U.S. Forest Service
Fire and Aviation Management

Special Mission Airworthiness Assurance Guide

for
Aerial Firefighting
and
Natural Resource Aircraft

December 7, 2011

Revision 1, December 7, 2011

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Version Date	Prepared by	Description of Changes
12/7/2011	J. Nelson	Addition of FAA Airtanker Loads Report references

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File Code: 5700 **Date:** November 5, 2010
Route To:

Subject: Approval of the USDA Forest Service Airworthiness Assurance Guide

To: Regional Foresters, Regional Fire Directors, Regional Aviation Officers

The Forest Service (FS) Special Mission Airworthiness Assurance Guide (Guide) is approved for use. A copy of this approval letter will be included in the front of each Special Mission Airworthiness Assurance Guide. As agreed to in the FS response to the Department of Agriculture (USDA), Office of Inspector General (OIG), Air Safety Audit of 2008, Recommendation 3, the U.S. Forest Service Special Mission Airworthiness Assurance Guide was created to establish prerequisite criteria, evaluations and monitoring, based on each FS special mission. This will validate aircraft for these missions and ensure the aircraft has an appropriate maintenance and inspection program which assures airworthiness when used in that capacity.

This Guide will present the prescribed criteria necessary to meet the latest FS standards for aircraft either proposed or operating in a specific FS Special Mission, with the ultimate goal to provide for the safe continued airworthiness of the aircraft.

This Guide is the culmination of FS efforts in cooperation with the Federal Aviation Administration (FAA) and National Transportation Safety Board (NTSB) with respect to the impacts of FS special missions. The criteria is based on a large volume of historical and recently collected special mission usage data as well as a significant amount of engineering analysis that has been performed on existing aircraft performing special missions. Once a FS special mission is incorporated into Part 7: Special Mission Aircraft Evaluation Criteria of the Guide, the criteria specified therein is then provided as the FS minimum requirements for aircraft proposed or operated in these special missions.

The Special Mission Airworthiness Assurance Guide is on the FAM website at www.fs.fed.us/fire/aviation/.

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REFERENCES

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10. AC 25.571-1C, Damage Tolerance and Fatigue Evaluation of Structure, April 29, 1998
11. AC 23-13A, Fatigue, Fail-Safe, and Damage Tolerance Evaluation of Metallic Structure for Normal, Utility, Acrobatic, and Commuter Category Airplanes, September 29, 2005
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Part 1 Executive Summary

Introduction:

As agreed to in the response to OIG Air Safety Audit of 2008, Recommendation 3 the US Forest Service Special Mission Airworthiness Assurance Guide was created to establish prerequisite criteria, evaluations and monitoring, based on each Special Mission that will validate the aircraft for that usage and ensures the aircraft has an appropriate maintenance and inspection program based on damage tolerance analysis which assures airworthiness when used in that capacity.

STANDARDS OF AIRWORTHINESS

Airworthiness[1] - The properties of a particular aircraft to safely attain, sustain, and terminate flight in accordance with the approved usage *[special mission]* and limits.

1. To meet its requirements, the US Forest Service will seek to procure and sustain FAA certificated fixed and rotary wing aircraft even when the intended use of such aircraft is not consistent with original design or an equivalent civil operation does not exist.

2. The US Forest Service will seek to ensure its aircraft, to the extent practicable, comply with civil airworthiness standards set by the federal aviation regulations. Commercial aircraft are required to comply with 14 CFR requirements and Public law designates the FAA as the regulator of the US national airspace system and enforcer of 14 CFR requirements. However, aircraft owned, operated and contracted by the US Forest Service perform "Public Aircraft Operations" and **the US Forest Service is the responsible agent for their airworthiness assurance while performing these special missions**. Restated, aircraft when performing special missions for the US Forest Service:

- May be modified to perform that mission (installation of a retardant tank, etc),
- May be flown in a flight profile not typical for the aircraft during a Civil flight (low level dropping of retardant)
- Perform a governmental function that is under the authority of the agency with operational control of the aircraft (low level dropping of retardant)

NOTE

The example above is specific to a Large Airtanker but there are other missions that could be used as examples, smokejumping, rappelling from helicopters, etc.

Under these conditions the US Forest Service is responsible for the operation and elements that come together that enable the special mission to occur, including the airworthiness assurance of the aircraft. For contracted aircraft, this is in addition to their FAA certification, which is a minimum standard.

3. The US Forest Service will use the baseline airworthiness standards of 14 CFR wherever practicable and may use additional 14 CFR evaluations, processes and inspections not originally required of an aircraft during original FAA certification to assure airworthiness while operating in a US Forest Service special mission. These special missions and their criteria are identified in Part 7 of this Guide.

[1] MIL-HDBK-516, AIRWORTHINESS CERTIFICATION CRITERIA, Definitions

Part 2 Aerial Firefighting and Natural Resource Program Scope

A. Program Scope and Fleet Description:

The FS aviation program provides aviation services that assist in the accomplishment of the agency's land management goals. The FS uses aircraft and related aviation activities for a wide variety of missions, including fire suppression, fire prevention, research, forest rehabilitation, law enforcement support, aerial photography, infrared detection and personnel transport. The predominant use of the FS aviation program is for fire management resulting in an average of 80,000 flight hours annually. Approximately 700 contracted and owned aircraft are used each year by the FS. This number varies from year to year based on the amount of fire management activity. Measured by flight hours, over 95% of aircraft services used to support FS programs are provided through contract and rental agreements with commercial aviation operators.

