# NASA Procedural Requirements

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## Chapter 2. Airworthiness and Maintenance

## 2.1 Purpose

2.1.1 This chapter establishes policy to ensure the airworthiness and maintenance of NASA aircraft/UASs that use aerodynamic lift for flight, operate in the Earth's atmosphere where aeronautical flight can occur, and are used to perform NASA missions. It also establishes policy for safety and flight readiness reviews performed in conjunction with the acceptance or modification of aircraft.

## 2.2 Airworthiness General Requirements

2.2.1 NASA aircraft shall be operated in an airworthy condition as certified by a formal NASA airworthiness review board (ARB), under the authority of a NASA Center Director, using a NASA Certificate of Airworthiness process. [75]

2.2.1.1 All NASA aircraft shall possess and maintain a NASA Certificate of Airworthiness (Appendix F) approved by the Center Director. [76] For all NASA aircraft other than NASA-owned aircraft, the certificate shall state the duration of applicability, as well as any limitations of that certificate. [77] A NASA Certificate of Airworthiness is valid only when conducting a NASA mission.

2.2.1.2 All aircraft used for passenger transportation purposes shall possess a "Normal" or "Transport" category FAA Certificate of Airworthiness. [78]

2.2.1.3 When NASA aircraft are transferred between Centers, a new NASA Certificate of Airworthiness approved by the receiving Center Director shall be obtained prior to commencing flight. [79]

2.2.2 Airworthiness, flight safety, and mission readiness reviews, including configuration control, shall be conducted for all aircraft modifications, with the exception of those noted in section 2.4.2.4 that are cleared through an airworthiness review process (ARP) or configuration control process. [80] These review processes are to clear unique or nonstandard internal or external payloads or stores configurations for flight and to review nonstandard flight operations—those other than normal aircraft operations for the specific aircraft. The purpose of these reviews is to identify hazards so as to minimize risks to persons and property and to enhance the likelihood of mission and program success. Formal review requirements will be appropriate for the types of modifications incorporated, the specific mission or project requirements, and the operational risks involved.

2.2.3 The ARP may include several levels of review. Each Center shall clearly identify the appropriate airworthiness review process for experimental, research, and operational configurations and nonstandard ground or flight operations for all aircraft operated by the Center. [81]

## 2.3 Airworthiness Responsibilities

2.3.1 The Chief, Safety and Mission Assurance formulates NASA safety policy and provides independent oversight of NASA aviation safety and safety procedures or guidelines.

2.3.2 Center Directors shall establish airworthiness, flight safety, mission readiness, and configuration control review processes and procedures to identify any hazards, to manage the risks associated with flight programs, to ensure safe flight operations, to manage and thoroughly document aircraft configurations, and to ensure that flight objectives satisfy programmatic requirements. [82] Center Directors shall ensure that these review processes and procedures are incorporated into the contracts of those who operate and maintain NASA aircraft. [83]

## 2.4 Airworthiness, Flight Readiness, and Safety Reviews

2.4.1 Center Directors shall establish procedures to ensure that airworthiness and safety reviews are conducted for flight operations or missions. [84]

2.4.1.1 Reviews shall ensure that hazards associated with aircraft experimental modifications, research, or unique internal or external payloads and nonstandard operations are identified and that risks are adequately managed to enhance the likelihood of mission and program success for all aircraft missions or operations and to minimize the risks to persons or property. [85]

2.4.1.2 Program managers shall review flight programs early in the development cycle to identify the need and schedule for additional safety-related resources, procedures, or reviews. [86]

2.4.1.3 Managers shall ensure that aircraft modifications are accomplished with sufficient time for engineers and technicians to safely complete required tasks. [87]

2.4.1.4 Center Directors shall establish configuration control procedures to ensure that the configuration of each NASA aircraft is fully documented and reviewed. [88] Waivers to a minimum equipment list (MEL) may be granted by the Chief of Flight Operations but may not be delegated to a lower office/position.

2.4.1.5 Center Directors shall establish a MEL for all non-test-related equipment for all aircraft operations. [89] Waivers to a MEL may be granted by the Chief of Flight Operations but may not be delegated to a lower office/position.

