airplane, or in connection with their physiological needs.



12.22.3. Flight Deck / Jumpseat Access. The PIC may exclude any person from the flight deck in the interest of safety. It is critical that Secondary Aircrew members strictly control access to the flight deck. Non-aircrew personnel may be permitted entry to the flight deck upon authorization from the PIC. Once in the flight deck, the actions of non-aircrew should be monitored closely.

12.22.4. Flight Deck Safety. NASA aircraft are not necessarily configured to provide physical barriers to flight deck entry. For aircraft which either do not possess a flight deck door or aircraft for which the flight deck door typically remains open, NASA aircrew provide the first and most important protection of the flight deck.

12.22.5. Limiting Non-Aircrew Movement. Limiting non-aircrew movement during critical phases of flight is mandated. Additionally, PICs should consider limiting non-aircrew movement while flying in the vicinity of certain high risk regions.

12.22.6. Unusual Interest. Aircrew should be cognizant of persons showing unusual interest in the aircraft flight deck or making attempts to enter without authorization.

12.22.7. Sterile Cockpit Environment. FAR prohibits all activities in the flight deck not required for the safe operation of the aircraft during critical phases of flight. Critical phases of flight include all ground operation involving taxi (does not include pushback), takeoff, and landing, and all other flight operations conducted below 10,000 feet MSL. The Sterile Cockpit Environment is not in effect when the aircraft is not in motion with the parking brake set. The flight crew can coordinate flight deck entry via the interphone system.

12.22.8. Seat Swaps. No flight deck seat changes are to be made below 1,000 feet.

12.22.9. Manipulation of Flight Controls. Manipulation of GSFC aircraft flight controls during research flights by other than a designated GSFC pilot is not permitted.

## 12.23. **Automation**

12.23.1. Automation General Policy. Pilots shall be proficient in all the capabilities of their aircraft including the automated systems. NASA GSFC policy is to fly the aircraft using the highest level of automation, consistent with specific mission requirements, and the requirement to maintain basic flying skills. Select the level of automation that optimizes situational awareness while reducing pilot workload. Hand flying to maintain proficiency should only be accomplished in the correct threat environments.

12.23.2. Automation Assistance. Pilots should realize the more complex the situation, the higher the threat/risk level. As threats increase, automation usage when properly applied, will improve overall performance and safety. Pilots are authorized to choose an appropriate level of automation consistent with a changing flight environment.

12.23.3. Multi-Pilot Automation Specific Policy. It is easy with high levels of automation to lose track of individual pilot roles and responsibilities. The following guidelines should assist GSFC pilots by providing standardized practices.

12.23.3.1. Autopilot On Procedure. When the autopilot is on, the Pilot Flying (PF) will normally manipulate the Master Control Panel (MCP - this is the general term for the pilot-to-automation interface panel) and the Flight Management Computer (FMC) or Global Positioning System (GPS) that feeds the autopilot. In aircraft which are not equipped with auto-throttles, the PF also retains control of aircraft power adjustments. The Pilot Monitoring (PM) should verify inputs and changes.

12.23.3.2. Autopilot Off Procedure. When the autopilot is off, the PF will call for all changes to the MCP and the FMC/GPS. The PM will make the input and the PF will verify. The crew should brief and clearly understand their respective duties.

## 12.24. **Verbalize, Verify, and Monitor (VVM)**

12.24.1. VVM Policy. Verbalization between crewmembers is extremely important for flight deck situational awareness. Many threats and errors can be countered by effective communication. VVM is a key element of the real-time risk management process and is an effective strategy in managing automated aircraft. Verbalize – Verify – Monitor: should be used during every phase of the flight, beginning during preflight planning until you climb out of the aircraft.

- a. Verbalize – Outwardly explain what you are doing or expect a system to be doing
- b. Verify – That the system is doing what is expected
- c. Monitor – Validate that a system continues to operate as expected

12.24.2. VVM Processes. Pilots shall “verbalize, verify and monitor” in the following manner:

- a. Prior to executing any route changes in the FMC/GPS, the pilot making entries should verbalize the change(s). Both pilots should verify the change(s) and monitor for expected aircraft performance.
- b. With any mode changes to the MCP, the PF should verbalize the change(s). Both pilots should verify the change(s) using the autopilot annunciator system and monitor for expected aircraft performance.
- c. When selecting the Autopilot (or Auto throttle if installed) on or off, the PF should verbalize the change. Both pilots should verify the change and monitor for expected aircraft performance

## 12.25. **Functional Check Flights (FCF)**

12.25.1. FCF Flights. Functional Check Flights, also referred to as a Post Maintenance Test Flights, are performed after repair or replacement of certain damaged or worn components, or extensive maintenance has been performed, or when deemed necessary by the Airworthiness and Maintenance Manager. For the sake of this document, ‘Repair or replacement’ is defines as: like

components used to replace faulty items or a repair which involves restoration of the aircraft to its original configuration. Aircraft modifications are specifically precluded from this definition.

12.25.2. FCF Weather Conditions. Functional test flights (maintenance test flights) will be conducted during daylight (i.e. must neither takeoff nor land during the hours of darkness) with all maneuvers being accomplished clear of clouds. Exceptions to this policy must be requested by the PIC with the verbal or written approval from the Chief Flight Operations

12.25.3. FCF Crew Makeup. The PIC of an FCF flight shall be a designated GSFC designation FCF Pilot. All other Primary Aircrew members must be current and qualified, in type.

## 12.26. **Unusual Maneuvers inside Controlled Airspace**

12.26.1. Operations Below Class B Airspace. When under ATC control, unless otherwise authorized, each person operating a large turbine engine-powered airplane to or from a primary airport for which Class B Airspace area is designated must operate at or above the designated floors of the Class B Airspace area while within the lateral limits of that area. Large turbine powered aircraft operating to and from a primary airport are prohibited from operating below the floor of any portion of Class B Airspace, unless specifically authorized by ATC. A visual approach does not constitute authorization to operate below the floor of Class B Airspace. A visual approach through Class B Airspace should be conducted only with reference to the chart depicting the Class B Airspace, bearing in mind:

- a. Descent must be regulated so that the aircraft does not penetrate the floor of any segment of Class B Airspace.
- b. Since the various segments have floors or different altitudes, an inadvertent lateral excursion through the side of on segment could place the aircraft below the floor of an adjoining segment. This would also constitute a violation.

12.26.2. Unusual Maneuvers within Class B, C, or D Airspace. Pilots shall not perform or request clearance to perform unusual maneuvers within class B, C, or D airspace, other than at GSFC WFF, if such maneuvers, were not pre-approved and are not essential to the performance of the mission. ATC personnel are not permitted to approve a pilot's request or ask a pilot to perform such maneuvers. Unusual maneuvers include unnecessary low passes, unscheduled fly-bys, climbs at very steep angles, practice approaches to altitudes below specific minimums (unless a landing is to be made), or any so-called flat hatting wherein a flight is conducted at a low altitude and/or a high rate of speed for thrill purposes.

## 12.27. **Airworthiness and Maintenance.**

12.27.1. Airworthiness. GSFC aircraft are deemed airworthy provided:

- a. Certificate of Airworthiness. Possess a signed NASA airworthiness certificate in accordance with NPR 7900.3 or an airworthiness certificate from another certifying federal agency (such as the FAA or DoD).

- b. Safety of Flight Release. If modified from the airworthiness certificate baseline configuration, NASA aircraft must additionally possess a signed Safety of Flight Release (SOFR).

12.27.2. NAMIS Flight Release. Maintenance release of NASA GSFC aircraft, for each specific flight or segment of flights, is conducted in accordance with the GSFC General Maintenance Manual (GMM), 830-GMM-0001.

12.27.3. Maintenance Turns after Release. All engine performance turns requested by maintenance involving the participation of aircrew after the aircraft has been released, shall be coordinated through, and are at the discretion of, the PIC.

12.27.4. Placards. When a maintenance discrepancy is deferred in accordance with the MEL, an INOPERATIVE label is placed by the effected component or control panel. These placards will remain in place until maintenance personnel correct the discrepancy and document it in NAMIS.

12.27.5. Aircraft Configuration Summary. An aircraft configuration logbook shall be prepared by the Airworthiness Engineer and assigned Project Pilot for each modified aircraft. The logbook shall contain all pertinent modifications and any limitations or constraints applicable to the new configuration.

12.27.6. PIC Aircraft Acceptance (Maintenance). Regardless of Minimum Equipment List data, the PIC must consider many complex variables when determining the suitability of an aircraft for a specific mission. The PIC has the authority to cancel any flight when the condition of the aircraft is deemed unsuitable for the scheduled mission.

12.27.7. Maintenance Action after Release. If maintenance is performed upon an aircraft which has been released for flight, and accepted by the PIC, the assigned mechanic will advise the PIC of his/her presence on the aircraft. The aircraft is considered temporarily 'not safe for flight.' Maintenance control personnel will make appropriate NAMIS entries. Upon successful completion of the maintenance action, maintenance control shall verify that all tools have been accounted for (ATAF), that any required QA inspections have been completed, and that the maintenance action did not trigger the requirement for further inspection or FCF. Maintenance control shall complete the required NAMIS entries then, communicate to the aircrew that the aircraft is again 'safe for flight'.

12.27.8. Engine Trend Analysis. This program allows maintenance to monitor the condition of engines and perform maintenance based on condition rather than interval. This generates considerable cost savings. At a minimum, pilots should complete an engine trend analysis card, for aircraft incorporated in the program, for each flight over one hour in duration.

12.27.9. Post-Flight Aircraft Maintenance Procedures. The PIC will ensure that all mechanical irregularities occurring during a flight as well as any irregularities noted during preflight inspections and checks are entered into NAMIS. Although verbal discussions with maintenance personnel are encouraged, verbal reporting of maintenance irregularities is not acceptable.

## 12.28. Oxygen Requirements

12.28.1. Oxygen Masks Preflight Inspection. Before takeoff, each aircrew member shall preflight their oxygen equipment to ensure that the oxygen mask is functioning, properly worn or stowed, connected to the appropriate supply terminals, and that the oxygen supply and pressure are adequate for use.

12.28.2. Oxygen Availability for Aircrew. Regardless of aircraft or altitude, oxygen or approved protective breathing equipment for aircrew members is required. Without supplemental oxygen available to aircrew members, a GSFC aircraft may not be operated above 10,000 feet.

12.28.3. Oxygen Requirements for Passengers. Without oxygen available to passengers and non-aircrew/QNCs, a GSFC aircraft may not be operated above 10,000 feet.

12.28.4. Pressurized Aircraft above FL250. In a multi-piloted aircraft, above flight level 250, if either pilot leaves the controls of the airplane temporarily, the remaining pilot must wear and use an oxygen mask secured, sealed and supplying oxygen. Movement of a non-designated pilot to that station does not fulfill this requirement.

12.28.5. Pressurized Aircraft above FL410. Above flight level 410, one flight crewmember at the controls must wear and use at all times an oxygen mask secured, sealed, and supplying oxygen.

12.28.6. Loss of Pressurization. If loss of pressurization occurs and oxygen systems are suspect, an immediate descent shall be made as soon as possible to a cabin altitude at or below 10,000 feet.

12.28.7. Pressurized Aircraft with Cabin Altitudes above 10,000 Feet. All aircrew members must wear and use an oxygen mask secured, sealed, and supplying oxygen at cabin altitudes above 10,000 feet. Pressurized cabin aircraft in which the mission was planned to operate continuously unpressurized and reviewed through the MORAP and M/FRR processes, may use Unpressurized Aircraft procedures for oxygen use.

12.28.8. Unpressurized Aircraft Aircrew. Each aircrew member of an unpressurized aircraft shall use oxygen continuously when flying at altitudes above 10,000 feet through 12,000 feet MSL for more than 30 minutes duration; and for any duration of time above 12,000 feet MSL. Aircrew participating in moderate physical activity (loadmasters) shall use supplemental oxygen continuously when altitude exceeds 10,000 feet.

12.28.9. Unpressurized Aircraft Non-Aircrew/QNCs. When oxygen is not available to other occupants (non-aircrew/QNCs), altitude exposure between 10,000 and 12,000 feet shall not exceed 3 hours duration.

12.28.10. Tactical Jet and Tactical Jet Training Aircraft. Oxygen shall be used by all occupants from takeoff to landing. Emergency bailout bottles, when provided, shall be connected prior to takeoff.

12.28.11. Quantity of Oxygen. The quantity of oxygen aboard an aircraft before takeoff must be sufficient to accomplish the planned mission. In aircraft carrying passengers, there shall be an adequate quantity of oxygen to protect all occupants through normal descent to 10,000 feet.

12.28.12. Pre-Oxygenation. Pre-oxygenation (uninterrupted breathing of aircraft oxygen systems) for 30 minutes or more prior to altitude exposure above 18,000 feet significantly reduces the risk of Decompression Sickness (DCS). Oxygen use improves night vision performance at altitudes above 5,000 feet.

## 12.29. Runway Requirements

12.29.1. Minimum Runway Length. All projects and missions should be flight-planned to operate on runways which comply with minimum recommended runway lengths, when prescribed, within individual aircraft flight operation manuals. Any circumstance resulting in either a reduction in runway length from the recommended aircraft flight manual value or a calculated takeoff roll, accelerate-stop, accelerate-go, or landing ground roll distance with less than 10% margin shall be reviewed for risk mitigation through the MORAP process and approved by the Chief of Flight Operations. Alternate airfield availability for varying leading or trailing-edge flap conditions and engine-out operations should be considered in risk analysis and mitigation strategies.

12.29.2. Required Runway Composition. All GSFC aircraft missions should be planned to operate on hard surfaced, paved, or concrete runways with appropriate load bearing capacity. Operations planned to incorporate unimproved or minimally improved surfaces, such as coral or gravel, shall be reviewed for risk mitigation through the MORAP process and approved by the Chief of Flight Operations.

## 12.30. Use of Aircraft Lighting

12.30.1. Aircraft Lighting. Except when the nature of operations requires different lighting displays (i.e., formation flight, night vision device (NVD) operations, emergency signals, etc.) or the model aircraft configuration precludes compliance, the following rules shall apply.

12.30.2. Position Lights or Navigation Lights. These lights shall be displayed whenever external or APU power is applied to an aircraft. Standard position or navigation lights shall be displayed during the period 30 minutes before official sunset until 30 minutes after official sunrise or at any time when the prevailing visibility as seen from the cockpit is less than 3 statute miles. During these conditions, they shall be displayed:

- a. Immediately before engine start and anytime the engine(s) is running.
- b. When the aircraft is being towed unless the aircraft is otherwise illuminated.



- c. When an aircraft is parked and likely to cause a hazard unless the aircraft is otherwise illuminated or marked with obstruction lights.

12.30.3. Anti-Collision Lights. Anti-collision lights shall be used immediately before engine start and at all times when the aircraft engine(s) is in operation, except when the use of such lights adversely affects ground operations. They may be turned off during flight through clouds when the rotating light reflects into the cockpit.

12.30.4. Landing/Taxi Lights. The use of landing/taxi lights is an effective means of illuminating surface hazards during taxi movements at night and alerting all concerned of an aircraft's presence/position in flight. Landing/taxi lights should be utilized for all taxi movements during the hours of darkness unless a taxi signalman is directing the aircraft. Use of such lights during landing approaches (both day and night) within class B, C, or D airspace is recommended when meteorological conditions permit. Good judgment should be exercised to avoid blinding pilots of other aircraft that are either airborne or on the ground. Use of landing/taxi lights is recommended in areas of high bird concentration.

### 12.31. **Flight with Night Vision Devices (NVD)**

12.31.1. Flight Operations with Night Vision Devices (NVD). NVDs greatly expand the capability and survivability of night flight when used by trained pilots and practiced regularly. Flying with NVDs is authorized only for types of aircraft for which a valid requirement exists.

12.31.2. NVD Operations Approval. Operations requiring NVDs will be approved through the MORAP process. The mission Threat Hazard Assessment shall address and place mission-specific operation limitations on NVD use.

12.31.3. NVD IMC Scan. NVDs are compatible for both VMC and IMC flight. However, when flying with NVDs in IMC, the primary flight reference shall be an instrument scan (pilot flight and navigation instruments). Inadvertent IMC procedures shall be briefed and used as required for all NVD flights.

12.32. NVD Instructors. The Chief of Flight Operations will establish requirements for training NVD instructors and designate NVD instructors in writing. Instructors will make every effort to attend an approved NVD instructional course on an annual basis.

12.32.1. NVD Training. NVD aircrew shall complete an approved initial NVD training syllabus and be certified by the Chief of Flight Operations. Training should include demonstrations of the limits to NVD capabilities imposed by environmental conditions and human factors. In addition to the initial training syllabus, NVD qualified aircrew must receive annual refresher training from a designated NVD instructor. This training will be limited to a ground-based lecture and participation at a night imaging lab, if one is available. Prior military training may be substituted for the initial training requirement.

12.32.2. NVD Currency. NVD designated aircrew shall meet additional currency requirements as specified by a dedicated TSRB. Such requirements will be based upon pilot experience, and



the individual aircraft flight manual. Qualification / currency requirements may vary for different mission areas (e.g. confined areas, shipboard operations, overland navigation, NOE navigation, etc). Simulators may be used to support such training, but shall not replace aircraft hour requirements established by the TSRB.

12.32.3. Training Flights. The operations department will make every effort to ensure that aircrew maintain required NVD currency. At a minimum, the PIC should be current for NVD training flights. If the PIC is not current, both aircrew must receive refresher training from an NVD instructor prior to the flight. For mission events, both the PIC and copilot shall meet appropriate currency requirements.

12.32.4. Mixing NVDs. Mixing different types of NVDs between aircrew within individual aircraft is not authorized. If NVDs are to be utilized during flight in a multi-place cockpit, both pilots must don and doff the NVDs at the same time. In other words, either both pilots may wear NVDs or neither may wear NVDs.

12.33. Landing While on NVD. Unless approved via the MORAP process, pilots of fixed wing aircraft must remove their NVD's prior to descending below 3,000 ft AGL during the terminal portion of the flight. Rotary wing aircraft may utilize NVDs for landing if approved by the Chief of Flight Operations.

## 12.34. **Aerobatic Flight**

12.34.1. Aerobatic Flight Policy. Aerobatic flight is useful in training high gain tasks under distracting/ adverse physiological conditions. However, it is of the utmost importance that aerobatic training be well regulated as to time, place, and conditions that enhance safety of flight.

12.34.2. Aerobatic Flight Precautions. Aerobatic flight maneuvers, shall not be performed:

- a. If prohibited by the aircraft flight manual or other directives applicable to a particular model aircraft;
- b. Over any congested area of a city, town, or settlement;
- c. Over an open air assembly of persons;
- d. Within the lateral boundaries of the surface areas of class B, C, D, or E airspace designated for an airport;
- e. Within 4 nm of the centerline of any Federal airway;
- f. Below an altitude of 1,500 feet above the surface;
- g. When flight visibility is less than 3 statute miles.

12.34.3. Designated Aerobatics Areas. In accordance with FAR subpart 91.303 , GSFC Pilots are encouraged to conduct aerobatic flight within the limits of R-6604 and WFF tower monitoring radar for air traffic.