Aviation activities also support interagency partners. Fire management responsibilities for natural resources are generally assigned to a lead local, state, federal or tribal agency. However, because wildland fires often cross agency boundaries, wildland fire response is conducted in an interagency and cooperator environment.

The FS owns and operates 26 aircraft, and an additional 13 aircraft are leased and flown by agency pilots in special missions. Owned and leased aircraft are crewed by FS government employee pilots. These aircraft are maintained to Federal Aviation Regulation (14 CFR) standards by approved maintenance contractors with oversight by FS maintenance and avionics specialists/inspectors.

Commercial aviation services contracts provide a complete package of aircraft, flight crew, and maintenance support. Contracts may be "exclusive use" (EU), which can vary from 30 days to a year in length, or "call-when-needed" (CWN), which have no guaranteed length. The extensive number of contracts and individual contractors located throughout the country require a large number of personnel to administer the contracts and perform quality assurance (QA) oversight. FS EU and CWN contract specifications for aerial firefighting assets are the minimum standards that the contractor must meet. These standards apply to their aircraft, flight and maintenance crews and other equipment required by contract. The contract specifications incorporate FS policy as well as FAA regulatory requirements and other referenced reliable standards that represent the minimum acceptable standard for each contract.

Additional cooperative aviation support is provided by other federal, state or local firefighting organizations when wildland fire incidents are located in areas of mutual interest and concern. Military assets may be employed during the most severe wildland fire situations when no additional commercial resources are reasonably available. This surge capability compliments the existing contracts.

Cooperator aircraft are owned, leased or contracted and operated by other federal, state, and local government agencies. Some of these aircraft have been obtained through the Federal Excess Personal Property (FEPP) Program administered by the FS. States acquiring aircraft through the FEPP program are required to use the aircraft principally for fire protection activities. When appropriate, these aircraft may be used for Forest Service missions under the auspices of cooperative agreements, interagency operation plans and Memorandums of Understanding (MOU). These aircraft are in a variety of configurations but must meet a comparable level of safety and effectiveness as contracted resources (FSM 5713.43).

Typically this is equivalent to a Federal CWN contract standard of the same aircraft type (i.e. Light Fixed-wing, Type 1, 2 & 3 Helicopters, Airtanker, etc.)

B. Aerial Fire Fighting Mission Categories:

Specific missions are identified under each category. A prioritized matrix of these is included in Tables 1 and 2 of Part 3.

Aerial Delivery of Firefighters – Provides various methods to rapidly transport qualified firefighters to an emerging fire in order to attack and contain the spread. Methods include the use of helitack, rappel and smokejumper resources for initial attack in an effort to contain and/or control fires within the first burning period, which is generally defined as 10 am to sundown, and to perform extended attack on wildland fires.

Aerial Detection / Command and Control – Provides the various methods for detection, command and control of wildland fires by combining: detection technology; fire, forest, aviation, and geographic knowledge; and communications. These methods are used to detect and direct efforts on wildland fires through Aerial Supervision Modules (ASM), Air Tactical Group Supervisors (ATGS), Leadplanes, Helicopter Coordinators and infrared technology.

Aerial Fire Suppression – Airtanker and Helicopter – Provides direct support to ground firefighters through the aerial delivery of approved fire retardants or suppressants on wildland fires by airtankers and helicopters.

Aerial Resource Support (Natural Resources and Fuel Management Missions) – Provides support to the overall FS mission to sustain the health, diversity and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. This includes missions to support recreation, timber resources, vegetation management, watershed condition, research and reduction of invasive species.

C. Public Aircraft Operations:

FS aircraft performing the special missions defined by this plan are conducting Public Aircraft Operations. These operations are defined as inherently governmental by Public Law 106-181, Sec 702 and FAA Advisory Circular AC 00.1.1. This means that there are elements of the special mission that fall outside of the FAA regulatory purview; the FS is therefore afforded additional latitude to accomplish these missions within legal parameters. That latitude has several forms:

- That the aircraft is not FAA certificated (Shorts C23A, AH-1),
- A particular modification to an aircraft is not certificated or use of the modification in the special mission use was not accounted for in the FAA certification
- How an aircraft is flown to accomplish the mission or
- A combination of these conditions.

A particular modification to an aircraft might be FAA approved for its installation, however, its application in an FS Special Mission may not be. For instance, a rappel anchor installed in an aircraft is FAA approved, but firefighters rappelling out of the aircraft may not be accounted for in the bracket certification. The mission would then have to be conducted under the Public Aircraft operation rules. These elements of the missions are the "Public Aircraft Operation" that the FS must account for by mitigating risk through additional requirements, engineering analysis, quality assurance oversight and/or accepting additional risk while performing the mission.

Part 3 Implementation Strategy and Prioritization of Special Missions

Recommendation No. 2, *USDA Audit Report "Forest Service's Air Safety Program" Report NO. 08601-48-SF, February 2008*

Develop an overall implementation plan to complete airworthiness assessments on all aircraft FS uses for firefighting. The plan should prioritize the assessments based on the relative risks of each aircraft model considering its mission requirements for the firefighting environment, and establish timeframes for completion.

A. Implementation Strategy:

Airworthiness assessments will be required for each aerial firefighting mission that is performed rather than by the aircraft model. This strategy documents which Forest Service special missions have a greater potential impact on an aircraft as compared to that aircraft's typical OEM intended mission use.