2.4.1.6 Test-related equipment will be handled through the flight test planning process. If test equipment remains on the aircraft for non-test-related missions, then such equipment shall be addressed in the aircraft MEL. [90] Waivers to a MEL may be granted by the Chief of Flight Operations.

2.4.2 The ARP is the process by which engineering and safety analyses are reviewed to determine that an aviation system or its component parts meets minimum design criteria, standards, and configuration for the conduct of safe flight operations. The ARP also includes a review of the operations of NASA aircraft when those operations are nonstandard for that aircraft type, place the aircraft into a more hazardous environment than normal, or involve experimental internal or external payloads, configurations, or noncertified external stores, including the dropping of uncertified stores, which may affect the airworthiness of the aircraft.

2.4.2.1 An ARP is required prior to an aircraft commencing its first or subsequent test or research flights in nonstandard configurations or operating envelopes. An ARP approval is valid only for the specific configurations and flight envelopes and operations specified in the approval. Any change to the specified configuration or flight operation requires issuance of a separate or amended ARP approval per individual Center procedures.

2.4.2.2 Examples of configuration and envelope changes requiring an ARP approval include, but are not limited to:

a. Structural and material changes that alter the basic aircraft design configuration.

b. Modification of the exterior contour or mold line of the aircraft to an experimental configuration (e.g., addition/removal of wing fence, ventral fin, vortex generator, air induction system, auxiliary inlets, and nonstandard antenna configurations or locations).

c. Modification to the flight control system, including software revisions, to nonstandard configurations.

d. A new or modified propulsion system or its control system, including software revisions, that is nonstandard for the aircraft.

e. Modification of the displays or annunciation affecting critical information presented to the aircrew (e.g., situational awareness, aircraft control, air vehicle launch) that are nonstandard for the aircraft.

f. Modification of any subsystem interfacing with and affecting flight or propulsion systems (e.g., mission computer, navigation, and warning and caution systems) that are nonstandard.

g. Modification of the aircrew life support systems to nonstandard configurations.

h. Evaluation of crosswind landing or wet runway landing limits, emergency procedures, structural or flight control

limits, wind envelopes, or helicopter external lift, cargo hook system, or tow limits that are outside the normal limits for the aircraft.

i. Flight test instrumentation that interfaces with normal aircraft systems or that may affect the operation of those systems.

j. Intentional operation in a degraded mode for test purposes (e.g., simulation of partial loss or malfunction of flight control system, engine, and avionics).

k. Dropping of uncertified stores or objects.

l. Any other modifications, payloads, or operations that are nonstandard according to established flight manuals, procedures, or FAA certification requirements (if operated under an FAA airworthiness certificate).

2.4.2.3 Minor aircraft system modifications that do not interface with or affect the standard operation of aircraft systems or alter aircraft aerodynamic characteristics may be reviewed through a configuration control process. Examples of modifications that might fall into this category include such systems as:

a. Additions of C-band tracking beacons.

b. Addition of onboard video-recording equipment.

c. Addition of global positioning system (GPS) recording or tracking systems.

2.4.2.4 The following aircraft modifications may not require airworthiness certification, flight safety, or mission readiness reviews:

a. Airworthiness Directives, commonly issued by FAA.

b. Maintenance Advisories, which are issued by multiple sources, such as the U.S. Navy, the U.S. Air Force, and manufacturers.

c. One Time Inspections (OTI), which may be issued by multiple sources.

d. Service Bulletins/Service Instructions (SB/SI), which may be issued by manufacturers.

e. Service Information Letters, which may be issued by multiple sources.

f. Time Compliant Technical Orders (TCTO), issued by the U.S. Air Force.

g. Technical Orders (TO).

h. Technical Directives (TD), issued by the U.S. Navy.

i. Power Plant Bulletins/Power Plant Changes (PPB/PPC).

j. Supplemental Type Certificates (STC) issued by the FAA.

2.4.2.5 Modifications to aircraft, such as avionics upgrades, that meet FAA certification requirements, according to applicable FAA regulations, may be handled through a configuration control process.