## 12.35. **Public Disturbance**

12.35.1. Reducing Flight-Related Disturbances. Flights of GSFC aircraft shall be conducted so that a minimum of annoyance is experienced by persons on the ground. It is not enough for the pilot to be satisfied that no person is actually endangered. GSFC aircraft, whenever feasible, shall be flown in such a manner that non-participants do not believe they or their property are endangered. The following specific restrictions apply in view of the particularly unfavorable effect of the fear, extreme annoyance, and damage that can be inflicted.

12.35.2. Aerial Refueling Disturbances. Aerial refueling over densely populated areas shall be avoided whenever possible.

12.35.3. Releasable External Stores/Cargo. Pilots carrying external stores/cargo shall avoid overflying populated areas whenever possible.

12.35.4. Temporary Flight Restrictions. Aircraft shall not be operated within an area designated by a NOTAM within which temporary flight restrictions apply except as permitted via mutual agreement.

12.35.5. Flat Hatting. Flat hatting or any maneuvers conducted at low altitude and/or a high rate of speed for thrill purposes over land or water are prohibited. Any acts conducted for thrill purposes are strictly prohibited.

12.35.6. Wild Fowl. PICs shall take steps to prevent aircraft from frightening wild fowl or driving them from their feeding grounds. When it is necessary to fly over known wild fowl habitations, care should be used to minimize such disturbances.

12.35.7. Noise Sensitive and Wilderness Areas. These areas should be avoided when at altitudes of less than 3,000 feet AGL except when in compliance with an approved:

- a. Traffic or approach pattern
- b. VR or IR route
- c. SUA

12.35.8. Noise Sensitive Area Mission Planning. Noise sensitive areas should be avoided during mission development of routes unless the 3,000-foot criteria can be observed.

12.35.8.1. Noise Sensitive Areas. Breeding farms, resorts, beaches, and those areas designated by the U.S. Department of Interior as national parks, national monuments, and national recreational areas are examples of noise sensitive areas.

## 12.36. **Airport Security Compliance**

12.36.1. Airport Security. Each individual airport has a good deal of latitude in establishing unique security requirements. GSFC crew should be prepared to adapt to procedural changes or modifications at various airports. Crewmembers reporting to an aircraft already established at a deployed location must check in with the PIC, PM and/or senior flight operations representative for badging requirements or specific security processes.

12.36.2. Badging Requirement. All GSFC crew members must present their ID/badge when requested by NASA or other airport security personnel.

12.36.3. Aircraft Security at GSFC. Aircraft security at GSFC's WFF is accomplished in accordance with GSFC/WFF Aircraft Security Plan.

## 12.37. **Onboard Illness / MedLink**

12.37.1. On Board Illness or Injury. MedLink – Medical Emergency services should be used any time a GSFC crew requires medical consultation to determine the best course of action in flight or if the health of a person onboard is in question prior to, or after, departure. MedLink physicians are specifically trained and are responsible for:

- a. Evaluation of the medical condition of an ill or injured individual. MedLink can help evaluate a person's suitability for travel.
- b. Evaluation of the medical condition of an ill or injured individual and providing onboard treatment instructions.
- c. Evaluation of and assuming responsibility for continuing the flight to scheduled destination or recommendation for diversion.
- d. Providing information on availability / capability of ambulance, EMT, hospital and specialty care available at cities/airports.
- e. Coordination and providing for all necessary medical preparations for the flight's arrival and follow-up status reports.

## 12.38. **Misconduct/Intoxication of Aircraft Occupant**

12.38.1. Misconduct. The PIC has the authority to request removal of any passenger or crew member should he/she feel such action is in the interest of safety or that failure to remove that individual could cause interference with crew duties or who may be detrimental to the reasonable safety and health of other persons on board.

12.38.2. Intoxication. The PIC shall refuse to carry any person who appears to be intoxicated or under the influence of drugs.

## 12.39. **Hijack**

12.39.1. Hijack of GSFC Aircraft. It is critical that GSFC primary aircrew maintain control of the flight deck at all costs. The primary aircrew should, through all means possible, maintain flight path guidance and communications to and from ATC and should land as soon as possible at a time and place chosen by the PIC.

12.39.2. Flight Deck Integrity. All non-primary aircrew should protect the integrity of the flight deck by any and all appropriate measures and available resources. Control of the airplane must always remain in the hands of GSFC aircrew; no matter what is threatened or what events occur in the cabin.

12.39.3. Transponder Code. The flight deck crew will communicate to ATC that a hijack attempt is in progress by switching to transponder code 7500 (U.S. and ICAO). Do not select code 7700 during a hijack. Once selected to 7500 do not change code to 7700. ATC will establish communication and coordination with the FAA, FBI, the Military, the State Department, the Coast Guard and/or other appropriate agencies.

12.39.4. Prepare for Evacuation. On the ground: set landing flaps and ground spoilers to the positions used for evacuation. Leaving flaps down after landing is not an effective way to signify that situation.

12.39.5. Deny Aircraft Movement. Once on the ground the aircraft should be disabled from flight and blocked from motion. Heavy objects such as unmanned vehicles or other obstructions should be placed ahead and behind the aircraft. Once the aircraft is blocked and/or disabled the aircrew should escape, if possible.

12.39.6. Cooperation. Full cooperation should be given to United States, foreign national authorities and ground personnel.

## 12.40. **Aircraft Intercept**

12.40.1. Intercept of GSFC Aircraft. It is imperative that the target of interest (TOI) aircrew immediately comply with direction from either ATC or military intercept aircraft. United States military fighter aircraft may be prepared to shoot down aerial threats if the National Command Authorities orders them to do so.

12.40.2. Monitoring Guard Frequencies. Pilots, if capable, should maintain a listening watch on VHF Guard 121.5. Fighter pilots will comply with prevention of inadvertent Traffic Collision Avoidance System (TCAS) initiation procedures. If launched, turn in the direction of flares.

## 12.41. **Carriage of Firearms and Weapons**

12.41.1. Carriage of Firearms and Weapons. No person may carry a firearm or taser on GSFC aircraft except if duly authorized by the GSFC WFF Facility Director. Such persons include: Officials of Federal / State / Municipal / or County governments who are authorized to carry firearms or other dangerous weapons and are doing so in the line of duty.

12.41.2. Other Authorized Personnel. Other persons specifically authorized by the GSFC/WFF's Security Department may also carry weapons onboard provided they carry the proper credentials.

12.41.3. Federal Law Enforcement. Federal law enforcement officers, due to the nature of their work, may be considered to be on duty status at all times. Other officials normally authorized to carry a weapon, but not on official duty, (i.e., state, city or county officer on personal travel) will not be permitted to carry a weapon.

12.41.4. Not Authorized. Bondsmen, private security guards, bounty hunters and law enforcement officers while serving as bondsmen or bounty hunters are prohibited from traveling with weapons of any kind.

12.41.5. Weapons Transport. Other than as detailed above, when authorized by the GSFC/WFF Facility Director and the GSFC/WFF security department, any firearms or other dangerous weapons must be carried unloaded and stowed in a baggage compartment not accessible to persons in flight.

12.41.6. Survival Gear Firearms. Firearms which are a component of certain survival gear pack-outs must be authorized by the GSFC/WFF Facility Director and the GSFC/WFF Security Office. They must remain in the authorized storage device, properly inventoried, and in compliance with all federal and state laws.

12.41.7. Military Flights. FARs allow the carriage of weapons aboard flights conducted for the military forces of the government of the United States when the total cabin load is under exclusive use by those military forces.

12.41.8. PIC Authorization. The PIC must be made aware of all firearms (loaded or unloaded) on board his/her aircraft.

## 12.42. Briefings

12.42.1. Flight Personnel and Passenger Briefing. The PIC of a GSFC aircraft shall ensure that prior to takeoff, flight personnel and passengers are adequately instructed on personal safety and survival equipment and procedures required for the particular aircraft in which they embark.

12.42.2. Crew Safety Briefing (Planeside Brief). The PIC shall conduct a safety briefing with all members of the aircrew before the first flight of any mission/project. If the crew compliment remains the same, subsequent briefings are at the PICs discretion. The briefing should normally be conducted with the entire crew. In the event that a briefing with the entire crew at the beginning of a mission/project is not possible, the PIC will review the brief with the absent aircrew member at the first available opportunity. The crew safety brief should be tailored to the individual flight and circumstances however, at a minimum will include:

- a. Purpose of the flight
- b. Flight route and duration and anticipated crew duty day
- c. Expected weather and flight conditions
- d. Review the manifested number of occupants
- e. Review AFSRB identified mission Hazards
- f. Review onboard chemicals, their locations and the MSDS information
- g. Review onboard UPS systems and their locations
- h. Review assigned mission rules, aircraft limitations and constraints

- i. Review emergency procedures and responsibilities (ground evacuation, Fire of Unknown Origin/Fuselage Fire, Smoke and Fumes, Ditching, Loss of Cabin Pressurization)

#### **12.43. Normal and Emergency Checklists**

12.43.1. Normal and Emergency Checklists. Aircraft flight manual checklists shall be provided in each aircraft for mandatory use by pilots to assist them in preparing the aircraft for the various phases of flight. They shall be followed carefully and in their given order to ensure that all steps are performed.

#### **12.44. Reclining Seats**

12.44.1. Reclining Seats. Personnel embarked in aircraft equipped with seats that have a reclining back shall be instructed to lock the seat in the erect position for all takeoffs, landings, and emergencies. Reclining seats that will not lock in the erect position shall not be used for passenger transport.

#### **12.45. Hearing Protection**

12.45.1. Hearing Protection. Any Air/ground crewmember required to be on the ramp to perform his/her duties is required to wear hearing protection. Hearing protective devices will be furnished by NASA or the Aircraft Maintenance and Operations Contractor through the Maintenance Control Office.

#### **12.46. Carry-On Baggage**

12.46.1. Carry-On Baggage. It is required that each article of carry-on baggage be properly stowed before aircraft movement for departure. Carry-on bags may be weighed and/or made available for examination by cognizant aircrew. Carry-on baggage weight limits may be applied for weight and balance purposes.

#### **12.47. Headsets – Personal Headsets / Noise-Cancelling Headsets**

12.47.1. Headsets – Personal Headsets / Noise-Cancelling Headsets. NASA headsets are provided for aircraft not requiring the use of a helmet. Personal headsets may be used on the flight deck for communication purposes only after receiving approval from a qualified NASA avionics technician or aviation electrician for compatibility with aircraft intercom systems.

#### **12.48. Portable Electronic Devices**

12.48.1. Portable Electronic Devices. Certain electronic devices are prohibited for use onboard GSFC aircraft. Prohibited by federal regulations:

- a. Televisions / radios (AM / FM / Citizen Band)

- b. Any electronic remote control device that signals / controls another electronic device (e.g., remote controlled games / toys).
- c. Respirators or ventilators onboard the aircraft when operated by use of an aircraft electrical outlet or dry, gel or wet cell batteries.

12.48.1.1. Exceptions. Exceptions are made for:

- a. Any medically prescribed physiological instrument (e.g., hearing aids, pacemakers).
- b. Use of Oxygen Concentrators under certain limited circumstances

## 12.49. **PA Announcements during Delays and Irregular Operation**

12.49.1. PA Announcements during Delays and Irregular Operation. PA announcements concerning the status of the flight during delays and/or irregular operations should be made as frequently as deemed appropriate by the PIC, even if there is no change in the status of the flight since the last announcement. It is imperative that passengers and secondary aircrew receive the most accurate information available concerning a flight delay.

## 12.50. **Animal / Pet Carriage**

12.50.1. Animal / Pet Carriage. No animals or pets may be carried on GSFC aircraft without written consent from the Chief of Flight Operations.

## 12.51. **Cargo in Cabin**

12.51.1. Cargo in Cabin Compartment. Cargo in the cabin compartment shall be stowed and secured by appropriate aircrew or maintenance personnel.

## 12.52. **Dangerous Goods / Hazardous Materials (HAZMAT)**

12.52.1. Dangerous Goods / Hazardous Materials (HAZMAT). Dangerous goods / HAZMAT carried aboard GSFC aircraft must be carried in accordance with 49 CFR 171-175, or reviewed by the Center's AFSRB for significant risk to health, safety, or property when transported.

## 12.53. **Aircrew Documentation and Photo Identification**

12.53.1. Documentation Required Of Crewmembers. Each aircrew members shall keep their NASA Common Access Card (CAC), passport (if traveling internationally), medical, and FAA licenses in their possession while on duty. The FARs require airmen to be in possession of current airman and medical certificates while exercising the privileges of those certificates.

12.53.2. Photo I.D. Requirements. Federal Aviation Regulations require that each person must carry photo identification when exercising the privileges of a pilot certificate. Your NASA Common Access Card (CAC) card may be used as the means to meet this regulatory requirement. When necessary, a driver's license or passport may be substituted. All Aircraft Operations personnel shall adhere to the following:



- a. Mechanics, technicians, and aircrew members shall wear CAC cards on the outermost garment above waist level while in all aircraft operations spaces and on the flight line (unless actively working on equipment, an aircraft, or aircraft component in which it would become a direct FOD or safety hazard)
- b. All aircraft operations personnel shall challenge all unidentified individuals and report their presence to supervisory personnel.

#### **12.54. Non-Aircrew & Passenger Pregnancy**

12.54.1. Non-Aircrew & Passenger Pregnancy. Clearance to fly shall be evaluated by the Chief of Flight Operations. Consideration for such clearance should be based on the mission requirements and desire of the pregnant individual to fly; the formal recommendation and concurrence of her obstetrician; and the recommendation and concurrence of a NASA FS or FAA AME. The member shall submit her request to the Chief of Flight Operations with these endorsements. Her request should acknowledge an understanding of the potential risks of continued flying during pregnancy.

#### **12.55. Handicapped or Disabled Considerations**

12.55.1. Handicapped or Disabled Considerations. The Aircraft Office strives to provide nondiscriminatory availability to its aircraft in accordance with Department of Transportation regulations. However, certain aircraft missions and configurations may limit the ability to provide specialized handling to individuals with mobility challenges. Individual situations shall be reviewed for safety consideration by the ASO.

### **13. Helicopter/Tiltrotor Operations**

#### **13.1. General Helicopter/Tiltrotor Operations**

13.1.1. Ground Operations. Air taxi/ground operations shall be conducted with sufficient horizontal separation to preclude damage to aircraft, property, or personnel. Pilots shall operate with the minimum required power while on the ground and shall be particularly alert to prevent foreign object damage (FOD) and/or gust damage to their own and other aircraft.

13.1.2. Autorotation. Practice autorotation shall be conducted within the limits of the field boundary over a surface upon which a full autorotation can be safely completed and that is readily accessible to crash, rescue, and firefighting equipment. Practice autorotation shall require the specific approval of the tower.

13.1.3. Helicopter/Tiltrotor Terrain Flight Operations. Terrain flights (low level, contour, nap of the Earth (NOE)) shall be conducted only as operational necessity dictates and executed within designated training areas, or as published procedures and clearances prescribe.

13.1.4. Helicopter/Tiltrotor Night Hover Operation over Water. Night/low visibility hover operations over water shall be conducted only when a natural horizon visible from the cockpit is available to assist the pilot in establishing/maintaining a stable hover.

13.1.5. Helicopter Extra-Cabin Operations. All aircrew shall remain inside the aircraft cabin during all flight regimes unless deemed by the PIC to be operationally necessary for safety of flight or mission accomplishment. Any acts conducted for thrill purposes are strictly prohibited.

13.1.6. Helicopter/Tiltrotor Operations Over Water. GSFC Helicopter and tiltrotor aircraft shall minimize the over-water time required during any mission. If required to operate over Open Ocean, in a single engine helicopter, the helicopter must maintain 1.5 times greater altitude than its lateral distance to the shoreline but never greater than 1 NM. Any GSFC helicopter that is assigned a mission to operate over water which exceeds these parameters shall be reviewed through the MORAP process for crew makeup, survival training, and survival equipment requirements.

## **14. Reduced Vertical Separation Minima (RVSM) Operations**

### **14.1. RVSM Policy.**

14.1.1. RVSM Operations. Designated airspace utilizes RVSM as a safe method for reducing vertical separation. RVSM reduces vertical separation from 2,000 feet to 1,000 feet.

14.1.2. RVSM Airspace. The RVSM designated airspace in between and including FL290 and FL410 is reserved for RVSM operations. Only RVSM authorized aircraft are allowed into this block of airspace. Any GSFC aircraft authorized to fly in RVSM airspace must have been prior certified by the FAA as meeting the airworthiness requirements for RVSM operations. This approval is based on each aircraft having:

- a. Two independent altitude measurement systems meeting RVSM requirements.
- b. One secondary surveillance radar (SSR) altitude reporting transponder.
- c. One altitude alert system.
- d. One automatic altitude control system.

14.1.3. RVSM Training. All pilots conducting reduced vertical separation minimum (RVSM) operations shall conduct annual training as prescribed by the TM. Records of RVSM training shall be retained in each pilot's training record.

14.1.4. Transitional Airspace. Transitional airspace has been designed to provide altitude transitions to / from RVSM airspace and conventional airspace. RVSM compliant and non-RVSM compliant aircraft are permitted to fly through transitional airspace. Appropriate separation will be provided by ATC for RVSM compliant and non-RVSM compliant aircraft.

14.1.5. RVSM Normal Procedures. The following RVSM operating requirements shall be accomplished:

- a. When passing transition altitude/level both pilots must respond as follows: PM: "TRANSITION ALTITUDE / LEVEL, \_\_\_\_ SET" PF: "\_\_\_\_ SET"
- b. Upon reaching initial cruise flight level, pilots must verify that all altimeters are set to 29.92 and that both pilot and copilot altimeters agree within 200 feet.
- c. The initial altimeter crosscheck must be recorded on the flight plan and reported to maintenance.
- d. Pilots must also crosscheck altimeters at intervals of approximately one hour. If the pilot's altimeters do not agree within 200 feet while within RVSM airspace, advise ATC.
- e. Crosschecks between the primary altimeters should be made at each waypoint while operating within RVSM airspace. Recording is not necessary. They should agree within 200 feet. Failure to meet this condition requires the altimeter system to be reported as defective and ATC notification.
- f. An automatic altitude-control system should be operative and engaged during level cruise, except when circumstances such as the need to retrim the aircraft or turbulence require disengagement. In any event, adherence to cruise altitude should be done by reference to one of the two primary altimeters.
- g. In level cruise, it is essential that the aircraft be flown at the cleared flight level. Except in contingency or emergency situations, the aircraft should not intentionally depart from the cleared flight level without a positive clearance from ATC.
- h. During the transition between levels, the aircraft should not be allowed to overshoot or undershoot the cleared flight level by more than 150 feet (45m). It is recommended that the level off be accomplished using the altitude capture feature of the automatic altitude-control system (autopilot).
- i. Flight crew are reminded of the importance of setting all primary and standby altimeters to 29.92 in. Hg/1013.2 hPa) when passing the transition altitude and rechecking for proper altimeter setting when reaching the initial cleared flight level.

## 15. Passenger Operations

### 15.1. GSFC Passenger Operations

15.1.1. GSFC Passenger Operations. Periodically the AO conducts passenger carriage onboard GSFC aircraft. Such operations are referred to as Mission Management flights and are conducted in compliance with OMB Circular A-126. NASA aircraft are public aircraft, as defined by 49 U.S.C. § 40102, definitions, but are operated as civil aircraft when carrying passengers. NASA aircraft are prohibited from carrying passengers when operating as public aircraft. The NPR 7900.3 establishes policies and procedures for management, use, operation, and control of Government aircraft when used or controlled by NASA to transport passengers or cargo. The definition of passengers does not include crewmembers or qualified non-crewmembers who are directly associated with the conduct or purpose of the flight.