All missions will be prioritized and systematically addressed; additional airworthiness assessment will only be required for aircraft performing special missions that include elements that are "unique" to aerial firefighting. For a Special Mission to qualify as *"unique to aerial firefighting,"* representative aircraft used for that mission would experience loads, maneuvers or system cycles (in amplitude and or frequency) in addition to or in excess of those normally experienced by the aircraft under its typical use. Special Missions that exhibit no unique elements will be documented as such and will continue to be maintained in accordance with the FAA standard maintenance and inspection requirements for the aircraft in its properly altered condition. The FS will provide the same oversight and evaluation whether the missions are unique or not. Aircraft performing unique missions will have an added FAA approved maintenance and inspection program supplement (or equivalent for non-certificated aircraft) that addresses the special mission flown. This supplement will most often be in the form of Instructions for Continued Airworthiness (ICA). This requirement will be incorporated into FS policy, contract requirements, interagency and cooperator standards. Airworthiness assessments required for special missions deemed unique will be completed within three years of the acceptance of the special mission profile.

B. Prioritization and Completion Timeframes:

The following tables of FS Special Missions have been grouped into Mission Categories. Each Mission Category has specific special missions classified under that category. The mission mix will then contain each element of the mission that comprise it as well as nuances particular to it because of its composite nature. The prioritization below is based on operational loads data collected and assumptions of potential impact of missions where data has not been collected yet based on the professional judgment of FS Airworthiness Practices Board.

Table 1 Fixed Wing Missions

Mission Categories	Fixed Wing Aircraft Missions	Priority to Address	Timeframe for Completion
Aerial Fire Suppression	Large Airtanker (3000 to 5000 gal)	**1**	**2010**
Aerial Detection and Command and Control	Aerial Supervision Module Mission Mix	**2**	**2012**
	Leadplane Element	**2**	**2012**
	Air Attack Element	**2**	**2012**
	Infrared Aircraft (Higher Altitude, above 3000 Ft)	**5**	**2015**
Aerial Delivery of Firefighters	Smokejumper Mission Mix	**3**	**2013**
	Firefighter Delivery (Parachute) Element	**3**	**2013**
	Paracargo Element	**3**	**2013**
Aerial Resource Support (Natural Resources and Fuel Management Missions)	Reconnaissance / Patrol / Survey	**4**	**2014**

Table 2 Rotor Wing Missions

Mission Categories	Rotor Wing Aircraft Missions	Priority to Address	Timeframe for Completion
Aerial Fire Suppression	Water / Retardant Delivery (Fixed Tank)	**1**	**2012**
	Water / Retardant Delivery (Bucket)	**2**	**2012**
Aerial Delivery of Firefighters	Helitack Mission Mix	**3**	**2013**
	Rappel Element	**3**	**2013**
	Fire Crew Transport Element	**3**	**2013**
Aerial Detection and Command and Control	Helicopter Coordinator / Air Attack	**4**	**2013**
Aerial Resource Support (Natural Resources and Fuel Management Missions)	Aerial Ignition Mission Mix	**5**	**2013**
	Heli Torch Element	**5**	**2013**
	Plastic Sphere Dispenser (PSD) Element	**5**	**2013**
Cargo Delivery	Cargo Delivery Mission Mix	**6**	**2014**

	Internal Cargo Element	**6**	**2014**
	External Cargo Element	**6**	**2014**
Aerial Detection and Command and Control	Infrared / GIS	**7**	**2015**

C. Summary Descriptions of Special Missions:

Fixed Wing Aircraft Missions

1. Large Airtanker Mission (Type 1) - The aircraft is used to deliver 3000 – 5000 gallons of fire retardant (a chemical mixture that helps to suppress fire) to a wildfire from an airtanker base by means of a fixed tank that is attached to or built into the aircraft. The retardant is usually dropped from a height of 200 ft above the fire.

2. Aerial Supervision Module Mission (Note: A Aerial Supervision Module consisted of an Air Tactical Pilot (ATP) and an Air Tactical Supervisor (ATS), both trained specifically for the ASM mission).
    a. Leadplane Element – The leadplane mission directly supervises firefighting aircraft, usually airtankers dropping fire retardant. This is done to increase safety and efficiency over an incident. The lead mission consists of low-level runs in order to assess the terrain, entry and exit routes, visibility, turbulence and location of ground firefighters. Ideally this can be worked out in advance, and the arriving airtankers can be dropped in a timely manner, reducing exposure to the low-level environment. The leadplane mission can also assume the functions of an Air Tactical Group Supervisor in their absence.
    b. Aerial Supervision Element – As part of the ASM the ATS supervises all other aircraft over a wildfire. This individual is in constant contact with ground firefighters, and is also responsible for communicating with the local dispatch. The ATS is always an experienced firefighter, and assists the Incident Commander and other personnel on the fire in formulating strategy and tactics in accordance with incident objectives.
3. Air Tactical Mission – A contract or agency pilot qualified for aerial supervision and an Air Tactical Group Supervisor (ATGS) compose this mission. An ATGS supervises all other aircraft over a wildfire. This individual is in constant contact with ground firefighters, and is also responsible for communicating with the local dispatch. The ATGS is always an experienced firefighter, and assists the Incident Commander and other personnel on the fire in formulating strategy and tactics in accordance with incident objectives.

4. Infrared Mission (Higher Altitude, above 3000 Ft) – IR fixed-wing aircraft conduct survey flights over wildfire incidents in order to accurately assess and map the fire's perimeter, and to locate the areas containing the most heat. These aircraft fly IR missions at night, and the information collected is available to the Incident Commander after the data is processed by interpreters on the ground and posted to an ftp site. This information is especially useful for fires located in rugged and remote areas.