## 2.5 Staffing for Airworthiness Review Process

2.5.1 Each Center Director shall ensure that the ARP is staffed with personnel possessing the appropriate scientific, engineering, operational, maintenance, and managerial expertise, including at least one NASA pilot and the ASO. [91]

2.5.1.1 The process reviews project or mission hazards, aircraft modifications, project processes, and procedures related to safety and mission assurance. In addition, the process approves appropriate risk mitigation procedures/techniques and provides oversight for all planned operations.

2.5.1.2 Each Center Director is responsible for establishing a list of senior managers and/or senior engineers who are responsible for conducting the ARP and approving projects or missions for flight, including appointing personnel responsible for managing and executing the Center ARP review board and maintaining records of airworthiness approvals.

2.5.2 The ARP review board may be broken down into several subpanels to facilitate the overall review process. For instance, separate reviews of technical issues and safety hazards may facilitate a detailed review of specific aspects of the project or mission by discipline experts, who then advise the Center review board. Any cockpit or cabin modifications that might interfere with aircrew egress shall be reviewed by a subpanel, including aircrew and life support personnel. [92]

2.5.3 The ARP approval for flight may be for an entire test or research program or be restricted to a certain number of flights or missions and require additional review once defined project or mission goals are achieved.

2.5.4 The ARP shall be continual throughout the course of a project. [93] The Center Director may establish periodic reviews to review project progress subsequent to defined project events (including successes or failures) or at other points in the project to review the overall airworthiness of the aircraft for the intended mission, as well as the progress of the project.

2.5.5 Each Center shall establish the content of the ARP based on the aircraft mission, complexity of the modifications, and the inherent hazards associated with the operation. [94]

2.5.5.1 Content for ARP approvals shall be documented in Center-level ARP procedures. [95] The following are typical of the information required for an ARP to approve an aircraft modification or flight operation for a specific aircraft configuration:

a. A description of the aircraft modifications, including aircraft configuration, loads, flight envelope, aircraft weight and balance data, reference to applicable mechanical and electrical design documents, reference to applicable software version description documents, and a listing of associated computer software configuration. The ARP reviews each of these items as applicable for the specific aircraft or subsystems under review.

b. Applicable engineering analyses that describe design criteria, aircraft loads and safety limits, external pod loads, electrical or mechanical system vibrations, aero-elastic vibrations (flutter), aero-servo-elastic effects, thermal loads, electrical system loads, and other abnormal environmental conditions and their effects on aircraft performance, stability, and control or aircraft systems operation. The results of tests conducted to verify the engineering analyses also shall be considered. [96]

c. A description of the required flight operations, including operating procedures, test conditions, maneuvers, required instrumentation, mission control operations, mission rules and flight limitations, nonstandard operation or inspection criteria, and associated checklists. Actions to be taken in the event of in-flight malfunctions or emergency conditions associated with the aircraft modifications or nonstandard operations also shall be described. [97]

d. A safety hazard analysis of systems and operations, including risk assessment and risk reduction actions and the methodology used to reduce the risks to acceptable levels (design, safety devices, warnings, procedure or training, or other methods).

2.5.6 ARP approval is based on the results of Center-approved engineering and safety analyses. The final approval shall contain a description of the configuration of the aircraft, operating instructions and procedures, operating limitations and restrictions, and specific maneuvers or operations for which the aircraft is cleared. [98]

## 2.6 Maintenance Program

2.6.1 The objective of an effective maintenance program is to ensure that assigned aircraft are serviceable (safe and operable) and properly configured to meet mission requirements in the most cost-effective manner. This is accomplished by performing maintenance, inspection, repair, overhaul, modification, preservation, testing, and condition or performance analyses. Emphasis is placed on processes that reduce the risk of a maintenance failure and the associated impact on operations. The Chief of Flight Operations is responsible for maintaining the airworthiness of aircraft assigned to the Center. The airworthiness of the aircraft includes airframes, engines, propellers, rotors, appliances, and parts. All maintenance and inspections shall be performed in accordance with this chapter and the applicable manufacturers' manuals as appropriate.[99] The Center's Chief of Maintenance is the focal point for all Center aircraft maintenance activities and will ensure that discrepancies between required inspections are corrected to maintain continued airworthiness.