15.1.2. Unique Requirements. All aspects of Mission Management flights are governed by the Mission Management Flight Operations section of the NPR 7900.3 and are more specific and often more restrictive in nature than the requirements for research flight operations outlined in

this manual. Aircrew and Operations Management personnel engaged with Mission Management operations shall be familiar and comply with that document.

## **16. International Operations**

### **16.1. Pilot Restricted Radio-Telephone Operator License.**

16.1.1. Restricted Radio-Telephone Operator. All pilots exercising international flight authority shall maintain and carry either an FCC Restricted Radio – Telephone Operator Permit or a General Radio-Telephone Operator License.

### **16.2. Customs, Health, Immigration, and Agricultural Clearance.**

16.2.1. Customs, Health, Immigration, and Agricultural Clearance. GSFC Aircraft should be made scheduled to arrive at the entry airport during those periods of time when customs/health/immigration/agriculture services are available. Official working hours within the United States are usually 0800 to 1700 local, Monday through Friday. Overtime charges accrue for services performed after official working hours.

16.2.2. Customs General Declarations. The PIC should ensure that all crewmembers are listed on the General Declaration prior to arrival. The PIC may make necessary pen /ink changes to the General Declaration. Multiple copies of General Declaration forms should be available upon request at the destination. Crewmembers should not keep any copies of the General Declaration. The General Declaration requires a signature in two places (all copies).

16.2.2.1. Customs Restriction on Aircrew member Belongings. It is not uncommon in Mexico, Central and South American countries to have laws allowing customs officials to confiscate personal items belonging to aircrew members including laptop computers and other digital devices. Crew should consider limiting their personal items to basic clothing and toiletries of a quantity necessary for the period. Aircrew members should also note that enforcement may be sporadic.

16.2.2.2. Discharging of Passengers/Cargo. The PIC shall not permit any cargo, baggage, or equipment to be removed from the aircraft without permission from customs officials. Passengers, non-aircrew members, or aircrew members shall not depart from the landing site prior to release by the customs official. Removal of cargo and/or departure of personnel may be allowed should such be necessary for the safety or preservation of life and property. Violations of customs regulations could result in a fine for which the aircraft PIC may be personally responsible.

16.2.3. Agriculture Inspection Procedures. From Hawaii, Puerto Rico, and certain international locations the U.S. Department of Agriculture restricts the movement of fruits, plants, animals, and other agricultural products to the mainland United States. All flight crewmembers departing certain international locations to the mainland United States are required to complete an agriculture inspection. During this inspection all flight crewmembers are required to have

available for inspection all personal luggage and bags (including flight kits). If you have any question concerning the status of items in your luggage it is recommended that you inform the agriculture inspector. Failure to do so may result in fines of \$1,000 or more and delay of flight.

16.2.4. Insecticide Spray Requirements for Specific International Destinations. Specific international locations may require the spraying of arriving aircraft with an insecticide. Flights requiring spraying must be identified by the Project Pilot and documented in the Mission Operations Directive. When required, flights departing the United States are sprayed prior to departure from the United States with an insecticide. The aircraft is sprayed prior to boarding. The crew departing the U.S. will transport an empty spray can with any applicable paperwork for the health authorities at the arrival location.

### 16.3. Potable Water

16.3.1. Potable Water (Aircraft Water Supply) at International Locations. All GSFC flights to international stations should use bottled water sources for personal hydration and to replenish aircraft systems used for human consumption. When unauthorized water is used to service any aircraft system used for consumption, the system must be purged and purified prior to its next use.

### 16.4. Trash Disposal

16.4.1. Trash Disposal. The PIC shall be responsible for identifying and complying with all national and local environmental laws and requirements for the proper handling and disposal of international garbage on GSFC aircraft.

### 16.5. Aircraft Waste Water

16.5.1. Aircraft Waste Water. Waste water shall be handled in accordance with airfield operating policies. The PIC shall be responsible for identifying and complying with all national and local environmental laws and requirements for the proper handling and disposal of aircraft waste water on GSFC aircraft.

### 16.6. Immunizations

16.6.1. Immunization Requirements for International Operations. GSFC Flight Operations Department should use the guidance provided by the Center of Disease Control (CDC) when determining the immunizations required by aircrew and non-aircrew members before operating to specific international locations. Whenever possible, aircrew schedule themselves to get vaccinations and immunizations on days when flight duties are not planned for a period of time after receiving the shots.

### 16.7. Passport Requirements

16.7.1. **Passport Requirements.** All aircrew conducting international flight operations shall have a passport. All aircrew shall keep the passport current at all times. The aircrew must have their passport in their possession when operating international flights. Anytime an aircrew member renews or receives a new passport, the pilot shall present their passport to the Flight Operations Office for incorporation into their training record.

16.7.1.1. **Passport and Visa Requirements.** In order to be eligible to operate to an international location all aircrew members must meet the passport and visa documentation requirements that apply to that location.

## 16.8. **Public Health Requirements**

16.8.1. **Public Health Service Report (42 CFR 70.0).** The following information is abstracted from Public Health Service Regulations. Flights from points outside the United States enroute to U.S. airports must report any cases of suspected communicable disease or suspected death onboard a GSFC Aircraft. The report shall be made via iridium phone to the Aircraft Operations Monitor (AOM) or AOOM. The AOM/AOOM will contact the appropriate government public health service agencies.

16.8.1.1. **Symptoms of Communicable Disease.** Signs and symptoms of communicable disease may include the following: Temperature of 100°F (38°C) or greater, if accompanied or followed by: rash, jaundice or glandular swelling, or if such temperature is known to have persisted for two days or more. Other symptoms may include flushed or unusually pale complexion, excessive perspiration or shivering which may indicate fever, frequent or prolonged use of aircraft lavatories which may indicate diarrhea. The PIC should consult with MedLink when the medical condition of a passenger is in question.

16.8.2. **Health Declaration (if required).** The Health declaration May be signed by any Primary or Secondary crewmember. Authorized Agent or Pilot in Command (lower right hand corner)

## 16.9. **Canada Inadmissibility**

16.9.1. **Canada Inadmissibility.** Security and enforcement at the Canada - United States border has heightened in recent years. For this reason, more U.S. citizens with past criminal charges or convictions are refused entry into Canada. Canadians with past criminal charges or convictions seeking entry into the U.S. are denied entry as well. Crewmembers should know that almost all convictions (including DUI, DWI, reckless driving, negligent driving, misdemeanor drug possession, all felonies, domestic violence (assault IV), shoplifting, theft, etc.) make a person inadmissible to Canada, regardless of how long ago they occurred. For this reason, Canadian authorities recommend that before a person (including a crewmember) with past convictions attempts to enter Canada that person should first obtain the necessary documents.

16.9.1.1. **Canada Inadmissibility Details.** To learn about criminal inadmissibility or to find ways to overcome criminal inadmissibility, pilots should visit the following websites for additional information: <http://www.cic.gc.ca/english/information/inadmissibility/index.asp>



## 16.10. **FAA Designated Special Airports**

16.10.1. **FAA Designated Special Airports.** The FAA has designated certain airports as “Special Airports” due to surrounding terrain, obstructions or complex approach or departure procedures. No person may act as PIC to or from designated “Special Airports” unless:

- a. Within the preceding 12 calendar months, the PIC or SIC has made a takeoff and landing at that airport while serving as a pilot or;
- b. Within the preceding 12 calendar months, the PIC has qualified by using FAA approved pictorial means or;
- c. The takeoff or landing is made with a ceiling at least 1,000 feet above the lowest MEA, MOCA or initial approach altitude prescribed for the instrument approach procedure for that airport and the visibility is at least 3 miles.

16.10.2. **Special Airports.** PIC’s shall use up-to-date, qualified aeronautical charts (may be printed or digitally available) for selected FAA designated special airports. The airport qualification pages are an FAA approved pictorial means of complying with FARs.

### FAA DESIGNATED SPECIAL AIRPORTS

United States Airport, Airport ICAO ID

Adak Island NAF, AK PADK

Ashville, NC KAVL

Aspen, CO KASE

Beckley, WV KBKW

Binghamton, NY KBGM

Bluefield, WV KBLF

Bullhead City, AZ KIFP

Burbank, CA KBUR

Burlington, VT KBTV

Butte, MT KBTM

Cape Lisburne LRRS, AK PALU

Cape Newenham LRRS, AK PAEH

Cape Romanzof, AK PACZ

Charleston, (Kanawha), WV KCRW

Cody, WY KCOD

Cumberland, MD KCBE



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Durango, CO KDRO  
Dutch Harbor, (Unalaska), AK PADU  
Eagle, CO KEGE  
Elmira, (Chemung), NY KELM  
Flagstaff, AZ KFLG  
Gunnison, CO KGUC  
Hailey, ID (Friedman Memorial) KSUN  
Hayden, Yampa Valley, CO KHDN  
Hilo International, HI PHTO  
Hot Springs, VA KHSP  
Huntington, WV KHTS  
Indian Mountain LRRS, AK PAIM  
Jackson Hole, WY KJAC  
Juneau, AK PAJN  
Kahului, HI PHOG  
Keene/Dillant-Hopkins, NH KEEN  
Ketchikan, AK PAKT  
Klamath Falls, OR KLMT  
Kodiak, AK PADQ  
Kulik Lake Airport, AK PLKK  
Lebanon Regional, (Lebanon), NH KLEB  
Lihue, Kauai, HI PHLI  
Missoula, MT KMSO  
Ontario, CA KONT  
Palm Springs, CA KPSP  
Petersburg, AK PAPG  
Pinal Airpark, (Marana), AZ KMJZ  
Red Dog, AK PAED  
Reno, NV KRNO

Rifle/Garfield Co. Regional, CO KRIL

Roanoke, VA KROA

San Diego, CA KSAN

Caribbean Airports, Airport ICAO ID

E.T. Joshus, Lessor Antilles TVSV

Ft. De France, Martinique TFFF

Guantanamo Bay, Cuba MUGM

Gustavia III, French West Indies TFFJ

Pointe-A-Pitre, Guadeloupe TFFR

Santa Domingo, Dominican Rep. MDSD

St. Maarten I, Neth Antilles TNCM

St. Thomas I, Virgin Is TIST

Ponce, Puerto Rico TJPS

Central American Airports, Airport ICAO ID

Guadalajara, Mexico MMGL

Guatemala City, Guatemala MMTT

Loreto Int'l, Mexico MMLT

San Jose, Costa Rica MROC

Tegucigalpa, Honduras MHTG

South American Airports, Airport ICAO ID

Arequipa, Peru SPQU

Bogota, Colombia SKBO

Cali, Colombia SKCL

La Paz, Bolivia SLLP

Pasto, Colombia (Antonio Narino) SKPS

Pereira, Colombia (Matecana) SKPE

Quito, Ecuador SEQU

Rio De Janeiro, Brazil (Galeao) SBGL

Pacific Airports, Airport ICAO ID

Fukuoka, Japan RJFF

Hong Kong Intl, PR of China VHHH

Pago Pago, Tutuila Island, U.S. NSTU

16.10.3. Airport Orientation Charts. NASA GSFC pilots should use FAA approved pictorial means to place its crewmembers in compliance with FARs regarding FAA designated special airports. A special airport should not be used as an alternate when the PIC is not qualified for that special airport.

## 16.11. **International Altimeter Settings**

16.11.1. International Altimeter Setting Terminology. One of the most critical issues during international flight operations is the significant differences in the various altimetry systems used throughout the world. It is imperative that flight crew understand and apply altimeter settings correctly, consistent with the rules and procedures of a particular country/airport.

16.11.1.1. QNH. The local setting in inches of mercury (in. Hg) or hectopascals (hPa, also known as millibars, not millimeters) used at lower altitudes which will result in the aircraft altimeter reading field elevation above MSL when on the ground. The term also refers to “altitude” rather than “flight level.”

16.11.1.2. QNE. The term refers to the “flight level” standard setting of 29.92 hg / 1013 hPa, used primarily for high altitude vertical separation.

16.11.1.3. QFE. The term is used to represent the actual atmospheric pressure at the level of the aerodrome or runway threshold. In-flight, when set to a QFE value, the altimeter will indicate height above the aerodrome level or runway threshold level. On the ground, at the airport, the altimeter will read zero with a QFE setting regardless of the field height above mean sea level. QFE altimetry settings are used by Russia, Commonwealth of Independent States (CIS) and some People’s Republic of China (PRC) airports.

16.11.2. International Transition Level, Transition Altitude, Transition Layer. All airports have established Transition Altitude/Transition Level values and/or procedures for when to change the altimeter setting. The following verbiage details when to change the altimeter to the new setting.

16.11.2.1. Transition Altitude. On departure when climbing through the Transition Altitude, change from the local barometric pressure QNH (or QFE in Russia / CIS) setting to QNE (29.92 / 1013.2 hPa). 18,000 feet is the standard U.S. Transition Altitude. If you were given a level off at FL180, you would change from QNH to QNE approaching FL180 in sufficient time to allow for accurate level off.

16.11.3. Transition Level. On arrival, when descending through the Transition Level, change from the standard QNE to QNH (or QFE in Russia/CIS). FL180 is the standard U.S. Transition Level.

16.11.4. International Variances. It should be noted that the altitudes at which to accomplish these altimeter changes vary greatly throughout the world. Some countries and/or airports have fixed published Transition Altitudes and identical fixed Transition Levels such as the U.S. (18,000 feet / FL180) and Japan (14,000 feet / FL140). Most European countries and/or airports have very low fixed Transition Altitudes and changeable Transition Levels assigned by ATC. A few airports and/or countries have changeable Transitional Altitudes and Transition Levels, both assigned by ATC.

16.11.5. Specific Nation Rules. It is important to review not only the respective charts for these values, but also each individual country's rules and procedures. This is especially important for all United Kingdom airports, where the pilot is expected to set the local QNH altimeter setting when the aircraft is descending from a Flight Level to an Altitude for approach and landing. On vacating the flight level, the pilot will immediately change to the airport QNH unless further flight level vacating reports have been requested by ATC, in which case the QNH setting will be set following the final flight level vacating report.

16.11.6. At or Below Transition Altitude Terminology. Transition Altitude is the altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes or feet above Mean Sea Level (QNH). Clearance to maintain an altitude at or below the Transition Altitude can be confirmed by listening for clearance terminology that refers to an altitude in thousands of feet or meters, i.e., "CLEARED TO MAINTAIN 6000 FEET" or "CLEARED TO MAINTAIN 2100 METER."

16.11.7. Above Transition Altitude Terminology. Clearance to maintain a QNE standard altitude above the Transition Altitude can be confirmed by listening for clearance terminology that refers to flight level in feet or meters, i.e., "CLEARED TO MAINTAIN (FLIGHT) LEVEL 80" or "CLEARED TO MAINTAIN (FLIGHT) LEVEL 8000 METERS." Frequently the word "FLIGHT" is deleted and only the word "LEVEL" is used.

16.11.8. Unknown Transition Level. Frequently, neither ATC nor the ATIS informs arriving aircraft of the current Transition Level. Instead, one must listen very carefully to the descent clearance or SID for the key word "DESCEND TO XXXX FEET / METERS." The absence of "FLIGHT LEVEL" and the presence of altitude in "FEET" or "METERS" means that the Transition Level is somewhere between the two. In the case of an "unknown transition level value" the crew may ask ATC for the value if there is confusion.

16.11.9. Transition Layer. Transition Layer is the airspace between the Transition Altitude and the Transition Level. Aircraft climbing through the layer will be using a standard QNE (29.92 in. Hg / 1013.2 hPa) while aircraft descending through the transition layer will use altimeters set to local station pressure QNH (or QFE in Russia/CIS).

16.11.10. Units of Pressure. Exercise caution in determining which unit of pressure measurement is being used.

16.11.11. QFE Procedures. In order to provide continuity, it is recommended that GSFC aircraft inform the local ATC approach facility that you are requesting the QFE altimeter setting and will be operating using QFE procedures. Read back of the “QUEBEC FOXTROT ECHO ALTIMETER SETTING” is mandatory. Attempting to change back to QNH operations during the approach will create significant workload and confusion.

## **17. Research Project Processes**

### **17.1. Research Project Flight and Research Mission Flight Processes.**

17.1.1. Research Project Flight and Research Mission Flight Processes. Named Projects or Mission Flights scheduled to fly aboard NASA GSFC aircraft are subject to the GSFC Aircraft Operations mission lifecycle process to ensure all mission reviews and requirements are met prior to and during flight operations. Missions are scheduled in advance to allow time for Project Managers to formulate and obtain the necessary documentation, clearances and approvals. Project Management, prior to and during flight operations, is conducted in accordance with 830-MLCP-0001 NASA Aircraft/UAS Mission Life Cycle Process. Such flights shall be conducted by a Research Pilot or Research Test Pilot.

17.1.2. Airborne Science Program (ASP) Missions. All scientific support missions are requested via the NASA Science Operations Flight Request System (SOFRS): <http://airbornescience.nasa.gov/sofrs/>. Upon receiving a SOFRS request notification the AOOM will contact the initiating party to begin establishing mission timelines and requirements.

### **17.2. Project Pilots**

17.2.1. Project Pilots. For each research flight project conducted by Goddard Space Flight Center, a lead project pilot will be identified by the AOOM. Each aircraft project / deployment will have an assigned lead project pilot for each type aircraft to work flight operations issues relative to that mission. The Project Pilot will act as the project technical lead and interface with assigned project managers to ensure early pilot input regarding: safety of flight related issues, aircraft performance capabilities, deployment airfield selection, irregular / specialized crew staffing requirements, and the review of project documentation. The Chief of Flight Operations will review the recommendation of project pilot assignments, which will be indicated in all project documentation.

### **17.3. Aircraft Lead**

17.3.1. Aircraft Lead Designation and Responsibility. A highly qualified Research Pilot, Flight Engineer (if applicable), or Navigator (if applicable), will be identified by the Chief of Flight Operations as the Aircraft Lead for each aircraft.

- a. Aircraft Leads serve as the primary point of contact with outside agencies for obtaining technical and operational information and ensure distribution of relevant information to all assigned aircrew.

- b. Aircraft Leads will define, and update the aircrew training syllabus for each aircraft to be implemented and tracked by the TM.
- c. Aircraft Leads will conduct systems and emergency procedure reviews during training sessions and safety meetings.
- d. Aircraft Leads will work with assigned aircraft project pilots, and engineers to ensure that all flight publications, including flight manuals, flight manual supplements, fact sheets, checklists, and other relevant documents are current for the intended flight operations.
- e. Aircraft Leads are responsible to ensure that all mission and/or configuration specific limitations are disseminated to all applicable pilots and annotated accordingly in NAMIS.

#### **17.4. Aircraft Operations Monitor (AOM)**

17.4.1. AOM Duties and Responsibilities. The Operations Monitor, or AOM, is 24 hours (not required awake) duty position assigned within the Aircraft Office to personnel within the Flight Operations Department. Acting as the point of first contact for all deployed aircrew, the AOM is responsible for validating the execution of the flight schedule and verifying that each GSFC aircraft reports safe-on-deck after an operational cycle of sorties. The AOM is required to carry, and be accessible to, the specifically assigned AOM cellular telephone and the Aircraft Office Quick Reaction Handbook at all times. This AOM cellular phone has a unique and discrete phone number which should be immediately available to all aircrew in case of emergency. Specific training is required by the ASO prior to assuming the duties and responsibilities of the AOM.