5. Smokejumper Mission Mix- The aircraft launches at or near maximum takeoff weight, climbs to altitude and flies to the fire. Once the fire is located the aircraft descends to

1500 ft AGL (approx). Once there several orbits at shallow angle of bank may be done to locate smoke and jumpspots.

a. Firefighter Delivery (Smokejumper) Element: Once fire is located, and a jump spot is selected, descend for a low pass, (500 ft AGL so jumpers get a close look at fire and jump spots). Climb back to 1500 ft AGL and complete several orbits to drop streamers to determine the wind line. After winds are determined, complete several more patterns at the same altitude to deliver Smokejumpers, usually they exit 2 at a time so gross weight changes by roughly 500 lbs for each pass.
b. Paracargo Element**:** After all the jumpers are safely on the ground, cargo is dropped. These passes are done normally at 200 to 300 ft AGL. Each pass will deliver between 50 and 250 lb of cargo, depending on the airplane. After each pass, a climb will commence normally between 500 and 1500 ft AGL to set up for the next pass, with a descent on the final approach. After last cargo drop, climb back to 1500 ft AGL and circle the fire to determine that jumpers' needs are met and communications have been established. Climb back up to altitude and fly back to base for normal approach and landing.

6. Reconnaissance / Patrol / Survey – These flights are conducted in order to locate fires over large and remote areas. Aircraft can usually survey an entire forest or other area of responsibility in several hours, and fires are often discovered when they are small and can be easily attacked by ground and/or aerial resources.

Rotor Wing Aircraft Mission Definitions

1. Water / Retardant Delivery (Fixed Tank): The helicopter is used to deliver water or fire retardant (a chemical mixture that helps suppress fire) to a fire from a nearby water/retardant source by means of a tank that is attached to or built into the aircraft. The water or retardant is usually dropped from a height above the fire that minimizes the downwash from the aircraft.

2. Water / Retardant Delivery (Bucket): The helicopter delivers water or retardant to a fire with a bucket (a container, usually cylinder shaped, which can take-on and release water or retardant by mechanical means). The bucket is suspended below the aircraft with cables attached to a quick release mechanism. The bucket can also be suspended on a longer cable (50 feet or more) to minimize the effect of downwash from the aircraft.

3. Helitack Mission: Helitack crewmembers are firefighters that are trained in operations with the helicopter. This training includes loading and unloading people and cargo, preparing and attaching external loads, and operational safety around helicopters.
    a. Rappel Element: The delivery of firefighters to a fire area by helicopter when there is no suitable location to land the aircraft close to the fire. The firefighters descend from the aircraft with a rope that is attached to the aircraft and a device that attaches to the rope which controls the rate of descent of the individual. Additional firefighting equipment is lowered from the helicopter to the firefighters on the ground.

b. Fire Crew Transport Element: The helicopter is used to transport firefighters to fires when access is limited by lack of roads or adverse terrain. To keep wildland fires small and suppression costs low it is important to get firefighters to the scene as quickly as possible. Use of helicopters to transport personnel and equipment aids in saving time and conserves energy of the firefighters for actual firefighting.

4. Cargo Delivery Mission:
   a. Internal Cargo Element: When there are areas near the fire that are large enough and clear of obstacles for the helicopter to land, the helicopter is internally loaded with food, water, tools and other firefighting equipment. This allows transportation of cargo at a higher airspeed while eliminating the hazard associated with external loads.
   b. External Cargo Element: When firefighters are on the fireline or located in an area that is not open and clear of obstructions, the helicopter can deliver supplies by means of a cargo net and a cable attached to the helicopter (i.e., 50 feet or longer longline). This allows lowering of the supplies to the personnel while maintaining the helicopter's clearance from obstacles.

5. Helicopter Coordinator/Air Attack: The Helicopter Coordinator function is to provide mission direction to helicopters on a large fire with complex air operations and to provide separation between the helicopters as an added safety.

Part 4 Special Mission Airworthiness Assurance Methodology

Introduction:

The following methodology will be applied to all aircraft operated by the FS in the identified special missions. This includes owned, contracted and cooperator aircraft.

An aircraft's airworthiness assurance is directly related to the maintenance and inspection program it is maintained under. The original inspection program is developed at manufacture by the Original Equipment Manufacturer (OEM) based on the use the aircraft is designed to experience. As the aircraft is pressed into service for other special missions it is capable of performing, the OEM maintenance and inspection program may or may not remain valid. A valid maintenance and inspection program is driven by the usage the aircraft experiences. If the differences are not evaluated to validate the special mission use versus the original maintenance and inspection program, their scheduled intervals and component replacement times can be mismatched or nonexistent. If maintenance personnel are not given a maintenance and inspection program driven by the special mission that directs where, how and when to maintain and inspect the aircraft, any assumption of continued airworthiness for the new usage is not valid.

The following processes have been formulated to address the prioritized list of special missions identified above (Table 1 & 2) with a methodology to determine the aspects of the mission that would be unique to aerial firefighting, which the aircraft would not typically experience outside its designed usage. As missions are identified to be unique to aerial firefighting, a process will be followed to detail that uniqueness and define an appropriate level of analysis to account for it in the aircraft's maintenance and inspection program.

As a future and separate effort from this plan there is an expectation that as specific loads, maneuvers and cycles are identified that are more severe than an aircraft typically experiences, a review process will be formulated to quantify the severity recognized within that mission.

A special mission that can still be performed effectively by changing the flight maneuvers and/or profile, to one that diminishes the loads and cycles encountered will be proposed as a solution.