2.6.2 NASA aircraft shall be maintained in accordance with an established and documented Center maintenance program, using standards of quality in workmanship, materials, and support equipment that will ensure airworthiness of aircraft for safety of flight. [100] All NASA aircraft shall be maintained in a condition for safe operation and meet their respective type designs or properly altered condition. [101] It is essential that the continued airworthiness of NASA aircraft be consistent with the terms of the Airworthiness Certificate. A maintenance program shall meet FAA regulations for any passenger-seating capacity for an aircraft that is used for passenger transportation. [102] Documentation is an essential part of maintenance with the objective of providing timely, accurate, and complete information to the Chief of Flight Operations. Use of the NASA standard maintenance application, NASA Aircraft Management Information System (NAMIS) is mandatory.

2.6.3 Depot-Level or Major Aircraft Modifications

2.6.3.1 Center Flight Operations shall maintain continuous onsite oversight of vendors and facilities performing aircraft depot-level overhauls or major aircraft modifications to ensure quality of workmanship, adherence to NASA standards, schedule, and cost control. [103] This oversight function may be performed only by NASA employees or contractors that are independent of the vendor facility to reduce any conflict of interest.

2.6.3.2 Individuals assigned onsite responsibilities shall have expertise and experience in aircraft airworthiness standards and requirements. [104]

2.6.3.3 For maintenance performed outside of NASA, the Chief of Maintenance shall ensure that:

a. The person(s) performing the maintenance, preventive maintenance, or alteration is properly certificated and qualified to perform the assigned function. [105]

b. The work performed is done in accordance with the NASA-approved continuous airworthiness program and/or FARs. [106]

c. A record is made in the aircraft log book of the description of work performed, the date, certificate number, and type of certificate held by the person performing the work. [107]

2.6.4 The NASA process for a continuous airworthiness maintenance program is a compilation of the individual maintenance and inspection functions. These specifications prescribe the scope of the program, including limitations, and the reference manuals and other technical data as supplements to these specifications. The following are the basic elements of a continuous airworthiness maintenance program:

a. Aircraft Inspection: This element deals with the routine inspections, servicing, and tests performed on the aircraft at prescribed intervals. It includes detailed instructions and standards (or references thereto) by work forms, job cards, and similar documents, which also serve to control the activity and to record and account for the tasks that comprise this element.

b. Scheduled Maintenance: This element concerns maintenance tasks performed at prescribed intervals. Some are accomplished concurrently with inspection tasks that are part of the inspection element and may be included on the same form. Other tasks are accomplished independently. The scheduled tasks include replacement of life-limited items, components requiring replacement for periodic overhaul, nondestructive inspections, checks or tests for on-condition items, lubrications, and similar activities.

c. Unscheduled Maintenance: This element provides procedures, instructions, and standards for accomplishing maintenance tasks generated by the inspection and scheduled maintenance elements, pilot reports, failure analyses, or other indications of a need for maintenance.

d. Engine, Propeller, and Appliance Repair and Overhaul: This element concerns shop operations, which, although they encompass scheduled and unscheduled tasks, are remote from maintenance performed to the aircraft as a unit. Appropriate life-limited parts replacement requirements are included in this element.

e. Structural Inspection Program/Airframe Overhaul: This element concerns the structural inspections identified as the C and D check level by the manufacturer, airframe major overhaul, major corrosion inspections, Programmed Depot Maintenance (PDM), and Scheduled Depot Level Maintenance (SDLM) or similar inspections. In addition to structural inspection, major airframe overhaul programs require extensive maintenance scheduling.

f. Required Inspection Items: This element concerns maintenance work items, which, if improperly done or for which improper parts are used, could endanger the safe operation of the aircraft. Required inspection items appear in all elements of the operator’s continuous airworthiness maintenance program.