#### **17.5. Special Deployed Aircraft Operations**

17.5.1. Deployed Authorization to Fly Onboard GSFC Aircraft. When deployed, the PIC may approve add-on personnel to a flight under special circumstances (Familiarization, Media, Host Nation VIP etc.). The PIC shall ensure compliance with all processes and training requirements. Manifests shall be updated accordingly. If practicable, the PIC should attempt verbal or written concurrence from the Chief Flight Operations or the AOOM.

17.5.2. Deployed “Time Away” Restrictions. Due to Federal Travel Regulations, and for the sake of mission planning, no NASA GSFC Civil Servant aircrew should be scheduled to deploy for more than 30 days consecutively and no contractor should be scheduled to remain deployed for more than 56 days consecutively. No aircrew member should be scheduled to remain deployed for more than 160 cumulative days per fiscal year without written consent from the Chief of Flight Operations.

### **18. Safety**

#### **18.1. General.**

18.1.1. General Safety Guidance. This section has been prepared to assist and direct the handling of emergencies, accidents or abnormal situations. In establishing these procedures, it must be remembered that it is not possible to set forth instructions to cover all possible conditions or to outline in detail the exact steps to be followed in the event of such situations. Therefore, these procedures should be supplemented with good judgment on the part of personnel concerned.

18.1.2. Safety Concerns. The safety of our personnel, non-participants, and our equipment while conducting our mission is of paramount importance. Any employee concerned with a safety issue should report that concern to their immediate manager (Department Head), or the Aviation Safety Officer (ASO). Managers shall elevate safety concerns to the appropriate level and divisions to resolve the issue(s).

18.1.3. Immediate Safety Remedies. The Immediate Remedy to unsafe acts: “Stop Work”, “Time Out”, and “Knock It Off” Policy:

18.1.3.1. 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 to their All “Stop Work” events, shall be reported, in writing, to the ASO for appropriate disposition.

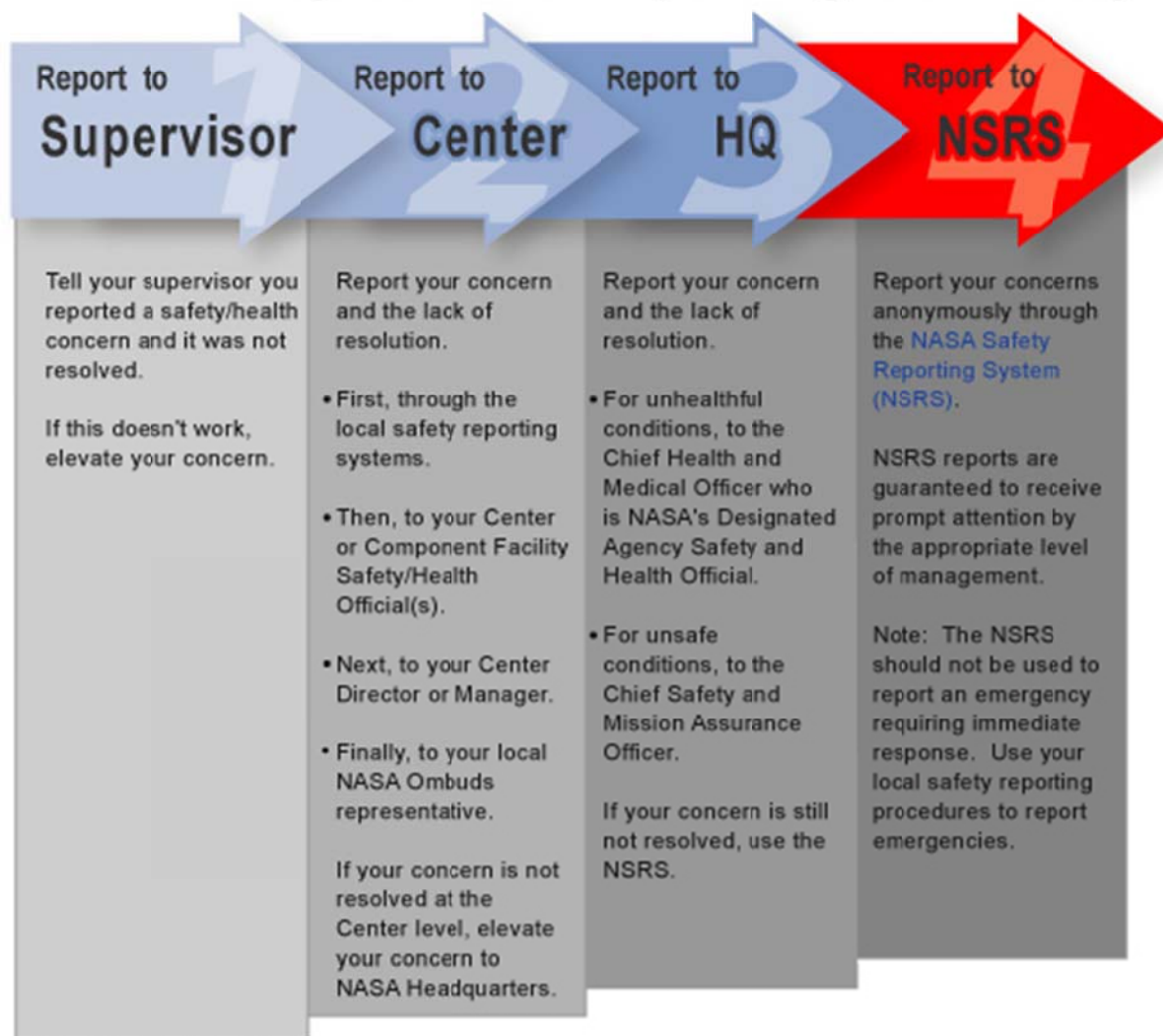
18.1.3.2. Training “Time Out”. During any training evolution, the trainee may initiate a “Training Time Out” (TTO), verbally or via acknowledged gesture. The instructor leading the evolution shall terminate training and render the situation safe for all participants then take prudent action. All TTO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

18.1.3.3. 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).

18.1.4. Reporting Safety Concerns. Any safety concern can be elevated to, or directly relayed to, the NASA Safety Reporting System (NSRS) to initiate resolution, if necessary. However, the standard procedure of notification is: Supervisor, ASO, Center, HQ, NSRS. Visit the WFF Safety Office website and use the Quick incidents tab or the NSRS tab:  
<http://sites.wff.nasa.gov/code803/>



# NASA Safety/Hazard Reporting Hierarchy



**Figure 1. NASA Safety/Hazard Reporting Hierarchy**

18.1.5. **Liability.** Under no circumstances will GSFC employees or contractors make any admission of liability in connection with any accident or emergency situation, or incur any expense, make any payment or settle any claim for which NASA may be liable, without the consent of NASA GSFC legal authority and the NASA WFF Contracting Officer - except to provide immediate medical attention as may be necessary for relief of the injured or as otherwise required by law or situational practicality.

18.1.6. **Press and Publicity.** If an emergency situation is serious enough to become news, prompt and accurate statements will be given to newspapers, wire services, television, and radio stations via the appropriate NASA WFF or higher level Public Affairs personnel. All requests for information from the media will be referred to the appropriate NASA Public Affairs Office, via the Chief of Flight Operations.

18.1.6.1. Public Statements. GSFC Aircraft Office personnel should not attempt to assess the cause of an accident or incident, pending investigation and findings by proper authorities, unless designated to do so and in accordance with NPR 8621.1. Care must be taken to make no statements (including digital messages and social media), speculations, or release of any specific information to external entities unless such statement is directed in accordance with designated Investigating Authorities per NPR 8621.1.

## 18.2. Investigations

18.2.1. Internal Anomaly Investigations. Small internal inquiries may be initiated by the ASO, the Airworthiness & Maintenance Manager or the Chief of Flight Operations, and conducted by the ASO in order to determine NASA procedural compliance and/or mishap classification in accordance with NASA procedural requirements.

18.2.2. NPR 8621.1 Investigations. In the event of an accident or significant incident requiring an NPR 8621.1 investigation, compliance with that investigation is required and supersedes any authorities or requirements outlined in this document.

18.2.3. Interim Response Team. To the maximum extent possible, all aircrew and ground crew, as well as Operations Department personnel shall receive training and qualification as Interim Response Team (IRT) members via the GSFC/WFF Safety Office.

18.2.4. Definitions and Terminology (NPR 8621.1). In order to provide immediate reference and effectively communicate, the following terms are defined in the NPR 8621.1 and reprinted in this document. In order to ensure the accuracy of the following information, visit <http://nodis3.gsfc.nasa.gov/> for the most up-to-date information.

*Aircraft Accident. An aircraft mishap is an occurrence associated with the operation of an aircraft, which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers a fatality or serious injury, or in which the aircraft receives substantial damage.*

*Emergency. An emergency is any situation in which the safety of flight is endangered, or in which it is necessary to deviate from the provisions of the FARs or other operational specifications, or to establish the need for preferential handling due to extraordinary circumstances. Although there is no clear cut distinction between an emergency and a non-emergency situation, the Pilot-in-Command should use prudent judgment and take the most prudent approach when deciding whether to exercise his Emergency Authority.*

*Incident. An occurrence of a mishap or close call.*

*Interim Response Team. A team that arrives at the mishap scene immediately after an incident; secures the scene; documents the scene using photography, video, sketches, and debris mapping; identifies witnesses; collects written witness statements and contact information; preserves*

*evidence; impounds evidence (at the scene and other NASA locations as needed); collects debris; implements the chain-of-custody process for the personal effects of the injured and deceased; notifies the NASA Public Affairs Officer about casualties, damages, and any potential hazards to the public and NASA personnel; advises the supervisor if drug testing should be initiated; and provides all information and evidence to the investigating authority. The team is considered "interim" because it operates as a short-term response team and concludes its mishap-response activities when the official NASA-appointed investigating authority arrives to the scene and takes control.*

*Investigating Authority.* *The individual mishap investigator, mishap investigation team, or mishap investigation board authorized to conduct an investigation for NASA. This includes the mishap investigation board chairperson, voting members, and ex officio but does not include the advisors and consultants.*

*NASA Mishap.* *An unplanned event that results in at least one of the following:*

- a. Injury to non-NASA personnel, caused by NASA operations.*
- b. Damage to public or private property (including foreign property), caused by NASA operations or NASA-funded development or research projects.*
- c. Occupational injury or occupational illness to NASA personnel.*
- d. NASA mission failure before the scheduled completion of the planned primary mission.*
- e. Destruction of, or damage to, NASA property except for a malfunction or failure of component parts that are normally subject to fair wear and tear and have a fixed useful life that is less than the fixed useful life of the complete system or unit of equipment, provided that the following are true: 1) there was adequate preventative maintenance; and 2) the malfunction or failure was the only damage and the sole action is to replace or repair that component.*

*NASA Operation.* *Any activity or process that is under NASA direct control or includes major NASA involvement.*

*Substantial Damage.* *Damage or failure which adversely affects the structural strength, performance, or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component. Engine failure or damage limited to an engine if only one engine fails or is damaged, bent fairings or cowling, dented skin, small punctured holes in the skin or fabric, ground damage to rotor or propeller blades, and damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wingtips are not considered "substantial damage" for the purpose of this part (from 49 CFR Part 830).*

*Mishap Classification*

*Type A Mishap.* A mishap resulting in one or more of the following: (1) an occupational injury or illness resulting in a fatality, a permanent total disability, or the hospitalization for inpatient care of 3 or more people within 30 workdays of the mishap; (2) a total direct cost of mission failure and property damage of \$2 million or more; (3) a crewed aircraft hull loss; (4) an occurrence of an unexpected crewed aircraft departure from controlled flight (except high performance jet/test aircraft such as F-15, F-16, F/A-18, T-38, OV-10, and T-34, when engaged in flight test activities).

*Type B Mishap.* A mishap that caused an occupational injury or illness that resulted in a permanent partial disability, the hospitalization for inpatient care of 1-2 people within 30 workdays of the mishap, or a total direct cost of mission failure and property damage of at least \$500,000 but less than \$2,000,000.

*Type C Mishap.* A mishap resulting in a nonfatal occupational injury or illness that caused any days away from work, restricted duty, or transfer to another job beyond the day or shift on which it occurred, or a total direct cost of mission failure and property damage of at least \$50,000 but less than \$500,000.

*Type D Mishap.* A mishap that caused any nonfatal OSHA recordable occupational injury and/or illness that does not meet the definition of a Type C mishap, or a total direct cost of mission failure and property damage of at least \$1,000 but less than \$50,000.

*Close Call.* An event in which there is no equipment/property damage or minor equipment/property damage (less than \$1000), but which possesses a potential to cause a mishap.

### 18.3. **Emergency Authority**

18.3.1. **Emergency Actions.** In an emergency situation that requires immediate decision and action, the Pilot in Command may take any action that he/she considers necessary under the circumstances. In such case he may deviate from prescribed operations procedures and methods (including this document), weather minimums, and the provisions of the FARs, to the extent required in the interest of safety.

18.3.2. **Emergency Action by the PIC.** The PIC may take any action that he/she considers necessary for safety, including use of Emergency Authority. The PIC may request any assistance desired from ATC and shall, when practical, coordinate his/her course of action back to the Flight Operations Office or the Operations Monitor. A Pilot's Irregularity Report is required for any exercise of PIC Emergency Authority.

18.3.2.1. **Emergency Declaration.** The Pilot in Command shall declare an emergency for the following conditions:

- a. Aircraft flight control failure

- b. Aircraft structural failure resulting in degraded aircraft capability
- c. Engine, APU, or wheelwell Fire
- d. Inflight engine failure requiring shutdown via an emergency shutdown checklist
- e. Major electrical system failure resulting in degraded aircraft capability
- f. Major/multiple hydraulic system failure resulting in degraded aircraft capability
- g. Persistent smoke or fire onboard (which requires the use of a fire extinguisher)
- h. Whenever the PIC deems it necessary in the interest of safety

18.3.3. Communication. A pilot exercising Emergency Authority, as workload permits, must keep both ATC and, when equipped with the capability and given the time and opportunity, inform the Flight Operations Office via the Operations Monitor. After landing, filing of a Pilot's Irregularity Report is required

18.3.4. Unusual Inflight Medical Situations / MEDLINK. In the event of a serious injury in flight, the PIC should notify the arrival airfield to have Emergency Medical Services (EMS) standing by. Deviations from the filed flight plan and/or mission profile are authorized at PIC discretion. MEDLINK and certain first aid supplies are available onboard most GSFC aircraft. Filing of a Pilot's Irregularity Report is required

## 18.4. Irregularity Reporting

18.4.1. Flight Irregularity Report. The Flight Irregularity (830-AOF-0212) report is used to report any event that drives deviation from standard procedures and/or operations (examples include: precautionary emergency landing at an unplanned airfield, in-flight abort due to non-emergency or injury, unusual ATC events such as non-emergency deviations from the FARs, an event that may have brought unplanned and/ or potentially negative public attention or negative reflection on NASA or NASA mission etc.). This report SHALL NOT be used with the intention of initiating the GSFC/WFF Aircraft Mishap Response Plan. The report captures data that may not be captured by normal reporting sources. It acts as the pilot's official account of an incident. It is initially distributed only to the GSFC/WFF ASO for determination as to the proper disposition.

18.4.2. Reporting Timeline. The Flight Irregularity Report shall be completed as soon as practical after a reportable event and in no case later than 2 days after completion of the sortie on which the event occurred.

18.4.3. Internet/Web Interface. The Flight Irregularity Report can be found at: <http://code830.wff.nasa.gov/#> Use the Internal Tab > Pilot Report and login using your standard NASA credentials.

18.4.4. Reportable Incidents. Incidents that may require an report include (non-exhaustive list):

- a. Any time an Emergency is declared
- b. System Malfunction
- c. Engine Thrust Reduced

- d. False Fire Warning (not shutdown)
- e. Electrical System
- f. Operational Problems
- g. Substantial Damage To Aircraft While Flight Crew In Charge
- h. Unplanned Rejected Takeoff
- i. Excursion From Runway/Taxiway
- j. Runway Incursion
- k. Unusual Turbulence / Stress On Aircraft
- l. Windshear
- m. Mission Abort (mechanical)
- n. Bird Strike
- o. Fuel Dumping
- p. Unanticipated GPWS TCAS RA Activation
- q. Portable Electronic Device Interference
- r. Near Midair or Midair Collision
- s. Requested Emergency Equipment
- t. Cabin Prepared For Evacuation
- u. Emergency Evacuation
- v. Special Handling of a Passenger or Aircrew member
- w. Unsatisfactory RNAV Procedure
- x. Use of PIC's Emergency Authority
- y. Deviation From ATC Clearance and/or Request for Priority Handling from ATC
- z. Overweight Landing
- aa. Security
- bb. Flight Crew Unable To Perform Duties
- cc. Injury/Illness To Crew Or Passenger
- dd. Onboard Security Incident
- ee. NTSB reportable incident
- ff. Laser Illumination of Aircraft

18.4.5. Mishap Plan Recall. The ASO and Operations Monitor, via the Aircraft Office Mission Anomaly and Mishap Contingency Plan (830-MAMC-0001), shall maintain a current list of persons/offices to be notified, in the event of an aircraft accident or emergency.

18.4.6. NTSB Notification. Notification to the National Transportation Safety Board is required for certain types of accidents/incidents. Normally this report is accomplished through the ASO. Determination as to whether an incident requires NTSB notification will be made by the Chief of Flight Operations in consultation with the GSFC ASO.

18.4.7. NTSB Reportable Incidents. The PIC shall notify the GSFC ASO as soon as when an aircraft accident or any of the following listed incidents occur:

- a. Flight control system malfunction or failure.
- b. All aircraft accidents with substantial damage.
- c. Inability of any required flight crewmember to perform normal flight duties as a result of injury or illness.



- d. Failure of structural components of a turbine engine, excluding compressor and turbine blades and vanes.
- e. In-flight fire.
- f. Aircraft collision in flight.
- g. Damage to property other than the Agency aircraft.
- h. Large Multi-engine Aircraft. For large multiengine aircraft (more than 12,500 pounds maximum certificated take-off weight):
- i. In-flight failure of hydraulic systems that results in sustained reliance on the sole remaining hydraulic or mechanical system for movement of flight control surfaces.
- j. Sustained loss of the power or thrust produced by two or more engines.
- k. An evacuation of an aircraft in which an emergency egress system is used.
- l. An aircraft is overdue and is believed to have been involved in a mishap or close call

18.4.8. Report Information. Information Required for All Agency Aircraft Mishaps and Close Calls:

- a. Type, nationality, and registration marks of the aircraft.
- b. Name of owner and operator of the aircraft.
- c. Name of the pilot in command.
- d. Date and time of the mishap, malfunction, or failure.
- e. Last point of departure and point of intended landing of the aircraft.
- f. Position of the aircraft with reference to some easily defined geographical point.
- g. Number of persons aboard and number killed or seriously injured.
- h. Nature of the mishap or occurrence, the weather, and the extent of damage to the aircraft, so far as is known.
- i. A description of any explosives, radioactive materials, or other dangerous articles carried

18.4.9. ATC Notification. When time permits, the following information should be given to ATC or the Aircraft Rescue and Firefighting (ARFF) Command:

- a. Souls on Board - total number of passenger and crew.
- b. Fuel on Board - fuel remaining in minutes should be reported to ATC, fuel in pounds should be reported to airport rescue and firefighting personnel. If any fuel is dumped after the initial information is given, ATC or the ARFF Command should be advised of the revised FOB.
- c. HAZMAT / Dangerous Goods - location on aircraft, if any, and type (if known). Each crewmember, if physically able, shall submit a statement setting forth the facts, conditions, and circumstances relating to the accident or incident as they appear to him to the best of his knowledge and belief. If the crewmember is incapacitated, he shall submit the statement as soon as he is physically able.