A. *Defining Mission Profiles:*

For each special mission identified, the Defining Matrix (Fig 1) will be followed. This will ensure all currently identified aerial firefighting missions are detailed and documented, with a decision accepted as to whether it is unique to aerial firefighting. The mission profile is defined as the altitudes, airspeeds, maneuvers, flight duration, aircraft operating weights and landing cycles that the aircraft will experience while accomplishing the typical special mission. Of the profiles identified, they will be grouped into "Unique" or "Not Unique" to aerial firefighting. Missions that are not unique are those that have no more impact on an aircraft than the usage it was designed to perform. Whereas unique special missions involve usage with aspects that are found only when performing aerial firefighting missions. Missions identified as unique will have an operational loads report produced that identify each detailed characteristic of that mission profile and aerodynamic loads spectra are. For missions with unique aspects, a supplemental maintenance and inspection program with any applicable component life limits adjustments must be developed to account for the unique elements. The determination if a special mission is unique and whether a particular aircraft model is suited to perform that mission will be made by the FS. The FS will rely on the original equipment manufacturer (OEM) of the aircraft, in-

house or contracted aerospace engineering expertise and recommendations made by the Forest Service Airworthiness Practices Board (FSAPB) to assist in making these determinations. A recommendation shall also be made by the FSAPB if any aircraft that the FS operates in a unique special mission will require installation of operational loads monitoring equipment for continuous evaluation, or a flight operations quality assurance (FOQA) program.

Once a special mission is determined to not be unique, the FS will accept FAA certifications as equivalent standards of airworthiness, with quality assurance provided by FS Airworthiness Inspectors.

B. *Process for Defining Mission Profile (Figure 1):*

1. A representative aircraft is selected for the special mission.
2. Each special mission will have a flight profile developed by qualified mission pilots and then be administered to a representative pool of mission qualified pilots. Appendix 2 provides a sample of a special mission survey.
3. Operational Loads system is selected, data collection parameters are defined and aircraft are instrumented. Data is collected and refined as needed to define flight profile and loads experienced. A report will be developed from the data collected that compares the baseline flight profile the aircraft was designed to perform verses the special mission profile that the aircraft is performing.
4. The pilot survey results along with the comparison report are considered by the Forest Service Airworthiness Practices Board (FSAPB). The board will recommend if the subject special mission has potential “Unique” elements. When “Unique” elements are suspected the board will recommend the number of aircraft to be instrument and representative number of flight hours or flights to be collected. If the special mission is seen as “Not Unique” that recommendation will be documented.
5. Adapt the Loads Report Template to the mission being addressed with any needed changes or additions to appropriately document the profile flown and loads experienced.
6. Collect valid loads data.
7. Consolidate and publish FAA Loads report in cooperation with FAA Operational Loads Program, William J. Hughes Technical Center and their Center of Excellence at Wichita State University (WSU).

   The Unique Special Mission Profile and Operational Loads Report will then be accepted by the Deputy Chief of State and Private Forestry through a Decision Memo. It will then be referenced as the mission specific loads report in policy and contract specifications as the representative mission that will be flown. FS owned, contracted or Cooperator aircraft that are approved for use will have their maintenance and inspection programs address this “Unique” usage.