2.6.5 Each Center shall develop written maintenance procedures and practices in a Center’s maintenance manual that supports the aircraft-specific (manufacturer, NASA, or DoD) maintenance programs. [108] While this maintenance program may be completed by contractor maintenance, the contractor is required to follow the Center maintenance manual whose accuracy and currency shall be the responsibility of the Chief of Maintenance.[109]

2.6.5.1 The Center’s maintenance manual serves to define the continuous airworthiness maintenance program and to provide procedures and instructions for its use. A comprehensive maintenance plan will be detailed in the Center’s maintenance manual and include a list of specific maintenance processes. At a minimum, the following shall be included:

a. A description of how aircraft log books and associated records for assigned aircraft and components are maintained. [110] Maintenance of aircraft log books is essential to ensure the airworthiness of aircraft. Aircraft log books, whether electronic or on paper, provide a history of maintenance, operation, and configuration control of aircraft. Persons signing entries in the aircraft log book and/or entries on serviceable parts tags shall:

(1) Be authorized in accordance with NASA requirements and applicable Federal Aviation Regulations (FARs) and have satisfactorily completed maintenance training or possess the equivalent current experience on the applicable type appliance, aircraft, engine, or propeller. [111] The equivalent experience will be documented on the individual’s training record, which is filed in the maintenance organization.

(2) Understand and have knowledge of FARs and the applicable types of maintenance or overhaul manuals and follow the applicable procedures set forth in this manual. [112]

(3) Meet Center-defined certification processes. [113]

b. A documented aircraft release procedure that ensures that all maintenance release authorities are designated in writing. [114] Additionally, there shall be a documented aircraft release process for aircraft that are deployed from the

Center. [115] If required, the Chief of Maintenance will designate the maintenance release authority in writing for aircraft deployed from the Center.

(1) Any individual with maintenance release authority shall have at least six months experience during the preceding 24 months in the inspection, servicing, or maintenance of an aircraft or system, in accordance with Center maintenance procedures. [116]

c. Written ground handling procedures that may be accomplished only by qualified ground handling personnel to perform fire guard, application of external electrical power, towing, engine run, and taxi operations that document aircraft-specific training and designate those qualified in writing. [117]

d. A documented Metrology and Calibration (METCAL) program that establishes policy, responsibilities, and requirements to ensure that calibrated and tested tools/special equipment performance is compared to referenced calibration standards (CALSTDs) of known and sufficiently greater accuracy. [118] Calibration ensures that only currently calibrated and tested tools/special equipment operating within established tolerance limits are used to perform maintenance on an aircraft.

e. A documented foreign object damage (FOD) control program that addresses the periodicity and inspection criteria and effectively reduces the risk of FOD both during maintenance and flight operations. [119] The FOD Prevention Program establishes policy, responsibilities, and requirements to prevent damage to aircraft, engines, ground support equipment (GSE), and other aeronautical equipment and provides uniform FOD reporting procedures. All flight operations personnel and employees shall be constantly on lookout for material that could be ingested into engines, struck by propeller blades, and/or blown by the exhaust of engines or propellers, causing injury to personnel or damage to aircraft. [120] Maintenance personnel shall be assigned to perform a general inspection of hangar and ramp areas for FOD on a weekly basis at a minimum. [121]

f. A documented tool control program (TCP) that ensures the accuracy of tool inventories at specific intervals, contains a lost tool process, and prohibits aircraft from flying until all tools used on an aircraft have been accounted for. [122] The TCP establishes policy and responsibilities for implementing, maintaining, controlling, storing, replacing, and inventorying common hand tools. The TCP is applicable to all NASA activities performing or supporting aircraft maintenance. The TCP shall apply to all commercial and Government activities performing contract maintenance, production, or other support functions on NASA aircraft. [123] This program shall provide instant inventory capability. [124] The primary objectives of the TCP are enhancing safety by eliminating accidents and equipment damage attributed to uncontrolled tools and minimizing tool replacement costs. An effective TCP is the responsibility of all maintenance personnel and all levels of the chain of command.