## 18.5. Cockpit Voice Recorder (CVR)

18.5.1. Cockpit Voice Recorder (CVR). The cockpit voice recorder, when installed, should be operated as provided by the FARs. If any of the occurrences requiring NTSB Notification result



in termination of the flight the CVR Circuit Breaker (CB) must be pulled to preserve recorded information.

18.5.2. Process to Pull CVR CBs. In all cases, the CB must not be pulled until after landing and then, preferably, as time permits after completing the after landing checklist. If the incident/accident occurred on the ground, the CB should be pulled after completing the engine shut down checklist.

18.5.3. Approval/Notification to Pull CVR CB. Under no other circumstances will the CVR be intentionally deactivated unless directed by the Chief of Flight Operations. When the circuit breaker is pulled, the ASO must be notified as soon as practical in order that the NTSB can be notified in a timely manner. The NASA Office of Safety and Mission Assurance and/or the NASA Aircraft Management Division Aviation Safety Officer should be notified to provide arrangements for NTSB removal of the data, if required.

18.5.4. Precautionary CVR Deactivation. If any doubt exists as to whether or not the CB should be pulled for preservation of the data as listed above, it should be pulled after landing as a precautionary measure and the ASO notified. Should the ASO determine, after consultation with the NASA Office of Safety and Mission Assurance and/or the NASA Aircraft Management Division Aviation Safety Officer, that preservation of the tape is not essential the crew will be advised to reset the CB.

18.5.5. CVR Tape Removal. When the tape is removed for preservation purposes, the following procedures will be followed:

- a. It shall be removed by qualified maintenance personnel only
- b. It shall be immediately given to the ASO or Chief of Flight Operations until released for review
- c. It shall not be reviewed or released without express permission of the Chief of Flight Operations
- d. Prior to review, the Chief of Flight Operations shall notify the PIC involved, who should be invited to attend the initial review by cognizant authorities

## 18.6. **Flight Data Recorder (FDR)**

18.6.1. Aircraft Flight Data Recorder. Select aircraft at GSFC are equipped with an aircraft Flight Data Recorder (FDR). The tape from the FDR may only be removed by direction of the Chief of Flight Operations or a duly appointed investigation authority in accordance with NPR 8621.1.

18.6.2. FDR Tape Removal. When the tape is removed for other than routine maintenance purposes the following procedures will be followed:

- a. It shall be removed by qualified maintenance personnel only
- b. It shall be immediately given to the ASO or Chief of Flight Operations until released for review

- c. It shall not be reviewed or released without express permission of the Chief of Flight Operations
- d. Prior to review, the Chief of Flight Operations shall notify the PIC involved, who should be invited to attend the initial review by cognizant authorities

## 18.7. **Overdue Aircraft**

18.7.1. Overdue Aircraft. When an aircraft is overdue, unreported by any means or system of tracking:

18.7.1.1. 30 minutes overdue. The Operations Monitor shall attempt to call the assigned aircraft via iridium telephone (when applicable), or radio, the PIC cell phone (when applicable), or if operating from WFF, call the WFF control tower (when available) for amplifying data.

18.7.1.2. 1 hour overdue. The Operations Monitor shall notify the Chief of Flight Operations, ASO and AOOM of overdue aircraft status and continue to attempt contact.

18.7.1.3. 2 hours overdue. The Operations Monitor shall notify cognizant ATC authorities of the situation and coordinate the possibility of SAR operations. Recall the ASO, or alternate, to duty for possible mishap plan activation. The Chief of Flight Operation will notify senior leadership of potential missing aircraft.

## 18.8. **Apparent Death Onboard GSFC Aircraft**

18.8.1. Apparent Death of Employee or Passenger. Every attempt should be made to quickly acquire medical attention for any passenger or crewmember is physical distress. In the event of 'apparent death' aboard GSFC aircraft, the following general procedures should be followed:

- a. In the event the 'apparent death' is from natural causes, no member of the crew or passenger shall make a pronouncement of death, no matter how qualified.
- b. Airport authorities shall arrange to have an ambulance waiting when the aircraft arrives.
- c. The individual shall be moved to a hospital where death may be pronounced in accordance with usual procedures.
- d. A Pilot's Irregularity Report must be submitted.

## 18.9. **Abnormal/Emergency Egress**

18.9.1. Abnormal Egress from Aircraft. An emergency evacuation is utilized when it is determined that remaining on board the aircraft could present a safety hazard to the passengers and/or crew. In any emergency evacuation, the likelihood of injury to those evacuating the aircraft is a tangible risk. Ordering an evacuation must always be done with the judgment that remaining on board the aircraft represents a greater safety risk than the inherent hazards of an emergency evacuation. In the case where the aircraft is disabled on a runway, ramp, or taxiway, when no threat to the safety of the passengers or crewmembers is presented by remaining on board the aircraft, an emergency evacuation simply for the purpose of egress is not recommended. An alternate means of egress utilizing portable steps or self-contained stairs

should be coordinated by the PIC with the crew and ground personnel. Once the stability of the aircraft and its systems are assured and the means of egress is coordinated and established, it is acceptable to disarm any emergency methods of egress. Any unusual egress from a GSFC aircraft requires a Pilot's Irregularity Report.

18.9.1.1. Aircraft Emergency Evacuation While Parked. In a situation where an emergency evacuation is required while the aircraft is parked, the first and foremost responsibility of all available aircrew members is the safe and successful evacuation of all passengers and aircrew members from the aircraft. This should be accomplished as described in the aircraft flight manual. If an evacuation is required and all aircrew members are not onboard the aircraft the remaining aircrew members should take the initiative to safely evacuate the passengers and crew in the most expeditious manner possible.

## 18.10. Airport Rescue Fire Fighting (ARFF)

18.10.1. Airport Rescue Fire Fighting (ARFF) Notification. The PIC or SIC should notify the appropriate fire and rescue services. This will normally be completed by radio or phone call. Additionally, any aircrew member observing this type of situation from another aircraft should immediately notify fire and rescue services.

18.10.1.1. PIC Responsibilities for AARFF. At WFF, PICs of large aircraft are responsible to ensure that adequate rescue support is available for the specific number of occupants.

18.10.1.2. AARFF Communications. Effective communications between flight deck crew and ARFF personnel is very important during emergencies. Several methods of direct communication are generally available such as aircraft interphone, tower relay, direct radio communications via approved frequency, visual signals or when necessary cell phone communications.

18.10.1.3. ARFF Operations at GSFC's WFF. It is common practice at GSFC's Wallops Flight Facility to notify, through the air traffic control tower, the facility fire department prior to engine starts. ARFF equipment is usually standing by in close proximity to the aircraft during engines starts and taxi operations (in- and out-bound) to reduce ARFF response time. The PIC may elect to conduct operations without such protections, at his/her discretion.

## 18.11. Injuries

18.11.1. On-The-Job-Injuries. If injured in the course and scope of performing job duties, seek immediate medical attention and notify an immediate supervisor as soon as practical. The ASO should be notified, and an IRIS report submitted. Injuries that are treated at the GSFC/WFF Health Unit are automatically reported in IRIS. If working internationally and an injury requires medical attention, be aware that most providers in international locations insist on immediate payment when service is provided. If pay is required at the time service is rendered, be sure that to obtain an itemized receipt for services performed. If the medical provider will not accept your

payment and an individual does not have the financial resources to pay for the service, the individual should contact a supervisor to assist in obtaining medical treatment.

18.11.2. Non-Work Related Illness or Injury. Prior to international travel an individual should check with a medical provider regarding procedures to use in the unlikely event that medical treatment is required outside the US. Medical providers may be able to provide information on treatment facilities to utilize in the event of a medical emergency. It is an individual's responsibility to keep the PIC of the deployment team informed.

## 18.12. Fuel Spills

18.12.1. Fuel Spill. Personnel shall notify the assigned aircrew of a fuel spill. Aircrew will notify the fire department and ASO. The PIC will determine whether the aircraft is to be deplaned or evacuated.

# 19. Aviation Life Support Systems (ALSS)

## 19.1. Aviation Life Support Systems (ALSS)

19.1.1. General. The safety and survival equipment/requirements specified in this manual are minimum requirements across all GSFC aircraft. Each aircraft at GSFC has unique and specialized ALSE formulated by the TM, approved by the TSRB process, and implemented by the ALSE technician. Systems descriptions, limits, procedures, deviations and authorization are retained by the AMOC ALSE technician. Specific training is tracked and managed by the TM.

## 19.2. Use of Seat Belts and Restraint Harnesses

19.2.1. Safety Belts and Shoulder Harnesses. Each person's safety belt and shoulder harness shall be worn and tightened prior to takeoff and shall be worn until completion of the flight except when necessary activities require temporary removal. Inertia reels, where provided, shall be manually locked for all takeoffs and landings and at all other times when high g forces may be encountered except where the procedure is detrimental to safe operation. The number of persons over 2 years of age embarked in a GSFC aircraft for flight shall be restricted to the number for which there are adequate seats and safety belts. During takeoffs, landings, and at other times as specified by the PIC, each person over 2 years of age on board GSFC aircraft shall occupy a seat, or car seat secured to a seat, and be secured with the safety belt provided for that purpose.

19.2.1.1. Exceptions. For aircraft in which the aircraft flight manual permits seating without safety belts during takeoff and landing evolutions, those positions may only be occupied by primary or secondary aircrew members and only when, at the PICs discretion, a legitimate reason for doing so exists (IFE overseeing training etc.). Occupying such a position for any other purpose is not authorized.

## 19.3. Automated External Defibrillator and First Aid Kits

19.3.1. Automated External Defibrillator (AED). Certain GSFC aircraft are equipped with an AED. AED devices should be tracked in NAMIS for periodic maintenance or replacement. Any trained personnel may use the AED. The PIC may order use of the AED be stopped if anomalies are observed in flight deck navigation instrumentation.

19.3.2. First Aid Kit. Most GSFC aircraft carry a first aid kit. The number and location of first aid kits will vary by aircraft. The kits should be checked prior to mission deployment, observing the plastic wrap or seal intact. If the seal is found broken or a kit is missing, a NAMIS entry is required.

#### 19.4. **Aircrew Aviation Life Support Equipment (ALSE)**

19.4.1. ALSE Preflight and Post-flight Inspections. All aircrew shall perform a preflight and post-flight inspection of their aircrew personal protective equipment.

19.4.2. Aircrew Personal Protective Equipment Requirements. The following flight gear is applicable to R&D and PS flights operations at GSFC:

19.4.2.1. Fire-Resistant Flight Suit (Aramid). Aramid fire-resistant clothing shall be worn by all GSFC aircrew. Suitable fire-resistant clothing (aramid) may be substituted for the flight suit for flight personnel in non-ejection seat aircraft, with the permission of the Chief of Flight Operations.

19.4.2.2. Aircrew Safety/Flyer Boots. Approved flight boots will be furnished to all aircrew. They are required to be worn while performing flight duties.

19.4.2.3. Fire-Resistant (aramid) Flight Gloves. Approved flight gloves will be furnished to all aircrew. They are required to be carried by all aircrew while performing flight duties, and worn during critical phases of flight.

19.4.2.4. Protective Helmet. Helmets are only required for certain aircrew positions in specific aircraft. White reflective tape coverage is only required when the helmet is incapable of affixing a strobe or similar automatic signaling device.

19.4.2.5. Survival radios. An approved voice-capable survival radio or an approved EPIRB shall be carried by each aircrew member on all R&D and PS flights, unless a voice-capable radio or EPIRB is packed with a multi-place life raft within the assigned aircraft.

19.4.2.1. Emergency beacons. At least one beyond-the-line-of-sight, emergency beacon shall be on board GSFC aircraft when performing extended overwater flights outside of normal oceanic air traffic routes. Aircrew member equipped with EPIRBS meet this requirement.

19.4.2.2. Flashlight. A flashlight shall be carried by all aircrew during night flights.

19.4.2.3. Anti-blackout suits (G-suits). G-suits shall be worn and connected on all flights in aircraft equipped for their use.

## 19.5. Immersion

19.5.1. Immersion. Immersion in water with a temperature of between 50° and 60° for as little as 2 hours can result in unconsciousness because of hypothermia. Wearing a complete anti-exposure ensemble is the only configuration that ensures adequate thermal protection with water temperatures below 60°F. Without a full anti-exposure ensemble, aramid undergarments are of very little or no practical value for thermal protection during water immersion situations.

19.5.2. Anti-Exposure Suits for Aircraft in excess of 5,000 lbs GW . Quick-donning anti-exposure suits, as appropriate, shall be available for flight personnel of GSFC aircraft in excess of 5,000 lbs GW when in the event of a mishap there would be a significant risk of water entry and when either of the following two conditions prevail:

- a. The water temperature is 60°F or below.
- b. The outside air temperature (OAT) is 32°F or below (based on the wind chill factor corrected temperature).

19.5.3. Anti-Exposure Suits for aircraft less than or equal to 5,000 lbs GW, single piloted or ejection seat aircraft. Anti-Exposure dry suits for aircraft in this category must be worn by personnel of GSFC aircraft when either of the following two conditions prevail and the aircraft will be operating beyond gliding distance of land:

- a. The water temperature is 60°F or below.
- b. The outside air temperature (OAT) is 32°F or below (based on the wind chill factor corrected temperature).

19.5.4. Anti-Exposure Suit Wear. The recommendation as to when anti-exposure suits must be worn by flight personnel shall be made by the MORAP or ORM risk evaluation processes. The Chief of Flight Operations shall make the final determination as to when anti-exposure suits must be worn.

19.5.5. Immersion Considerations. Before making a recommendation, the MORAP or ORM evaluation shall consider:

- a. Assess maximum probable rescue time (which is a function of mission distance, SAR equipment, and SAR location).
- b. Determine the lowest water temperature in the mission area during the time period of flight.
- c. When OAT corrected for wind chill is at or below 50°F and anti-exposure suits are not mandated the wearing of fire-resistant (aramid) undergarments is recommended. Wearing double layers of these undergarments can significantly improve anti-exposure performance in a cold dry environment (e.g., survival situation resulting from overland mountainous flight profile).



WHAT THE THERMOMETER READS (degrees F.)												
WIND SPEED MPH	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	WHAT IT EQUALS IN ITS EFFECT ON EXPOSED FLESH											
CALM	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-21	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-36	-45	-58	-72	-85	-99	-112
20	32	18	8	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-137	-148
<div> <div>Little danger if properly clothed</div> <div>Danger of freezing exposed flesh</div> <div>Great danger of freezing exposed flesh</div> </div>												

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Table 3. OAT corrected for Wind Chill.

19.5.6. Quick Donning Suits. When anti-exposure suits are not actually worn by occupants of aircraft in which the use of quick-donning suits is practical (i.e., large aircraft), such suits shall be carried for each occupant as part of the aircraft survival equipment.

19.5.7. Personal Inflatable Life Preservers. Inflatable life preservers shall be available during all extended over-water flights. Life preservers shall be readily available when operating from aerodromes in the vicinity of coastal waters or when operating from inland aerodromes where takeoff, route of flight, or approach path is over water. Occupants of ejection seat aircraft shall wear the appropriate life preserver at all times. Life preservers shall be worn by all aircraft occupants when mission requirements dictate operation over water below 1,000 feet exclusive of normal departures or approaches.

19.5.7.1. Incorrect Wear of Life Preservers. Wearing a life preserver under any item of clothing or equipment may cause serious injury or death. Life preservers should never be worn under any garment or equipment unless the equipment is specifically designed to be worn in that configuration.

19.5.8. Supplemental Emergency Breathing Devices (SEBD). SEBD shall be carried by all helicopter aircrew or during select overwater flight activities, as determined by the MORAP risk



assessment process. Aircrew that must carry an SEBD bottle shall complete applicable SEBD training elements prior to being issued personal SEBD equipment.

19.5.9. Life Raft Requirement. Life rafts of sufficient capacity to accommodate passengers and crew shall be provided in all aircraft when there would be a significant risk of water entry in the event of a mishap or malfunction.

19.5.10. Extended Over-Water Operations Life Raft Requirements. For fixed wing aircraft, extended over-water operations is defined as operations over-water at a horizontal distance of more than 50 nautical miles from the nearest shoreline. A briefing covering the location and operation of water survival equipment for any extended over-water operation is required. An aircraft performing an extended over-water operation shall be equipped as follows:

- a. An individual life preserver for each occupant of the aircraft.
- b. Enough life rafts to accommodate all occupants of the aircraft.
- c. At least one signaling device.
- d. Approved emergency locator transmitter.
- e. Survival kit for each life raft.

## 19.6. Parachutes

19.6.1. Parachute Requirements. The PIC of any GSFC aircraft shall assure that parachutes are available for all required personnel, as outlined below. When required, the PIC shall assure that a parachute is available to all flight personnel and passengers in a location convenient to the intended user and that all flight personnel and passengers are familiar with the location, use of the type parachute provided, and bailout procedures for the aircraft in which embarked.

19.6.2. Aerobatic Flight. Parachutes must be carried as dictated by the aircraft flight manual and when a flight is planned in which any intentional maneuver exceeds:

- a. An angle of bank of 60 degrees relative to the horizon; or
- b. A nose-up or nose-down attitude of 30 degrees relative to the horizon.

19.6.2.1. Exceptions. This section is intended for sustained aerobatic flight activities and does not apply to flight test activities or research flight activities where such maneuvers are short, controlled excursions approved by standard risk review processes or a signed test plan.

19.6.3. Departures and Spins. Flights which plan intentional departures from controlled flight (excluding standard stall sequences) and/or spins shall be equipped with parachutes.

## 20. Risk Management

### 20.1. Types of Risk Management

20.1.1. ORM Requirement. Every flight evolution at GSFC shall be evaluated via one of the Risk Management tools outlined in this section. The following processes are accomplished in addition to, and in parallel with, the risk review processes outlined in NPR 7900.3.

20.1.2. Types of Risk Management. The GSFC Aircraft Office uses 4 distinct methods of risk management:

20.1.2.1. Real-Time Risk Management – This process is used while in the aircraft, during operations. This process draws largely from an aircrew member’s training and experience and is documented through the Pilot’s Irregularity Report process and training. Regular training uses the information from such reports to educate other GSFC aircrew through informational feedback.

20.1.2.2. Non-Mission or Operational Risk Management (ORM) – This process is used for local, routine operations. This process substitutes a review panel or board with a standardized checklist for aircrew to evaluate each flight individually. Varying levels of risk require additional approval or flight cancellation.

20.1.2.3. Mission Operations Risk Assessment Process (MORAP) – This process is designed for missions and uses a board or panel of subject matter experts to identify threats very early in the project lifecycle and begin implementing controls immediately. Findings from this panel are reviewed for closure during the FRR/MRR process near the end of the pre-mission lifecycle process.

20.1.2.4. Test Flight & Engineering Check Flight Risk Management (TFRM) – This process is only used for test activities and identifies the level risk associated with a test activity. Risks are mitigated by increasing levels of pilot category, experience and training.