Process for Defining Mission Profile

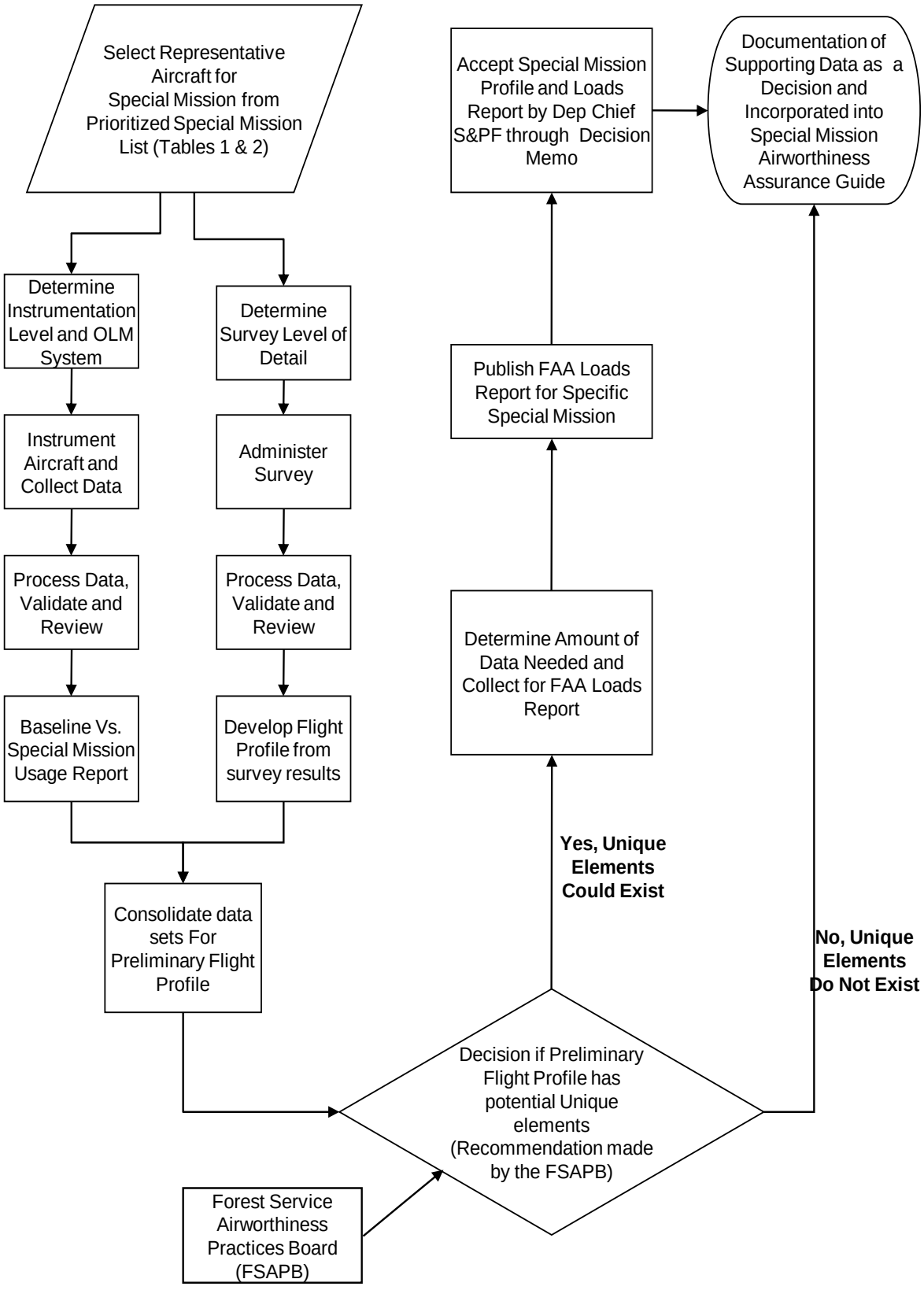


Figure 1

Once unique special missions are accepted by Decision Memo, corresponding Mission Profile and Operational Loads Reports will be added to this Guide (Special Missions and Airworthiness Assurance Guide). This guide will furnish the evaluation criteria that an offered aircraft, no matter the model, will have to be substantiated to.

C. Validating Aircraft for Special Missions with "Unique" Elements:

Once a Mission Profile and Operational Loads Report is published for missions that are unique to aerial firefighting, that report will be the minimum standard that fleet, contracted or cooperator aircraft must meet or show that their maintenance/inspection program and component retirement times have been accounted for. There are many factors that could define how rudimentary or extensive that effort might be. Those factors are:

- The comparison of the firefighting mission as opposed to its non-firefighting role and consequences.
- The age of the aircraft expressed in hours, flights and/or cycles
- FAA certification standard for the aircraft being considered
- FAA certification standards subsequent to those used for an aircraft's initial certification
- OEM support for the aircraft to perform the Special Mission
- OEM ability / desire to accomplish the analysis for the Special Mission
- OEM design data available for an engineering firm (DERs) to perform a comprehensive F&DT analysis.

Typically compliance will be shown by an FAA approved engineering analysis and revision to the maintenance/inspection program and component retirement times that specifically addresses use of the aircraft in the published aerial firefighting special mission. This will be in the form of an Instruction for Continued Airworthiness (ICA) for the specific usage. Interagency / Cooperator aircraft offered for federal use, whether FAA certificated or non-certificated will be held to an equivalent standard.

D. Additional Standards:

In an effort to avoid duplication of FAA regulatory functions, the FS will primarily rely on FAA maintenance, inspection and certification standards for all basic aircraft, equipment and additional alterations, which are *minimum* standards. The FS may impose its own standard or a later FAA certification requirement that is above and beyond what was needed for initial FAA certification of the aircraft, additional equipment or an alteration because of special mission needs or additional risk mitigation.

E. Restricted Category Aircraft:

Restricted Category aircraft offered for FS use in missions classified as "Unique to Aerial Firefighting" should be certificated following the guidelines set forth in FAA Order 8110.56 for the special purpose of **Forest and wildlife conservation, aerial dispensing of liquids,** using the corresponding Mission Profile and Operational Loads Reports that the aircraft will be offered for, irrespective of its current certification. Aircraft can be dual certificated in Standard and Restricted category. This will be required by policy and contract standard not later than 5 years after the Mission Profile and Operational Loads Report for a specific mission is incorporated into the Special Mission Airworthiness Assurance Guide.

F. Operational Loads Monitoring for Continuing Evaluation:

The installation of Operational Loads Monitoring equipment may be required based on the impact of the special mission on the aircraft, as recommended by the Forest Service Airworthiness Practices Board (FSAPB). When installed the data collected shall be used for

individual aircraft health management and or a flight operations quality assurance (FOQA) program. The data shall be provided for review to the FS in a format that allows it to be included with the agency OLM Library Database. The operator shall define and describe an exceedance, how it is detected by the system, and the actions to be taken when an exceedance occurs. The OLM system will record the following minimum parameters at the record rate indicated unless otherwise directed for a specific special mission:

Table 3 Basic OLM Channel List

Channel Description	Number of Channels	Discrete / Analog Channel	Sample Rate (Hz)	Record Rate (Hz)
1. Altitude (GPS)	1	Analog Channel	4 Hz	8 Hz
2. Equivalent Airspeed (GPS)	1	Analog Channel	4 Hz	8 Hz
3. Vertical Speed (GPS)	1	Analog Channel	4 Hz	8 Hz
4. Heading (GPS)	1	Analog Channel	4 Hz	8 Hz
5. Date and Time in GMT (GPS)	1	Analog Channel	4 Hz	8 Hz
6. Latitude (GPS)	1	Analog Channel	4 Hz	8 Hz
7. Longitude (GPS)	1	Analog Channel	4 Hz	8 Hz
8. Engine Start (one engine oil pressure)	1	Discrete Channel	8 Hz	8 Hz
9. Pitot Pressure or Airspeed Transducer (If Indicated Airspeed is able to be collected from an airspeed transducer this channel would not be needed)	1	Analog Channel	8 Hz	8 Hz
10. Static Pressure	1	Analog Channel	8 Hz	8 Hz
11. Outside Air Temperature	1	Analog Channel	8 Hz	8 Hz
12. Altitude (Static Pressure)	1	Analog Channel	8 Hz	8 Hz
13. Indicated Airspeed (must be derived from Pitot / Static differential)	1	Analog Channel	8 Hz	8 Hz
14. Tank Door Actuation(All Doors, Fixed Wing) / Bucket Gate Actuation(Rotor Wing)	1 to 8	Discrete Channel	8 Hz	8 Hz
15. Retardant Quantity (Airtanker) / Load Cel Weight (Rotor Wing)	1	Analog Channel	8 Hz	8 Hz
16. Power On/ Off	1	Discrete Channel	8 Hz	8 Hz
17. Landing Gear Squat Switch (Fixed Wing) / Collective Up (Rotor Wing)	1	Discrete Channel	8 Hz	8 Hz
18. Flap Extend (or as an analog in Degrees)	1	Discrete or Analog Channel	8 Hz	8 Hz
19. Flap Retract (not needed if Flaps are collected as an analog channel)	1	Discrete Channel	8 Hz	8 Hz
20. Speed Brake / Spoiler Extend	1	Discrete or Analog Channel	8 Hz	8 Hz
21. Speed Brake / Spoiler Retract (not needed if it is collected as an analog channel)	1	Discrete Channel	8 Hz	8 Hz
22. Radar Alt (Only if already installed. There may be limitations for recording this based on the aircraft being instrumented)	1	Analog Channel	8 Hz	8 Hz
23. Fuel Quantity (as an electronic signal if possible. There may be limitations for recording this based on the aircraft being instrumented. Collect manually otherwise.)	1	Analog Channel	8 Hz	8 Hz
24. Normal Acceleration (Nz)	1	Analog Channel	32 Hz	8 Hz
25. Pitch	1	Analog Channel	32 Hz	8 Hz
26. Pitch Rate	1	Analog Channel	32 Hz	8 Hz
27. Roll	1	Analog Channel	32 Hz	8 Hz

28. Roll Rate	1	Analog Channel	32 Hz	8 Hz
29. Yaw Rate	1	Analog Channel	32 Hz	8 Hz

Part 5 Delegation of Actions and Responsibility

Introduction:

Regardless of aircraft ownership, when the FS accepts operational control it is responsible to ensure that the aircraft meets a standard that mitigates risk to an acceptable level considering aircraft and pilot performance, aircraft equipment, maintenance and inspection, etc. This section will address roles and responsibilities and the formulation, implementation, oversight and review of this plan.

A. *Forest Service Working Capital Fund Fleet:*

FS WCF aircraft are owned nationally but are deployed and managed on a regional level. These aircraft will be assessed IAW the Special Mission Airworthiness Assurance Methodology and appropriate supplements created to address usage unique to aerial firefighting. The OEM will be pursued as the first source to develop a maintenance and inspection program supplement with qualified FAA DERs, designated in an applicable discipline, sought as an acceptable alternative. The FS Airworthiness Branch Chief will coordinate and work with Regional Aviation Maintenance Program Managers to identify funding, address the aircraft IAW the prioritization of Tables 1 and 2 and approve the incorporation of needed supplements into fleet maintenance and inspection programs. IAW FSM 5719.04c Site Visits shall be performed every three years of the Regional programs to ensure compliance.

B. *Forest Service Contracted or Leased Aircraft*:

Mission profiles and additional standards shall be incorporated into aviation contracts as they are completed as referenced in Tables 1 and 2. Offerors will be required to show how their FAA approved maintenance and inspection program will address the uniqueness of the aerial firefighting mission for which their aircraft is being considered.

There will be four tasks for contracted aircraft:
1) Incorporation of the standards into contract language,
2) Evaluation of proposals for compliance,
3) Initial inspection to show compliance and
4) Quality assurance monitoring during the contract period.

The annual inspection and approval required by FSH 5709.16, Para 14.13 will verify information submitted in the offeror's proposal and the contractor shall have additional inspections during the contract period as necessary for quality assurance purposes. Accomplishing the work specified in Tasks 1 and 2 will be a collaborative effort of the Airworthiness Branch and Regional Program Managers, and the subject matter experts (SME's) they enlist to assist with these tasks. Tasks 3 and 4 will be the responsibility and a collaboration of National and Regional FS Airworthiness and Avionics Inspectors as well as technical SMEs included as needed.

C. *State and Local Cooperator Aircraft Offered for Federal Use (including FEPP):*

All cooperator aircraft offered for use on federal fires will be subject to the same methodology and standard as FS fleet and contracted aircraft for the special missions for which they are being considered in accordance with Cooperator Aviation Standards for Interagency Fire, as

amended. This standard is based on the Federal Aviation Regulations (14 CFR), FS Call When Needed contract standards and OPM 21(Interagency Fire Helicopter Standards). This cooperator standard shall include the Mission Profile and Operational Loads Reports for specific missions once they are added to this Guide. Based on the Mission Profile and Operational Loads Report, Instructions for continued airworthiness (ICA) for the specific aircraft will be added to the Cooperator Aviation Standards for Interagency Fire in the form of a supplement. Cooperators shall be approved by the FS Regional Aviation Officer through a letter based on this cooperator standard following review by FS designated aircraft inspectors. FS policy (FSM 5710.35, 5713.43 & FSH 5709.16 14.11, FEPP Desk Guide) shall be amended to incorporate this standard as well as the normal scheduled site visits of the cooperators.

Currently the Cooperator Aviation Standards for Interagency Fire addresses only light fixed-wing aircraft and helicopters. In the future this document may include fixed-wing airtankers.