g. A documented process to ensure that all GSE used on aircraft are safe and operable. [125] GSE shall be maintained per written requirements that document how to identify and remove equipment that is unserviceable. [126] GSE includes all equipment used to make an aeronautical system or end item operational in its intended environment. GSE shall be maintained and documented under an aviation maintenance system or other NASA-approved system. [127]

h. Maintenance procedures and technical standards for Aviation Survival Equipment (including life support and ejection seats) for the equipment being flown, which are an integrated function of aircraft maintenance. [128] If the Center maintains explosive devices (propellant actuated devices (PADs)/cartridge-actuated devices (CADs)), the Center maintenance manual shall document the program for personnel training and qualifications. [129] All tools shall be accounted for after the repack and inspection of each item. For example, parachutes and floatation equipment, since these items cannot be functionally checked prior to use. [130]

i. A documented confined space program that defines all aircraft confined spaces and ensures safety in these spaces prior to entry per NPR 8715.3, NASA’s General Safety Program Requirements. [131] The objective of the Aircraft Confined Space Program is to ensure that a safe environment is maintained when working on aircraft fuel cells, tanks, and service areas.

j. A documented program that ensures that aircraft maintenance complies with Center Electromagnetic Interference (EMI)/Electrostatic Discharge (ESD) programs. [132] The EMI/ESD control program establishes policy, responsibilities, and requirements for EMI prevention and reporting and the handling, transportation, storage, and maintenance of ESD-sensitive devices/components. Improper handling, transportation, and storage techniques can cause electrostatic-sensitive devices and components to fail. The insidious nature of ESD-induced failures requires ESD control protection measures to be integral parts of aviation maintenance and supply disciplines. All solid state electronic components and assemblies containing such components are considered ESD-sensitive items, unless otherwise directed by higher authority. These items include printed circuit board assemblies, line replaceable units (LRUs), individual components, and integrated circuits.

k. A Fuel Surveillance Program that ensures that fuel is free of contaminants prior to fuel entering any Center aircraft. [133] The Fuel Surveillance Program establishes policy, responsibilities, and requirements for implementing procedures to maintain aircraft and engine fuel systems’ purity. The Fuel Surveillance Program applies to all NASA aircraft, engines, and test cells to include outside vendor-supplied fuel.

l. A documented program that ensures aircraft maintenance is conducted in compliance with the Center Hazardous Material Program and the Protection of the Environment Act, 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; and 40 C.F.R. § 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities, which shall include use, disposal, and both long-term and worksite storage of hazardous materials. [134]

m. An oil analysis program, per original equipment manufacturer (OEM) and/or DoD maintenance instructions, to identify mechanical breakdown precursors that exist prior to catastrophic failure. The program shall be specific to the type of engine installed and provide trend analysis, immediate feedback, and recommended actions to the Center's Chief of Maintenance. [135]

n. A documented Weight and Balance (W&B) Program for each aircraft in compliance with any existing Center program. [136] The W&B Program provides the means to ensure that aircraft weight and center of gravity remain within established limits. The program will establish and maintain a master file for each aircraft's weight and balance, schedule aircraft for periodic weighing, and provide procedures for the accountability of basic empty weight and balance during the period between weighing.

o. A configuration control process (CCP) established to determine applicability and ensure compliance with Product Improvement Publications (PIP), which are defined as airworthiness directives, technical orders, service and safety bulletins, or other pertinent requirements, including those from FAA, DoD, or OEMs. [137] The process will allow for documentation of alternate procedures or inspections if they are substituted. It shall provide a complete audit trail of decisions and design modifications. [138] A CCP includes three basic elements: configuration identification, configuration control, and configuration status accounting.

p. An Aviation Material Management process to ensure that aircraft and aircraft parts are inventoried and property accountability records are properly documented per NPR 4100.1, NASA Materials Inventory Management Manual, and Center procedures. [139]

q. General housekeeping to ensure that aviation facilities are maintained by NASA standards for hangars, shops, and ramps. [140]

r. Explosives-laden aircraft shall be parked in designated aircraft parking areas that meet airfield criteria and afford appropriate quantity distance criteria to eliminate hazards to personnel and resources per NASA STD 8719.12, paragraph 5.15.13. [141]

s. A documented aircraft component inspection program to determine the serviceability, authenticity, traceability, and airworthiness of parts, components, accessories, and assemblies by subjecting them to inspections, tests, or operational checks. [142] This program will ensure that aviation parts are segregated from nonaircraft parts.