## 20.2. Risk Management Philosophy

20.2.1. General. “You will never remember the many times the launch slipped, but the on-time failures are with you always” – Walt W. Williams, NASA Program Manager for X-15 and Mercury. Well-seasoned flight operations recognize risk management as a critical tool embedded in a healthy safety culture. Risk Management is the continuous cycle of risk assessment, risk decision making, and implementation of risk controls, resulting in the acceptance, mitigation, or avoidance of risks. This process aids aircrew in the early identification and quantification of the hazards associated with any given flight evolution - factors that might otherwise go unnoticed. All GSFC Pilots in Command shall be trained and comfortable with the ORM tools in this document. PICs are encouraged to continuously weigh the ‘risk to benefit ratio’ with the rationale that, “there is nothing that we must accomplish today that we cannot accomplish tomorrow.”

20.2.2. Mission Risk Assessment and Review. Properly managing risks through a systematic process of pre-mission risk analysis, risk elimination, risk mitigation and risk acceptance at the appropriate level, is critical to the execution of a safe mission cycle. Research flying imposes demands on pilots which vary according to such factors as: pilot’s familiarity with the aircraft or type, the performance and handling characteristics of the aircraft in use, aircraft configuration and modifications, the complexity of tasks and demands made of the pilot, the environment in

which the flight is conducted, burdens placed upon pilot attention, and the duration of the assigned flight task. Such elements influence the level of skill, training, and knowledge required to successfully complete the mission safely.

### 20.3. **Real Time Risk Management**

20.3.1. **Real-Time Risk Management.** Real-time risk management happens continually during flight operations. Research aircrew and supporting ground crew are charged with evaluating the unique circumstances affecting each flight evolution and applying their experience and initiative to meet NASA mission objectives aggressively without compromising safety. Risks are inherent to flight operations. Occasionally, real-time exigencies will demand time-critical risk management skills that call upon well trained, appropriately equipped, and highly experienced aviators to take proper action in order to balance mission success criteria with the safety of the persons and equipment in their charge. The procedures and information provided in this manual are tools to aid the crew in this decision making process. While some of the information reflects regulatory requirements and policies, at no time are crew bound to any procedure which may compromise the primary and overriding objective of safety. A designated GSFC/WFF Pilot-In-Command is expected to use his/her command authority, or ultimately emergency authority, if necessary, to ensure the safety of the persons and equipment for which they are responsible. Judgment is the ultimate tool in ensuring this objective. The best way to improve real-time risk management is through continuous training and experience.

### 20.4. **Non-mission Operational Risk Management (ORM)**

20.4.1. **Non-mission Operational Risk Management (ORM).** All flight operations contain risk. Quantifying the composite of flights conducted for passenger carriage, pilot proficiency, training, familiarization, currency, public affairs, management oversight, educational outreach, or similar standard flight operations do not require mission Operational Mission Risk Assessment. Such flights utilize the Non-mission ORM tool located in Appendix B for risk evaluation. The tool uses elevated levels of awareness, escalating approval requirements, and mandated cancellation in extreme cases.

### 20.5. **Mission Operations Risk Assessment Panel (MORAP).**

20.5.1. **Mission Operations Risk Assessment Panel (MORAP).** Each individual mission's risk shall be evaluated by a MORAP consisting of, at a minimum, the Aircraft Lead (for the type aircraft assigned to the mission), the assigned Project Pilot, and the Aviation Safety Officer. The ASO, or a designated alternate, shall chair the MORAP discussions.

20.5.2. **Determination of Mission Risk Categories.** Programmed early in each mission lifecycle, the Mission Operations Risk Assessment Panel shall conduct a technical interchange meeting with assigned project personnel (project managers, project support managers, experimental team members, scientists etc.) as desired/required by the MORAP to determine preliminary Mission Risk Category. The review will, at a minimum, include:

- a. Mission requirements.

- b. Crew makeup, mission manning, pilot experience requirements.
- c. Crew duty day and crew rest.
- d. Mission profiles and energy states.
- e. Mission fuel requirements.
- f. Aircraft maneuvers and lateral positional accuracy requirements.
- g. Required flight operations conditions and procedures.
- h. Required aircraft equipment (mission specific MEL)
- i. Pilot or aircrew mission specific training.
- j. Operational Go/No-Go criteria.
- k. Aircraft modifications, configuration and limitations.
- l. Required special weather conditions.
- m. The region: terrain, climate, survivability.
- n. Specialized survival equipment requirements.
- o. Specialized crew survival training requirements.
- p. Lighting conditions, pilot visual cues or distractions, pilot familiarity with the area.
- q. Provide input to test plan development.
- r. The development of a dedicated and detailed mission CONOPS (when required)
- s. Other topics, as required.

20.5.3. MORAP Output. After analyzing the mission's detailed conditions, constraints and requirements, the Mission Operations Risk Assessment Panel will make recommendations, in writing, to the AOOM.

20.5.4. MORAP Mission Risk Categories. One of the following Mission Risk Categories shall be assigned to all GSFC Aircraft Missions.

20.5.5. Mission Risk Category I (Minimum). A minimum risk mission is characterized by generally favorable operational conditions. The aircraft is flown in a normal configuration (speed, loading, altitude, geographic area, environmental conditions, pilot work load etc.), using standard flight rules under (VFR or IFR). Such missions involve primarily point-to-point flying using landing areas that are fully adequate for the respective aircraft performance and avionics instrumentation. Extraneous pilot tasks are minimized such that the pilot may devote essentially full attention to flying the aircraft. Minor additional tasks may be assigned such as the testing of communications gear, scientific instrumentation, navigation equipment, or transporting passengers and cargo.

20.5.6. Mission Risk Category II (Elevated). Elevated risk missions regularly involve exposure to situations requiring a significantly higher level of pilot experience, skills, or attention. Mission in this category may include: maneuvering flights in high traffic areas, extended range over water flights, operations over extreme temperature regions, operations in mountainous terrain, extended low level segments, limited visibility or night operations, use of unimproved airfields or runways lengths that restricted aircraft performance for standard operations, close formation or high-speed intercept flying.

20.5.7. Mission Risk Category II (Substantial). Substantial risk missions involve tasks and conditions that require materially greater pilot experience, skills, or attention. Certain situations may themselves expose the aircraft and crew to substantial risk, or a combination of multiple elevated risk elements may place the mission into this risk category. Such missions typically require the pilot to sustain high gain tasks (such as precise lateral and vertical navigation profiles, extended operations in unstable portions of the aircraft envelope etc.) combined with exacerbating external factors (such as maneuvering close to vertical terrain, limited visibility, unstable air currents, or extreme weather conditions etc.) which combine to present rapid pilot fatigue.

20.5.8. Inherently Hazardous Operations. Situations that are substantially hazardous in themselves include: using night vision goggles in high- or low-speed flight at very low altitudes, operation of the aircraft in a manner outside procedures recommended by the flight manual (e.g., piloting airplanes at very low speeds and altitudes or flying rotary wing aircraft outside the recommended height/velocity profile), or performing operations that require waiver of safety standards and regulations.

## 20.6. Test Flight & Engineering Check Flight Risk Management (TFRM)

20.6.1. Engineering Check Flight / Test Flight Risk Categories. Due to the hazards involved with certain test flights and the increased level of aircrew experience required to safely conduct certain flight test plans, flights have been divided into categories. Pilot minimum qualification for each category is defined herein.

20.6.2. Test Flight Risk Category. Threat Hazard Assessment (THA) is the primary tool for determining the overall risk associated with the conduct of all dedicated Test Flight evolutions at GSFC. The hazards included in the THA are only those hazards that are specifically introduced by the nature of the testing. When a hazard is discussed, there is an associated severity and probability that describes the risk of a defined hazard. After successful implementation of all mitigations, the resulting risk is termed Residual Risk. Summarization of residual risk will be used to determine the overall category of the test plan. The Risk Category Matrix shall be used to determine final assessment of the appropriate test flight risk category: Category A – Low, Category – B Medium, Category C- High. Category D encompasses all ground and flight tests of prototype/pre-production aircraft and are not typically required or conducted at GSFC excluding Unmanned Aerial Systems.

20.6.3. Category A. Ground tests or test flights not involving potential or known hazardous operations. This includes flights within the aircraft flight manual (NATOPS) prescribed flight envelope not involving testing of critical safety of flight components.

20.6.3.1. Pilot Qualification: GSFC Research Pilot

20.6.3.2. Examples include:

- a. Antenna patterns
- b. Sensor evaluation (not including night vision devices)

- c. Carriage of previously tested external hardware on previous tested mounting structure (unaltered)
- d. Cruise performance testing
- e. Handling qualities during normal flight maneuvers
- f. Handling characteristics during simulated engine out conditions when permitted by the aircraft flight manual
- g. Steady pull (turns) up to  $\frac{2}{3}$  Nz limit
- h. Steady push up to  $\frac{1}{2}$  (-) Nz limit
- i. Unaccelerated stall warning / buffet testing that recovers at onset
- j. Emergency descent as prescribed in aircraft flight manual
- k. Static Lateral-Directional Stability (steady heading sideslip) when permitted by aircraft flight manual
- l. Generally most ground and laboratory tests
- m. Aborted takeoffs in turbo propeller powered aircraft
- n. Standardized internal configuration changes with no substantial external mold line change.

20.6.4. Category B. Ground tests or test flights that involving potentially hazardous operations.

20.6.4.1. Qualification: GSFC Research Test Pilot

20.6.4.2. Examples include:

- a. Engine stall susceptibility
- b. Helicopter object suspension and towing
- c. Stores separation of non-standard or modified stores
- d. Helicopter external lift
- e. Airstart envelope definition – multi-engine only
- f. Full unaccelerated and accelerated stalls (when applicable)
- g. Engine component improvement
- h. Engine out testing: one engine on three- or four- engine aircraft
- i. Quantitative performance testing
- j. Mission software not yet flown that could affect flight related displays, navigation accuracy
- k. Tower fly-by tests
- l. Captive carry of live stores
- m. Engine performance testing
- n. Initial Instrument Meteorological Conditions (IMC) testing after modification to relevant systems
- o. Tests that intentionally remove electrical power from normally powered equipment or buses (not including in a standard FCF)
- p. Non-standardized internal configuration changes or substantial external mold line change.

20.6.5. Category C. Ground test or test flights that involve known hazardous operations.



#### 20.6.5.1. Qualification: GSFC Research Test Pilot

#### 20.6.5.2. Examples include:

- a. First flight of significantly modified external aircraft configuration
- b. Aborted/reject takeoffs in jet aircraft
- c. Ground and air minimum control speed determination
- d. High angle-of-attack maneuvering evaluations
- e. Helicopter dynamic interface testing
- f. Full autorotation
- g. Flight control software
- h. Hazardous stores jettison

20.6.6. Category B and Category C Requirements. Flight test assignments within Category B and Category C involve aircraft with substantially modified systems and are characterized by a substantial degree of hazard. Such assignments require the application of a very high degree of skill in determining aircraft performance and flight characteristics under critical flight conditions of loading, speed, and maneuvers. Substantial modifications are those which are significant enough to influence the flight characteristics of the aircraft to a pronounced degree. These assignments are performed, for example, to certify aircraft as meeting prescribed safety standards after substantial modifications. They require an exceptionally wide background of experience and training to evaluate aircraft operational procedures and mechanical deficiencies and recommend new procedures or corrective action. Assignments involve compiling reports on the suitability, functioning, and general practicability of the aircraft and components or systems.

20.6.7. Category D Requirements. Flights outside of the normal flight envelope (as defined by the aircraft flight manual), maneuvers prohibited by the aircraft flight manual, 'first flights' of prototype aircraft, testing of stores separation deemed hazardous to the aircraft, departures, spins, or other out-of-control maneuvers (except aircraft with known stall conditions, and T-34 spins). Such flights require specific approval and acceptance of risk through a dedicated Authority to Proceed approval. Such flights shall only be conducted by a designated Research Test Pilot (RTP) with the appropriate level of training and experience.

### 20.7. Final Risk Acceptance

20.7.1. Authority to Proceed (ATP). The ATP process represents the final acceptance of any and all residual risk for a mission or flight by the Center or Facility Director. A signed ATP is required prior to the first Test or Check flight associated with a modified aircraft for which a Safety of Flight Release (SoFR) document has been generated. Flight Test events, even of unmodified aircraft, that have a THA resulting in a Test Flight Risk Category of Category D, require a signed ATP to proceed. Standard operations or FCF events within the aircraft flight manual do not require an ATP, regardless of the level of FCF.

## 21. Abnormal Operations & Emergencies

### 21.1. Engine Shutdown Enroute



21.1.1.1. Twin-Engine Aircraft. The FARs require that if an engine fails enroute, or is shut down to prevent possible damage, the following action be taken:

- a. The aircraft shall land at the nearest suitable airport, in terms of time, provided weather conditions, terrain, and facilities available indicate that a safe landing can be accomplished. If the pilot, after considering these factors, decides to proceed to an airport other than the nearest suitable, he must include in the Pilot's Irregularity Report the reasons for so doing.
- b. The pilot must report any engine shutdown by radio to ATC. Time and workload permitting the aircrew should also report the shutdown to the Flight Operations Office, Operation Monitor on aircraft that are equipped to do so.

21.1.1.2. Aircraft with Three or More Engines. In the event of a single power failure or whenever not more than one engine is stopped as a precaution on an aircraft that has three or more engines, the PIC may proceed to a selected destination if, after considering the following, the PIC decides that proceeding to that destination is as safe as landing at the nearest suitable airport:

- a. The nature of the malfunction and the possible mechanical difficulties that may occur if flight is continued.
- b. The altitude, weight, and usable fuel at the time of engine stoppage.
- c. The terrain and weather conditions en route and at suitable landing points.
- d. Possible air traffic congestion at suitable landing points.
- e. Pilot familiarity with the airport to be used.

21.1.1.3. PIC Report to ATC. The pilot must report any engine shutdown by radio to ATC, when it is determined that preferential handling is required. This may be delayed into the terminal area (Tower Controller). Time and workload permitting the aircrew should also report the shutdown to the Flight Operations Office, Operations Monitor on aircraft that are equipped to do so.

21.1.3.1. After Safe Landing. After a safe landing, report the engine-out aircraft is safe on deck to the Flight Operation Office, as soon as possible.

## 21.2. **Overweight Landings.**

21.2.1. Overweight Landings. If in the PIC's judgment, landing the aircraft as soon as possible constitutes the safest course of action, and the existing circumstances would not be made worse by an overweight landing, an overweight landing option may be considered. The only considerations that should be considered in this decision are those associated with safety (i.e. not maintenance or mission accomplishment).

21.2.2. Approach and Landing Weight Restrictions. GSFC aircraft should not flight plan any segment which is calculated to exceed landing weight limitations, based upon expected conditions, at the destination or a suitable alternate. These calculations are for flight planning purposes only, and do not limit the aircrew to a particular runway or flap setting at the actual time of arrival.

21.2.2.1. Overweight Landing Considerations. Cases which might require an expedited landing:

- a. Any malfunction or failure that renders the aircraft unairworthy or may do so at some point in the near future.
- b. Any condition where an expeditious landing would reduce risk exposure to additional problems or prevent a further compromise of safety.
- c. Serious illness of an aircrew member or passenger which requires immediate medical attention.
- d. Overweight Landing Preferences. Factors desirable for an overweight landing are:
- e. A dry runway of sufficient length.
- f. Anti-skid (where installed) operative.
- g. No tailwind.

21.2.2.2. Fuel Dumping vs. Overweight Landing. An overweight landing made solely for the purposes of fuel conservation is not permitted. An overweight landing performed in order to avoid possible environmental damage from fuel dumping is not permitted. (However, dumping fuel in environmentally sensitive areas should be avoided, if possible.)

21.2.2.3. Overweight Landing General Procedures. Overweight landings should be flown in accordance with the aircraft flight manual. Additional considerations should include:

- a. Do not hold the airplane off in order to achieve an especially smooth touchdown; as stopping distance becomes a considerable factor at higher gross weights.
- b. Expect to apply heavier than normal braking due to both higher than normal weight and the associated high touchdown speed.
- c. In turbo propeller driven aircraft, consideration should be given to the maximum speed at which reverse thrust may be applied.
- d. Be alert for high brake temperatures during taxi.
- e. Remain clear of congested areas with hot brakes.

21.2.2.4. Overweight Landing Reporting. Making an overweight landing is an exercise of the PIC's Emergency Authority and requires that a Pilot's Irregularity Report be completed. Exceeding either the landing structural weight limit, or any inflight structural flaps extended weight limit (per specific aircraft flight manual), or both, requires an entry in NAMIS and usually permanent entry into the aircraft maintenance logbook. The entry should give the weight values which were calculated by the crew for the landing (or the flap extension), and state whether a "hard" landing was experienced, with approximate sink rate if possible.

21.2.2.5. Overweight Landing Sink Rates. Not all of GSFC aircraft are designed to FAA standards however, as a reference, FAR Part 25 specifies that an aircraft must be able to sustain a landing impact of 6 feet per second at its maximum design take-off weight with no damage. Typical sink rates at touchdown are on the order of 3-4 feet per second. Even a "hard" landing rarely exceeds 6 feet per second (or 360 feet/min).

21.2.2.6. Overweight Inspection. A mandatory inspection is required before the aircraft can be released again, regardless of whether or not the landing was judged by the flight crew to be “hard.”

### 21.3. Reporting Of Severe Structural Loads

21.3.1. Reporting Of Severe Structural Loads. When at the PIC’s judgment a severe structural load has been imposed on the aircraft for any of the following reasons an entry must be made in NAMIS.

21.3.1.1. Hard Landing - Due to high sink rate, crab, wind conditions or touchdown attitude.

21.3.1.2. Severe Turbulence - Required only if in the PIC’s judgment a severe structural load has been imposed on the aircraft.

21.3.1.3. Structural Loads Imposed by Flight Controls - Required if excessive loads have been applied to flight controls during flight or ground operation or while the aircraft is parked.

### 21.4. Traffic Collision Avoidance System (TCAS)

21.4.1. TCAS Requirement. TCAS is an aircraft collision avoidance system designed to reduce the incidence of mid-air collisions between aircraft. It monitors the airspace around an aircraft for other aircraft equipped with a corresponding active transponder, independent of air traffic control, and warns pilots of the presence of other transponder-equipped aircraft which may present a threat of mid-air collision. It is mandated by the International Civil Aviation Organization (ICAO) to be fitted to all aircraft with a maximum take-off weight of over 13,000 pounds or authorized to carry more than 19 passengers. TCAS has been designed and implemented as a backup to ATC and the see and avoid rules, therefore, flight crew are expected to respond to TCAS when necessary to avoid a midair collision. All GSFC aircraft shall be equipped with TCAS or operate in accordance with a risk mitigation strategy determined by the TSRB which must be reviewed annually.

21.4.2. Response to a Traffic Alert (TA). Respond to a TA by:

- a. Attempting to establish visual contact with the intruder aircraft. If traffic is acquired visually, continue to maintain, or attain, safe separation using visual see and avoid rules.
- b. Do not maneuver on TA information only, unless necessary with traffic visually acquired.
- c. Response to a Resolution Alert (RA). Response to a Resolution Advisory (RA) is always the safest course of action. The sighted traffic may not be the traffic referenced by the RA. When Reacting to an RA:
- d. Respond to a RA promptly and in the direction indicated by the TCAS system.
- e. Do not maneuver in a direction opposite to that indicated by the TCAS system.
- f. Do not maneuver laterally to RA commands, unless a turn is already established or traffic is acquired visually and a turn is deemed the safest course of action.

- g. Follow the RA commands as accurately as possible. More is not necessarily better.
- h. When maneuvering in response to a RA keep deviations from altitude to a minimum and return to ATC clearance promptly when Clear of Conflict is issued.
- i. When a RA maneuver causes deviation from an ATC clearance the controlling ATC agency should be notified as soon as is practical in simple terms. (example: PAX APPROACH NASA 426, TCAS CLIMB)

21.4.3. TCAS RA Response Exception. All TCAS Resolution Advisories (RA) shall be complied with except in very select circumstances:

- a. When the RA conflicting aircraft is the only aircraft displayed on the TCAS receiver (at a scale selected by the PIC);
- b. And the PIC has the TCAS RA aircraft in sight;
- c. And another member of the primary aircrew (pilot, copilot or flight engineer) have directly correlated the TCAS displayed RA traffic with the visually acquired aircraft.

21.4.4. TCAS Mode Selection. TCAS should be flown in the TA/RA mode under most conditions. There are recommended times/locations to utilize the TA ONLY mode of operation:

- a. Formation flights.
- b. In VMC conditions when on final approach to, or departure from, a runway that has a parallel operation and traffic is present.
- c. If certain areas tend to produce unwanted RA activity each time they are overflown and VMC conditions exist.

21.4.5. TA Mode Selection with Engine Loss. After loss of engine thrust, selecting TA mode prevents climb commands which can exceed single engine performance capability.

21.4.6. TCAS Reporting and Immunity. A Pilot's Irregularity Report is required if a RA maneuver causes a deviation from an ATC clearance. Pilot immunity from enforcement action due to deviation from an ATC clearance when responding to a RA has been granted by the FAA.

## **21.5. Ground Proximity Warning System (GPWS) and Terrain Awareness and Warning System (TAWS)**

21.5.1. GPWS/TAWS Requirement. GPWS/TAWS systems have been designed and implemented as a backup to ATC and the see and avoid rules, therefore, flight crew are expected to respond to GPWS/TAWS when necessary to avoid a collision with terrain. All GSFC aircraft shall be equipped with GPWS/TAWS or operate in accordance with a risk mitigation strategy determined by the TSRB which must be reviewed annually.

21.5.2. Response to GPWS/TAWS Alert "Pull Up" Command. GPWS/TAWS is a system designed to alert pilots if their aircraft is in immediate danger of flying into the ground or an obstacle. The occurrence of a GPWS alert typically happens at a time of high workload and nearly always surprises the flight crew. Almost certainly, the aircraft is not where the pilot thinks it should be, and the response to a GPWS warning can be late in these circumstances. Warning time can also be short if the aircraft is flying into steep terrain since the downward looking radio

altimeter is the primary sensor used for the warning calculation. Response to a GPWS/TAWS Alert is always the safest course of action. Any sighted terrain or object may not be the item referenced by the GOWS/TAWS database. When Reacting to an GPWS/TAWS Alert “Pull UP”:

- a. Respond to a GPWS/TAWS alert promptly and utilizing maximum aircraft power and climb performance nose attitude.
- b. Retract spoilers, speed brakes and landing gear (when applicable).
- c. Do not maneuver laterally, unless an obstacle or terrain is acquired visually and a turn is deemed the safest course of action.
- d. Follow the commands until clear.
- e. When such a maneuver causes deviation from an ATC clearance the controlling ATC agency should be notified as soon as is practical in simple terms. (example: PAX APPROACH NASA 426, GPWS CLIMB)

21.5.3. GPWS Nuisance Alerts. When GPWS warnings are deemed a nuisance to the current flight operation, the GPWS may be temporarily deactivated:

- a. At the direction of the PIC;
- b. And in continuous sustained VMC;
- c. For brief flight segments;
- d. Must be re-energized immediately upon completion of the flight segment

## 21.6. **Limited or Inoperative Airfield Lighting**

21.6.1. Limited or Inoperative Airfield Lighting. Aircraft arriving or departing at night in VFR conditions with portions of runway light systems inoperative are permitted to land or takeoff provided the PIC has determined that adequate visual references exist between aircraft exterior lights and operative portions of the runway lighting systems to safely operate on that runway.

The PIC's consideration shall include the following:

- a. The wind direction from an illuminated wind direction indicator or local ground communications or, in the case of takeoff, that pilot's personal observations; and
- b. The limits of the area to be used for landing or takeoff are clearly shown by boundary or runway marker lights.
- c. The pilot's familiarity with the airfield in use.

## 21.7. **Foaming of Runways**

21.7.1. Foaming of Runways. Runway foaming may provide a degree of safety to an aircraft landing with a malfunctioning landing gear, but it will not absolutely assure that fire will not occur. The following points should be considered:

- a. If the water content of the foam blanket is frozen, fire protection is materially reduced. Also, braking action may be reduced.
- b. Maximum effectiveness of the foam blanket is obtained from 15 to 60 minutes after the foaming.

- c. A foaming operation may, at certain airports, reduce firefighting capability below the critical level until the trucks are recharged. If a station does not have the capability to foam a runway and then fight a fire, it is recommended to not foam the runway.

21.7.1.1. **Radio Contact.** Radio contact should be maintained between the aircraft and the control tower and the firefighting officer in charge. The firefighting officer needs to know exactly what type of emergency is present so that he can determine the position and dimensions of the foam blanket. Airport personnel should inform the pilot how long he will be expected to remain aloft before the foaming is completed and the trucks recharged. Direct radio contact with the fire department on a common frequency may be recommended.

21.7.1.2. **Adjusted Touchdown Zone.** In a full wheels-up landing, the aerodynamic characteristics of the aircraft may result in touchdown from 500 to 2000 feet farther down the runway than normal, unless compensating pilot techniques are used.

21.7.1.3. **Decreased Directional Control.** Expect increased difficulty with directional control on foamed runway.

## 21.8. **Air Defense Emergency**

21.8.1. **Air Defense Emergency.** In the event of a defense emergency or threatened emergency, NORAD will instruct ATC to implement SCATANA or ESCAT procedures for the control of air traffic.

21.8.2. **SCATANA (Security Control of Air Traffic and Navigation Aids).** These procedures may be implemented after an air defense emergency is declared. These procedures may include grounding, diversion, and other restrictions to flight plus the shutdown of navigation aids.

21.8.3. **ESCAT (Emergency Security Control of Air Traffic).** These procedures may be implemented when no defense emergency has yet been declared. These procedures may be local in nature and may include diversion or rerouting.

21.8.4. **ATC Compliance.** Compliance with instruction from ATC is mandatory, superseding any instructions from this manual.

21.8.5. **Reporting.** In the event that SCATANA or ESCAT is implemented, the ASO will follow the notification procedures for emergencies and incidents as stated elsewhere in this manual.

## 21.9. **Near Midair Collision Reporting.**

21.9.1. **Near Midair Collision Reporting.** Near midair collisions shall be reported immediately and briefly to the ATC facility controlling the flight, when applicable. This permits ATC to investigate while the other aircraft is still in flight, and also to take measures to protect other



aircraft in the area. ATC may require a phone call for amplifying data. ATC normally discards its tapes after 15 days. A Pilot's Irregularity Report is required.

## 21.10. Volcanic Ash

21.10.1. Flights around Volcanic Ash. GSFC PICs shall flight plan around all known volcanic ash clouds by a sufficient distance to preclude aircraft damage. Flight into an area of known volcanic activity that is producing high altitude dust clouds must be avoided. This is particularly important during hours of darkness or in daytime instrument meteorological conditions when the volcanic dust may not be detected by the aircrew. Any exception or flight over an active volcano will be approved through the Chief of Flight Operations.

21.10.2. Flight Planning and NOTAMs. When a flight is planned into an area with a known or a potential for volcanic dust cloud formation, it is recommended that all NOTAMs and air traffic advisories be reviewed for the current status of volcanic activity. If volcanic activity is reported, the planned flight should remain well clear of the area, and if possible, stay on the upwind side of the volcano. Airborne weather radar systems are not designed to detect dust clouds and cannot be relied on to detect and avoid volcanic dust clouds.

21.10.3. Volcanic Dust Indications. The following can be expected when flying into volcanic ash:

- a. Smoke or dust appearing on the flight deck.
- b. A strong smell of sulfur (acrid odor) similar to electrical smoke.
- c. Multiple engine malfunctions, such as stalls, increasing turbine temperatures, torching from tailpipe, and flameouts.
- d. At night, St. Elmo's fire or other static discharges accompanied by a bright orange glow in the engine inlets.
- e. A fire warning indication.

21.10.3.1. Volcanic Dust Damage. Volcanic dust clouds may extend for several hundred miles. Volcanic dust can cause rapid erosion and damage to the aircraft engines. Loss of thrust, and / or high turbine temperatures may result. Retarding thrust to idle may lower the temperatures which, in turn, may reduce the debris buildup on the turbine blades.

21.10.4. Ground Operations In Volcanic Ash. When ground operations are required in an area contaminated with volcanic dust, the following criteria should be followed:

- a. All NOTAMs and air traffic control directives be reviewed for airfield conditions and current status of volcanic activity.
- b. Do not use windshield wipers for dust removal. Hose off dust with water, and wipe off residue with a clean cloth.
- c. Inspect all engine and ventilation inlets, pitot and static port openings, and air scoops for dust accumulation.
- d. Use of APU should be limited to engine starts only.
- e. Limit the use of reverse thrust to prevent volcanic ash from being ingested into engines



- f. Limit thrust operation to minimum required to taxi using all engines.
- g. When possible, avoid operating the engines above idle.
- h. If taxiways are wet, the dust covered surfaces should be treated the same as ice covered surfaces.
- i. Avoid using air conditioning on the ground. If air conditioning on the ground is necessary, operate at full cold setting if dust is visible.
- j. If a dust cloud is present, allow dust to settle prior to takeoff.
- k. A rolling takeoff should be used, avoid setting high thrust at low speeds when possible and takeoff (with EDCs dumped or packs off, should be considered on applicable GSFC aircraft).

21.10.4.1. APU Operation. The APU should only be used when the use other external power is either not feasible or inconsistent with mission requirements.

## 21.11. Ditching and Bailout

21.11.1. Cargo and Equipment Security - Ditching Precaution. When an aircraft must be crash landed on either land or water, the sudden shifting of cargo, equipment, and other heavy items may cause injury or loss of life. All GSFC aircrew shall arrange and secure equipment in their aircraft to guard against such dangers. Emergency gear, such as life rafts, should be properly stowed for quick availability. Responsibility for proper security of cargo and equipment lies with the PIC of each aircraft.

## 21.12. Wake Turbulence

21.12.1. Wake Turbulence Avoidance (Takeoff). Air traffic control facilities use 2-minutes departure separation or 5-mile separation (when the facility is radar equipped) when a narrow body aircraft departs behind a "heavy." A 5-mile separation approximates a time span of less than two minutes.

21.12.1.1. PIC Responsibility. It is PIC's judgment as to whether a full 2-minute separation makes sense in any given departure situation. After liftoff try to avoid the flight path of a large departing aircraft.

21.12.1.2. Adjacent / Adjoining Runways. When making intersection takeoffs, be alert to adjacent runway operations, particularly upwind runways. For takeoffs on adjoining runways where large or heavy aircraft have landed, PICs should consider the wind conditions and evaluate the potential for wake vortices. If the vortices have a likelihood of drifting into the takeoff path a delay should be considered. If the flight is departing after a preceding aircraft's missed approach, a possible vortex encounter also exists and a similar delay should be applied.

21.12.2. Wake Turbulence (Enroute). When experiencing wake turbulence, contact ATC and request a vector, FL change, or lateral offset if capable.

21.12.3. Wake Turbulence (Approach and Landing). A distance of three miles or greater reduces the potential for a vortex encounter. If a large aircraft is observed above and on the same track, a lateral adjustment upwind should be considered.

21.12.3.1. Wake Turbulence and Visual Approaches. Air traffic controllers are required to provide separation between IFR aircraft. When clearance is received to follow an aircraft visually, the flight crew accepts responsibility for separation as well as wake turbulence avoidance. A controller should issue the clearance “caution – wake turbulence” when, in the controller’s opinion, the aircraft following a large aircraft may be adversely affected by the wake turbulence. After issuing the caution, controllers do not provide additional information to the following aircraft.

### 21.13. **Aborted or Rejected Takeoffs (RTO)**

21.13.1. Aborted or Rejected Takeoffs (RTO). An RTO has been defined as any unplanned action initiated by the pilot that prevents a normal takeoff once the aircraft has been cleared for takeoff, aligned with the runway, and has commenced forward motion with the intent to takeoff. This does not include any action taken by ATC, i.e., clearance for takeoff canceled, or similar ATC situations that might occur prior to forward aircraft movement. The pilot at the controls is responsible for performing the rejected takeoff maneuver unless the PIC deems it necessary to conduct an exchange of aircraft control. A rejected takeoff requires the submission of a Pilot’s Irregularity Report.

### 21.14. **Jettisoning Fuel (Fuel Dump/Gross Weight Adjustment)**

21.14.1. Jettisoning Fuel (Fuel Dump/Gross Weight Adjustment). Whenever practicable, fuel shall not be jettisoned (dumped) below an altitude of 6,000 feet above the terrain. Should weather or emergency conditions dictate jettisoning at a lower altitude, every effort shall be made to avoid populated areas. Environmentally sensitive areas should be avoided, when possible. When under positive control, the PIC should advise the air traffic control facility that fuel will be jettisoned.

21.14.1.1. Reporting. The Flight Crew must notify Air Traffic Control of the intent to make a gross weight adjustment. The ASO shall make appropriate notifications to the applicable agencies and WFF offices. A Pilot’s Irregularity Report is required to be completed which includes:

- a. Amount of fuel discharged.
- b. Altitude and location in flight path of the fuel discharge.
- c. Wind speed and direction at time of fuel discharge.
- d. Area likely to be affected.

21.14.1.2. Fuel Dumping Over New Jersey. The State of New Jersey Department of Environmental Protection requires any fuel discharge over the land or waters of the State of New Jersey to be reported within 24 hours of fuel discharge

## 22. Interference from Portable Electronic Devices

22.1.1. Interference from Portable Electronic Devices. In the event that aircrew observe or suspect anomalies in aircraft navigation or communication equipment systems, a PA announcement will be coordinated with the cabin aircrew informing all passengers and/or QNCs to terminate the use of all personal electronic devices until the source of the anomaly can be definitively identified.

22.1.1.1. Suspected Interference Reporting. Suspected interference incidents should be documented in a Pilot's Irregularity Report. The following information should be included in the narrative:

- a. Description of interference/effects on flight deck indicators, radio reception, and duration.
- b. Identification of device if possible. Include: brand name, model, serial number, FCC number, seat location.
- c. Name and address of user (if possible) for further information if necessary.

## 23. Crew Resource Management

23.1.1.1. Crew Resource Management. Crew resource management training is required of all primary and secondary aircrew members annually. At a minimum the following topics will be covered during training:

### a. Communication / Assertiveness

- 1) *Plan for, brief, and debrief operational requirements.*
- 2) *Encourage crewmembers to state ideas, opinions, and recommendations.*
- 3) *Identify / verbalize mistakes, problems, deviations, errors, and limitations promptly.*
- 4) *Establish importance of identifying risks, threats and errors.*
- 5) *Keep aircrew and passengers informed and updated.*
- 6) *Communicate messages using standard terminology.*

### b. Leadership / Teamwork

- 1) *Set and maintain an open tone.*
- 2) *Plan for high workload situations and anticipate potential problems.*
- 3) *Manage flights/test plans as briefed - communicate changes / deviations from the plans.*
- 4) *Clearly state assignments and expectations.*
- 5) *Actively demonstrate monitoring and challenging.*

### c. Situational Awareness

- 1) *Discuss aircraft configurations, mission segment requirements, challenges to pilot attention, airport specific procedures, and performance issues.*
- 2) *Consider contingency requirements.*
- 3) *Monitor developments (e.g., fuel, time, weather, etc.).*
- 4) *Recognize and act on mandated procedures.*
- 5) *Inform crew when conditions change or unplanned situations emerge.*

- 6) *Acknowledge when something doesn't feel right.*
- 7) *Recognize the effects of stress or fatigue.*
- d. **Decision Making / Planning**
  - 1) *Use all available resources.*
  - 2) *Establish and brief "bottom lines" and "back up plans."*
  - 3) *Verbalize operational plans/decisions clearly.*
  - 4) *Resolve conflicting information.*
  - 5) *Initiate strategies for handling distractions.*
- e. **Self-Evaluation**
  - 1) *Conduct operational review - openly evaluate successes and mistakes.*
  - 2) *Give and take constructive feedback.*
- f. **Apply Automation and Technology**
  - 1) *Plan and brief automation modes and configurations.*
  - 2) *Plan workload and allow sufficient time for programming tasks.*
  - 3) *Verbalize entries and changes to automated systems.*
  - 4) *Maintain an awareness of the automation modes.*
  - 5) *Change level of automated system (up or down) to increase situational awareness and avoid work overload.*

## 24. Aircraft Equipment

### 24.1. Minimum Required Aircraft Equipment

24.1.1. Minimum Equipment List. Prior to release, the required aircraft equipment will be determined by the Minimum Equipment List (MEL). For using any minimum based on radio aids, the "Related Airborne Equipment" must naturally be operating. If the aircraft cannot receive or display the signals from a radio aid, minimums are the same as they would be if the radio aid were out of service.

24.1.2. Instrument Flight Equipment. The individual aircraft MEL dictates the minimum equipment for any given flight however; flights into IMC require additional requirements. For IMC flights, the pitot-static system and all vacuum pressure or electrical sources for the pilot flight instruments must operate satisfactorily. For flight into IMC GSFC aircraft shall, at a minimum, be equipped with the following instruments in proper operating condition:

- a. Airspeed indicator.
- b. Altimeter.
- c. Turn-and-slip indicator.
- d. A clock displaying hours, minutes, and seconds with a sweep second pointer or digital readout.
- e. Attitude indicator.
- f. Calibrated magnetic compass.
- g. Heading indicator or gyro-stabilized magnetic compass.
- h. Vertical speed indicator.
- i. Aircraft shall be equipped with deicing or icing control equipment for sustained or continuous flight in known or forecast icing conditions, when applicable.

- j. Navigation lights must operate satisfactorily.

24.1.3. Required Communication, Navigation, Identification Equipment. Certain aircraft equipment is critical for safety. The following minimum equipment is recommended for standard flight operations:

- a. The aircraft shall have two-way radio communication equipment and operating navigation equipment required for the en route and approach navigation aids to be used and on which the clearance is predicated.
- b. Pilots planning to operate in or through areas that require special communication frequencies shall ensure that the frequencies are available in the aircraft.
- c. A functioning radar beacon transponder is required for flight in airspace where FAR specify such equipment.
- d. A properly integrated GPS system with an integrity function may be used for primary and supplemental navigation during en route, terminal, and GPS NPA phases of flight when certified.
- e. IFR navigation with a handheld GPS receiver not intended for air navigation is prohibited. Such devices are approved as situation awareness tools only.
- f. Paper charts or approved electronic media publications which provide coverage for the planned route of flight are required in the cockpit and shall be the primary source of approach procedures.