(1) Organizations providing maintenance support to the Center shall have a procurement program to prevent the purchase of unapproved parts and material in type certificated products. [143]

(2) The Center-approved parts program shall include, at a minimum, methods to establish qualified suppliers who are authorized to manufacture or distribute parts they supply and criteria to identify and screen potential unapproved parts suppliers. [144]

2.6.6 Training

2.6.6.1 A documented training program shall be defined in the Center's maintenance manual that ensures that maintenance personnel and QA inspectors are trained and qualified prior to being assigned. [145] The program shall document the Center-defined recurrent and proficiency training requirements to ensure that maintenance personnel and QA inspectors attend refresher training that addresses changes to aircraft systems, test equipment, or critical troubleshooting and repair techniques at least every 24 months. [146]

2.6.6.2 All maintenance personnel that are qualified to perform servicing, inspections, and functional tests shall have completed the required training program, which shall be documented in their individual training records. [147]

2.6.6.3 The training program shall include all Center safety program training requirements, including training on fire protection equipment, medical stations, and hazardous materials. [148]

2.6.6.4 Within the training program, all required support functions shall be addressed. These include computer training, logistics training, and operator training for facilities and ground support equipment such as hoists, tow tractors, and lifts. [149]

2.6.6.5 Qualification records shall be kept up to date by the Chief of Maintenance or Center Training Officer to reflect both resident and onsite training. [150]

2.6.7 NASA Aircraft Management Information System (NAMIS)

2.6.7.1 NAMIS consists of eight separate but integrated modules. NAMIS shall be utilized to track servicing, inspections, and METCAL compliance. [151]

2.6.7.2 The following NAMIS modules are mandatory for active NASA-owned or -bailed aircraft: Flight Records/Currency, Flight Data Capture, Aircraft Maintenance, Flight Scheduling Application (FSA), and Aircraft Logistics' Spares Inventory.

2.6.7.3 The remaining NAMIS modules are optional, but NAMIS can be used to track demands (i.e., requisitions) and shall be used to track receipts and issues, regardless of how or who requisitioned the item. [152]

2.6.8 Quality Assurance (QA)

2.6.8.1 A comprehensive aircraft maintenance QA program is critical to flight safety. Each NASA Center that is responsible for the maintenance of NASA aircraft shall ensure that QA is integrated into every aspect of aircraft maintenance and that only fully qualified personnel are assigned as QA inspectors. [153] The Center shall operate a program to provide for analysis and surveillance of its continuous airworthiness maintenance program, including work performed according to Center requirements by a non-NASA entity. [154]

2.6.8.2 Special skills and experience not normally possessed by maintenance personnel are required of a staff of trained QA personnel for analysis of data and supervision of QA. Only fully qualified personnel are assigned as QA inspectors. Maintenance personnel assigned to QA are assigned as a collateral duty with limited authority, as determined by the QA Chief.

2.6.8.3 Each Center shall develop a written QA plan or quality management system (QMS) that covers all aspects of maintenance, material acceptance, documentation review, maintenance instruction applicability, and currency. [155] QA shall ensure that aircraft configuration and aircraft components have been properly maintained and that all requirements have been properly documented. [156] QA shall provide trend analysis and investigation of recurring discrepancies, high-failure-rate components, and high-usage materials to identify underlying causes for poor quality. [157]

2.6.8.4 The terms inspection, QA, and audit have separate and distinct meanings and should be used accordingly.

a. Inspection is the examination/testing of supplies (including raw materials, documents, data, components, and assemblies) and services to determine if they conform to technical requirements.

b. QA is the planned and systematic pattern of actions necessary to provide adequate confidence that maintenance will be performed satisfactorily for in-service maintenance and that monitoring, surveillance, and analysis of data will be carried out to verify the validity of work completed, maintenance processes, and procedures.

c. Audit, as it applies to QA, is a periodic or special evaluation of details, plans, policies, procedures, products, directives, and records.