24.1.4. Required Long Range Communication, Navigation, Identification Equipment. Additional equipment, beyond that outlined in the MEL, may be required for certain long range missions and regional considerations (HF radios, Cell Call etc.). Assigned Project Pilots should work directly with the A&MM and CPM early in the project to ensure each aircraft is correctly equipped for such operations.

## **25. General Personnel Policies**

### **25.1. Airman Certificate**

25.1.1. Airman Certificate. When a pilot makes a change to his/her certificate or the information on the pilot's certificate changes in any manner, the pilot must provide a copy of the new certificate (front and back) to the Aircraft Office for incorporation in his/her training record.

25.1.1.1. Replacing Lost Certificate. The FAA provides an online service to complete various administrative tasks concerning your airman certificate. The web address is:  
[http://www.faa.gov/about/office\\_org/headquarters\\_offices/avs/offices/afs/afs700/amsvcs.asp](http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs700/amsvcs.asp)

### **25.2. Notification of Arrest or Conviction**

25.2.1. Notification of Arrest or Conviction. Many NASA GSFC flight operations personnel require FAA certification for performance of their duties. Since such employees' FAA certification may be suspended for specific violations of law, such employees must notify their

Chief of Flight Operations prior to their next scheduled work day, but in no case more than three days after being arrested or convicted of a crime, whether that crime is a felony or a misdemeanor or if the employee received deferred adjudication; if that crime is listed as a reason for suspension or revocation of his/her FAA certificate. Employees must notify NASA whether or not they believe any record presently shows an arrest, conviction, or deferred adjudication and whether or not a lawyer has told them something to the contrary. The Chief of Flight Operations will forward pertinent information to the GSFC OHCM for civil servants or the appropriate contract manager for contractors, for disposition.

### **25.3. Attendance, Leave Of Absence**

25.3.1. Attendance Policy. Frequent, excessive, or patterns of absence or unavailability will be reviewed by the Chief of Flight Operations and the Office of Human Capital Management (OHCM), or support contract management and the NASA Contracting Officer, for disposition.

25.3.2. Military Leave Of Absence (MLOA). NASA is supportive of participation in the U.S. military as a reservist or member of the National Guard. Civil Servants may receive 15 or more days paid military leave each year for periods of active military duty. Contractor policies may vary. Coordination of military leave periods should be communicated to the AOOM as soon as possible for mission scheduling de-confliction.

25.3.2.1. OPM Military Leave Policy. The U.S. Office of Personnel Management military leave policy can be found at <http://www.opm.gov/oca/leave/index.asp>

25.3.3. Pilot Leave Of Absence. A pilot returning after an absence of 24 months or more shall be required to serve in a SIC capacity only, on all assigned aircraft, until currency in operating procedures and personal proficiency is reestablished. A TSRB will recommend a customized individual training plan to the Chief of Operations for review and approval. This period of time necessary to serve as a SIC shall be based on the individual's proficiency as determined by GSFC Instructor Pilots and the TSRB.

25.3.4. Personal Emergency. Death or Critical Illness in the Family. In the event of a death or emergency in the immediate family, aircrew should consult the Chief of Flight Operations, or his/her designated representative for immediate coordination.

25.3.5. Jury Duty Policy. Coordination of Jury Duty leave periods should be communicated to the AOOM as soon as possible for mission scheduling de-confliction.

### **25.4. Aircrew Contact Information and Addresses**

25.4.1. Aircrew Contact Information and Addresses. All GSFC aircrew members shall keep their aircrew training record up-to-date with current contact telephone numbers, mailing addresses and next-of-kin/emergency information.



## 25.5. **Loss of Documentation**

25.5.1. Loss of Documentation. It is each aircrew member's responsibility to monitor and maintain the status of their own documentation. An aircrew member who fails to maintain their documentation may be placed in a 'Loss of Qualification' status as aircrew and may be subject to loss of certain pay or privileges.

## 25.6. **Media/Press Interviews**

25.6.1. Media / Press Interviews. All interviews or voluntary interactions with the press or media outlets should be prior approved by the Chief of Flight Operations and coordinated through the GSFC/WFF Public Affairs division.

## 25.7. **Harassment**

25.7.1. Harassment. NASA policy defines harassment/harassing conduct as any unwelcome conduct, verbal or physical, based on an individual's race, color, gender, national origin, religion, age, disability, genetic information, sexual orientation, status as a parent, gender identity, or retaliation for making reports or allegations of harassment or providing information related to such allegations when: (1) The behavior can reasonably be considered to adversely affect the work environment or (2) An employment decision affecting the employee is based upon the employee's acceptance or rejection of such conduct.

25.7.2. Victim Reporting. NASA employees who believe they have been the victims of harassment should report the matter immediately to their supervisor, or the Center Anti-Harassment Coordinator.

## 25.8. **GSFC Employees on Non-NASA Aircraft**

25.8.1. GSFC Employees on Non-NASA Aircraft. Approval for GSFC employees to fly in non-NASA controlled aircraft (excluding standard FAR Part 121 operations) during the performance of their duties, requires approval by the Chief of Flight Operations.

## 25.9. **Loaning GSFC Aircrew to Another Center**

25.9.1. Loaning GSFC Aircrew to Another Center. Approval for NASA GSFC aircrew to fly in other NASA Center controlled aircraft is obtained verbally or in writing from the Chief of Flight Operations and documented in accordance with established procedures from the hosting NASA Center. Cross-assigned aircrew members shall follow the rules and regulations associated with the receiving Center.

## 25.10. **Outside Employment, Fund Raising and Non-NASA Activities**

25.10.1. Outside Employment. NASA has a regulation governing outside activities: 5 CFR Part 6901. Full time NASA GSFC pilots (civil servant and contractor) should coordinate with the



Chief of Flight Operations any intentions to perform paid flight activities outside of GSFC duties to allow for review for potential 'conflicts of interest' and potential impacts on GSFC crew scheduling. This requirement does not pertain to Guest Aircrew.

25.10.2. Outside Activities Restrictions. Employees are subject to a number of limitations on their outside activities. Most importantly, employees may not be involved in outside activities that conflict with their official duties. An activity conflicts with official duties:

- a. If it is prohibited by statute or regulation; or
- b. If the activity would require the employee to be disqualified from matters so central to the performance of the employee's official duties as to materially impair the employee's ability to carry out those duties.

25.10.3. Use of NASA Position or Titles. Employees generally may not be paid for outside teaching, speaking and writing related to NASA policies, programs, or operations. They also may not use their official titles or positions (except as part of a biography or for identification as the author of an article with an appropriate disclaimer) to promote a book, seminar, course, program or any other outside activity.

25.10.4. Fund Raising. Employees may engage in fundraising in a personal capacity, as long as they don't solicit funds from subordinates or from anyone who does business with the Agency. Also, employees may not use or permit the use of their official titles, positions or authority to promote the fundraising effort.

25.10.5. NASA Civil Servants as Sub-Contractors. NASA employees are not allowed to be, in effect, subcontractors to NASA. More precisely, a NASA employee may not engage in outside employment with (1) a NASA contractor, subcontractor, or grantee in connection with work performed by that entity for NASA; or (2) a party to a Space Act agreement, Commercial Launch Act agreement, or other agreement to which NASA is a party pursuant to specific statutory authority, if the employment is in connection with work performed under that agreement.

25.10.6. Advanced Approval for Outside Employment. NASA requires advance approval for outside employment involving the following:

- a. Teaching, speaking, writing, or editing, unless the subject matter pertains to the private interests of the employee, such as a hobby, cultural activity, or non-work related professional pursuit;
- b. The practice of a profession or the rendering of professional consulting services;
- c. The management or conduct of a business in which the employee or the employee's spouse has an ownership interest;
- d. Holding a State or local public office, whether by election or appointment;
- e. Employment with a NASA contractor, subcontractor, or grantee;
- f. Employment with a party to a Space Act agreement, Commercial Launch Act agreement, or other agreement to which NASA is a party pursuant to specific statutory authority;

- g. Serving as an officer, trustee, or member of a board, directorate, or other such body of a for profit organization or of a nonprofit organization that is a prohibited source; or
- h. Employment which involves the practice of a NASA-owned invention.

25.10.7. Employee in Doubt. Even when not required, a NASA employee who is in doubt as to the propriety of outside employment or another outside activity may request prior approval using the procedures set forth in the regulation.

## 25.11. **NASA Property**

25.11.1. NASA Property. Every NASA employee, contractor and civil service, has the responsibility to protect and safeguard government property. No employee will be in unauthorized possession of any property of the government, or attempt to remove such property from government premises under penalty of federal law. Legislation (18 USC 1361) specifies that it is illegal to steal or damage any property of the federal government and establishes provisions for fines and imprisonment.

## Acronyms

AC Aircraft Commander

ACET Aircrew Coordinated Emergency Training

ACM Aft Crew Member

AD Aircraft Division (HQ)

ADF Automatic Direction Finder

AE Airworthiness Engineer

AED Automated External Defibrillator

AFSRB Airworthiness and Flight Safety Review Board

AFM Aircraft Flight Manual

AGL Above Ground Level

ALSE Aviation Life Support Equipment

AME Aviation Medical Examiner

AMM Aircraft Maintenance Manual

A&MM Airworthiness and Maintenance Manager

AMOC Aircraft Maintenance and Operations Contract

AO Aircraft Office

AOM Aircraft Operations Monitor

AOOM Aircraft Office Operations Manager

AP Aerial Photographer

ARFF Airport Rescue Fire Fighting

ASO Aviation Safety Officer

ASR Airport Surveillance Radar

ATAF All Tools Accounted For

ATP Authority to Proceed

AX Auxiliary Crew Member

BCA Business Case Analysis

CMPM Contract Maintenance Project Manager

COTR Contracting Officer's Technical Representative

COR Contracting Officer's Representative

CP Copilot

CPR Cardiopulmonary Resuscitation

CRM Crew Resource Management

DDA(H) Derived Decision Altitude (Height)

DME Distance Measuring Equipment

DoD Department of Defense

ETA Estimated Time of Arrival

FAA Federal Aviation Administration

FBO Fixed Base Operator

FCC Federal Communication Commission

FCF Functional Check Flight

FDR Flight Data Recorder

FE Flight Engineer

FL Flight Level

FM Flight Mechanic

FMC Flight Management Computer

FMT Flight Maintenance Technician

FOD Foreign Object Damage / Debris

FOUO Fire of Unknown Origin

FP First Pilot

FS Flight Surgeon

FTE Flight Test Engineer

GPS Global Positioning System

GSFC Goddard Space Flight Center

HAC Helicopter Aircraft Commander

HFB Human Factors Board

HQ Headquarters

IFE Instructor Flight Engineer or In-Flight Evaluation

IFR Instrument Flight Rules

IFT In-Flight Technician

IFM In-Flight Mechanic

ILS Instrument Landing System

IMC Instrument Meteorological Conditions

IRTC Instrument Refresher Training Course

IP Instructor Pilot

LM Loadmasters

LPO Launch Panel Operator

MC Mission Controller

MCP Master Control Panel

MDA/DH Minimum Descent Altitude/Decision Height

MEL Minimum Equipment List

MMA Mission Management Aircraft

MOA Memorandum of Agreement

MORA Mission Operations Risk Assessment

MORAP Mission Operational Risk Assessment Panel

MOU Memorandum of Understanding

MSL Mean Sea Level

MSDS

NAARS NASA Aircraft Anomaly Reporting System

NATOPS Naval Air Training and Operating Procedures Standardization

NAV Navigator

NM Nautical Miles

NPD NASA Procedural Directive

NPR NASA Procedural Requirement

OBS Observer

OMB Office of Management and Budget

OPM Office of Personnel Management

ORA Operations Risk Assessment

ORM Operational Risk Management

ORR Operational Readiness Review

PAR Precision Approach Radar

PF Pilot Flying

PFPM Production Flight Procedures Manual

PIC Pilot in Command

PM Pilot Monitoring

PS Project Support

QAM/GSO Quality Assurance Manager / Ground Safety Officer

QNC Qualified Non-Crewmember

R&D Research & Development

RNAV Area Navigation

RON Remain Over Night

RTO Rejected Takeoff

RVR Runway Visual Range

RVSM Reduced Vertical Separation Minimums

SAR Search and Rescue

SM Statute Miles

SOR Senior Operations Representative

TACAN Tactical Air Navigation

TD Test Director

TFOA Things Falling Off Aircraft

TM Training Manager

UAV Unmanned (unpiloted, uninhabited, uncrewed) Aerial Vehicle

UAS Unmanned (unpiloted, uninhabited, uncrewed) Aerial System

UPS Uninterruptable Power Supply

USAF United States Air Force

USN United States Navy

USNTPS United States Naval Test Pilot School

VFR Visual Flight Rules

VMC Visual Meteorological Conditions

VOR VHF Omnidirectional Range





**Goddard Space Flight Center  
Wallops Flight Facility  
Formation Briefing Guide**



## **Appendix A Formation Brief**

### **PREREQUISITES**

- Requires certification of participating flight crew by operating organization
- Flights of two aircraft / UAV's only
- Comprehensive pilot-to-pilot brief required prior to each formation flight
- Written copy of this or equivalent brief provided to each crew
- Each aircraft responsible for own fuel state

### **Formation Brief**

#### Communication and Crew Coordination:

1. **Callsigns:** Lead \_\_\_\_\_ Wing \_\_\_\_\_
2. **Frequencies:** Dedicated primary and auxiliary (projects) frequencies are required.  
  
Primary: \_\_\_\_\_ Aux: \_\_\_\_\_
3. **Radio procedures and discipline** – Lead responsible for comms. Frequency changes will be over the radio, or via hand signals if unable and followed by positive check in.
4. **Change of control of aircraft** – Positive two way change of lead via hand signals. If there is doubt, lead will ID itself over radio using side number.
5. **Identification** – On initial check in with ground “NASAXX and NASAYY, flight of two”. All other ATC check ins “NASAXX, flight of two”. Subsequent calls “NASAXX and flight”.
6. **Lookout procedures** – Lead is responsible for visual lookout and traffic separation. Wing may assist but has primary responsibility for flight integrity.

#### **Navigation and Flight Conduct:**

1. **Ground Operations** – Set engine start time and initial check-in
2. **Marshal / Taxi** – Note Marshall location, taxi on centerline with 1000 foot separation

#### **Takeoff / Departure / En Route:**

1. **Duty Runway** – Note active runway
2. **Takeoff** – 10 sec flight lead separation or interval takeoff, others per Aircraft Office FOM

3. **Climbout and Rendezvous**– IAW VFR course rules and leads instructions.
4. **En Route Formation** - Cruise, parade, or tac-wing.
5. **Route of Flight** – Note route of flight and operating area.

#### Recovery:

1. **Fuel Management/ Joker / Bingo** – Set Values for each aircraft in flight.
2. **Penetration** – IAW leads instructions.
3. **Approach** – If unable to recover VFR, consider a section approach or individual instrument approaches IAW the Aircraft Office FOM.
4. **Recovery** – IAW Leads instructions and Aircraft Office FOM.

#### Contingencies / Emergencies:

1. **Fallout Plan** – Set Alternate lead and fallout plan
2. **Midair Collision** – Assess controllability and regain aircraft control. If not controllable, bailout or eject if able. If controllability is regained, both aircraft shall take a cut-away from one another and assign separate altitudes. One individual controllability checks are performed, both aircraft will RTB as soon as possible.
3. **Aborts** – Both aircraft will maintain their side of runway. Either lead or wing may abort entire flight by transmitting “NASA XX flight, abort” on projects frequency. If lead aborts during interval takeoff, lead will abort entire flight. If wing aborts, wing will call “NASA YY aborting” after lead is safely airborne.
4. **Emergency fields** – KSBY, KNHK, KNTU. Weather diverts KNHK primary and KSBY secondary.
5. **Minimum and emergency fuel** – IAW Aircraft Office FOM.
6. **Radio failure / ICS failure** – If radio failure occurs, the aircraft with the bad radio will assume the lead to troubleshoot. If comms cannot be reestablished, the aircraft with the good radio will assume the lead and coordinate a RTB. On initial contact, lead will inform tower that wing is NORDO and request clearance for wing. A touch and go to the active runway will indicate clearance to land.
7. **Loss of visual contact with flight** – If wing losses visual contact while in VMC, wing will call “NASA YY is blind”. Lead will try to establish visual contact and coordinate the join-up on projects frequency using wings reference system (clock code). If unsuccessful, lead will climb 500 ft above and wing will descend 500 ft below working altitude. Lead will then coordinate the join-up over projects frequency. If either aircraft is NORDO and lost sight, the flight will proceed to the prebriefed lost comm/lost sight waypoint and hold as briefed by the flight lead.

If the flight inadvertently enters IMC, lead will roll wings level and wing will maintain flight integrity. If the flight is not VMC at the end of one minute, the flight will execute a 15 deg AOB turn away from wing for 180 deg heading change to reestablish VMC.

If wing loses visual contact in IMC, wing will call "NASA YY is lost sight". If straight and level, lead will report current heading and altitude on projects frequency. Wing will turn 30 deg away from lead and then descend 500 feet below leads altitude. Lead will direct a rejoin or coordinate a separate squawk for wing. If in a turn, the aircraft on the outside of the turn will roll wings level and report heading and altitude on UHF. The aircraft on the inside of the turn will continue to turn for 30 deg of heading change. Lead will then direct a rejoin or coordinate a separate squawk for wing as appropriate.

If lost sight is encountered while in a climb or descent, wing will level off, while executing the procedures outlined above. Lead will be directive using the radios and assign different altitudes to formation members. If either or both aircraft encounter VMC, remain VMC and execute blind procedures. If unable to reach VMC, lead will coordinate separate squawks and approaches with ATC.

8. **Downed pilot and aircraft** – If the first aircraft on scene, lead will assume on scene command. Wing will provide assistance as required or remain clear.
9. **Aircraft emergencies and system failures** – The aircraft experiencing the system failure will be passed the lead and allowed to troubleshoot. The non-emergency aircraft will provide support as the wingman, to include assuming the comm lead and coordinating an RTB, if appropriate. The emergency aircraft may choose to fly as wing or RTB as a single at the PICs discretion.

**Goddard Space Flight Center  
Wallops Flight Facility  
Aircraft Office**



**Appendix B  
Operational Risk Management Worksheet**

Risk Factors	Risk Rating		
	Low	Medium	High
<b>Mission</b>			
Test Risk Category			
Duration (hours)			
Pressure			
Complexity			
Flight period			
Ops Tempo			
<b>Human Factors</b>			
Experience			
Currency			
Crew Rest			
Fatigue			
External Stressors			
Full crew complement			
Health			
<b>Aircraft</b>			
Days Since Last Flight			
Outstanding Gripes			
System Maturity			
Configuration Maturity			
Weight			
<b>Environment</b>			
Ceilings			
Winds			
Visibility			
Rwy Condition			
Temp / Dew Point			
Terrain			
Airfield Familiarity			
Nearest Divert			
<b>Overall Rating</b>			
Overall Rating			

Risk Level Approval Authority	Signature / Date
Low - Mission Commander	
Medium - Aircraft Operations Officer	
High - Aircraft Office Chief	

**Directions:** Make a qualitative assessment of each risk factor and place a lowercase "X" in the appropriate rating. The risk rating will auto-fill with the appropriate color. The overall rating should reflect the highest risk factor.