2.6.8.5 QA responsibilities shall be performed to:

a. Establish qualification requirements for QA personnel and collateral duty personnel. Centers shall maintain a list of all personnel qualified and authorized to conduct inspections. [158]

b. Provide a continuous training program in techniques and procedures pertaining to aircraft maintenance QA, per paragraph 2.6.4, and the conduct of inspections. [159]

c. Ensure that established standard procedures are observed for conducting scheduled and unscheduled inspections, ground tests, and bench check of components, including engines. [160]

d. Ensure that the configuration of aircraft and components is correct and all essential modifications have been incorporated. [161]

e. Ensure that an inspection is conducted on all equipment received for use, returned for repair, or held awaiting repair to verify satisfactory material condition, identification, packaging, preservation, and configuration and, when applicable, that shelf-life limits are not exceeded. [162]

f. Ensure that check pilots and aircrew are briefed before postmaintenance functional check flights (FCF) so that the purpose and objectives of the flight are clearly understood. After completion of the FCF, debrief the check pilots, aircrew, maintenance control representative, and applicable work center representatives to determine compliance with objectives outlined on the FCF checklist and clarify noted discrepancies. [163]

g. Review all incoming technical publications and directives to determine their applicability to Center-maintained aircraft. [164]

h. Conduct Parts and Hardware Certification of all items procured. All incoming serviceable aircraft material, parts, or components will be placed in a secured area and inspected by a QA inspector or designee. Ensure that the part or material is in good condition and conforms to specifications and standards. Ensure that certification paperwork or

data is correct for applicability and acceptance requirements. [165]

i. Ensure that personnel are trained in the Government-Industry Data Exchange Program (GIDEP) and FAA Suspected Unapproved Parts (SUP) Program and coordinate all actions with the Center's GIDEP office, HQ AD, and the Inspector General (IG), as appropriate. [166]

j. Monitor weight and balance of all Center aircraft, in accordance with Center guidelines. [167]

k. Validate all work orders (excluding minor aircraft write-ups/gripes) and oversee the installation of all work orders on aircraft. [168]

l. Assist the ASO in the impounding of Center aircraft involved in a mishap or when directed by ASO. [169]

m. Monitor maintenance using a program to develop trend analysis of processes. This program analyzes all reports of findings and/or actions taken during aircraft and component maintenance. [170]

2.6.8.6 QA Inspection Requirements.

a. Mechanic and QA signatures are required for the following maintenance actions: down discrepancy and special preflight--FCF, special configuration, and special flight purpose.

b. Mechanic and QA signatures are required for all back shop repairs.

2.6.8.7 Surveillance or monitoring programs use product or process surveillance based on an effective audit program and an objective statistical history. Sampling and surveillance verifications shall be used independently, or in combination, to accomplish the verification function of all QA processes. [171]

2.6.9 Technical Publications Library

2.6.9.1 The Technical Publications Library provides a central source of up-to-date information for use by all personnel in performing their work and is the source of reference information to facilitate personnel training and individual improvement.

2.6.9.2 The Technical Publications Library's function includes: determining which technical manuals are required to support maintenance of aircraft, their major components, and ground support equipment in the NASA inventory; receipt and distribution control of these manuals; and responsibility for ensuring manual updating throughout the maintenance organization. All manuals shall be maintained in accordance with the original manufacturers' updates or revisions (or DoD updates or revisions for DoD aircraft) as modified with NASA- or FAA-approved data. [172] Centers shall maintain documentation to confirm that periodic revision status audits of the technical library have been conducted. [173] Exceptions to this policy, including additional changes to documents, shall be approved by the Chief of Flight Operations. [174]

2.6.9.3 For remote sites, the Technical Publications Librarian is responsible for the distribution of manuals and inspections of remote libraries.

| TOC | Preface | Chapter1 | Chapter2 | Chapter3 | Chapter4 | Chapter5 | Chapter6 | Chapter7 | Chapter8 | Chapter9 | Chapter10 | Chapter11 | Chapter12 | Chapter13 | AppendixA | AppendixB | AppendixC | AppendixD | AppendixE | AppendixF | AppendixG | AppendixH | AppendixI | AppendixJ | AppendixK | ALL |

| NODIS Library | Program Formulation(7000s) | Search |

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