Part 6 Ongoing Quality Assurance and Evaluation for Airworthiness Assurance

A. Introduction

Ongoing program monitoring and evaluation is an essential element to ensure the effectiveness of the agency's airworthiness assurance program. This plan proposes an additional level of oversight for all aircraft the FS operates (owned, contracted, leased and cooperator). Current FS Manual authorizes this under FSM 5719, Reviews and Evaluations which along with other references list 41CFR 101–37.1207, Inspections and Evaluations: "The purpose of any inspection or evaluation is to prevent aviation accidents and to foster aviation safety. (a) Each agency should establish and maintain an inspection and evaluation program for all aviation activities."

B. Quality Assurance:

Program monitoring consists of activities whose purpose is to provide feedback on the program in a timely manner to permit needed program adjustments. To accomplish this, quality assurance checks will be conducted on a scheduled basis to compare the application of the airworthiness assurance standards to the documentation submitted, the aircraft offered, and any additional required program elements. This process will provide interaction between FS National office, Regions, States, contractors and possibly other entities with the purpose of identifying conformity with standards and identifying changes needed to improve the overall program. The quality assurance checks will typically be based on the following four elements:

1) Development of Standards for fleet, contracted and Cooperator aircraft
2) Compliance shown through documentation provided during evaluation process, prior to approval
3) Physical onsite Pre-Use Inspection where compliance is verified
4) Site Visits during Approval Period (in field conditions and / or home base) that ensures continued compliance

C. Program Evaluation:

Program evaluation consists of peer review by recognized technical experts both inside the FS, Cooperating agencies, the aviation industry and others. This peer review is scheduled as needed.

Part 7 Special Mission Aircraft Evaluation Criteria Minimums

INTRODUCTION

This minimum specification contains the necessary criteria and requirements for ensuring the continued airworthiness of aircraft utilized in the special mission of firefighting. The requirements contained herein are based on a combination of FAA and USFS requirements as well as the safety recommendations by the NTSB resulting from the in-flight break-up of USFS firefighting aircraft.

A: Large Airtanker Special Mission Evaluation Standards

A: Large Airtanker Special Mission Evaluation Standards

LARGE AIRTANKER INTRODUCTION

The primary goal of this standard is to provide the necessary criteria and requirements to ensure that platforms proposed for and used in the Large Airtanker role can perform the necessary firefighting operations while assuring their safe use and continued airworthiness. These are minimum requirements which must be met in order for a platform to be considered by the US Forest Service for the Large Airtanker role. This section prescribes the USFS airframe requirements and criteria for Large Airtankers based on FAA and NTSB recommendations. Full compliance with NTSB Recommendation A-04-29 is mandatory. The methods described in this section have been specifically developed to meet A-04-29.

1. LARGE AIRTANKER MISSION AIRCRAFT REQUIREMENTS

The unique nature of the Large Airtanker role is such that normal commercial flight profiles are not applicable or adequate in assessing the structural impact of the usage to the fatigue life of the airframe. The Large Airtanker role has been one that has been performed by USFS aircraft for over 50 years and for which a significant amount of data exists describing its overall unique nature. However, until the recent implementation of flight data recorders, specific details were not available for the retardant drop flight segments of this usage.

Based on the USFS historical data, operator input, and the recently recorded data, the following minimum mission and system requirements have been defined.

The mission profiles for a Large Airtanker may vary somewhat based on the specific aircraft range and performance capabilities, however, the general features of the mission remain the same. The FAA has published report DOT/FAA/AR-11/7, Usage and Maneuver Loads Monitoring of Heavy Airtankers that characterizes the mission that Large Airtanker perform. This document is available This document is available to the U.S. public through the National Technical Information Services (NTIS), Springfield, Virginia 22161 or from the Federal Aviation Administration William J. Hughes Technical Center at www.tc.faa.gov

2. Minimum Aircraft Standards - The Forest Service will only consider contracting for Large Airtankers that have the following:

A. US Military Derived Restricted Category Aircraft (14 CFR Part 21.25 Certificated) (P2V, P3, etc)

1. FAA Type Certificated in the Restricted Category.
2. Documentation of an FAA Approved complete baseline (original certificated usage, civil or military) airframe evaluation for Damage Tolerance and Fatigue to 14 CFR 25.571 at Amendment 25-54 or later. At a minimum this documentation shall be in the form of an FAA 8110-3 **"Statement of Compliance with Federal Aviation Regulations"** Form stating in the "**Purpose of Data**" block that it is for "*the Fatigue and Damage Tolerance evaluations for the baseline mission usage*" and that in the "**Specific Requirements**" block references 14 CFR 25.571 Amendment 25-54 or later.
3. Documentation of a FAA Approved complete airtanker usage evaluation of the aircraft (airframe and tank) for Damage Tolerance and Fatigue to 14 CFR 25.571 at Amendment 25-54 or later. The evaluation shall identify the loads, internal and external, to which the principal structural elements (PSE's) will be subjected to in the firefighting role and determined the impact of those loads. At a minimum this documentation shall be in the form of an FAA 8110-3 **"Statement of Compliance with Federal Aviation Regulations"** Form stating in the "**Purpose of Data**" block that it is for "*the Fatigue and Damage Tolerance evaluations for the aerial dispersion mission usage*" and that in the "**Specific Requirements**" block references 14 CFR 25.571 Amendment 25-54 or later.
4. The aircraft shall have FAA approved Instructions for Continued Airworthiness (ICAs) that meet FAR 25.1529 at Amendment 25-54 or later for the baseline and airtanker mission formulated from the 14 CFR 25.571 evaluations and the aircraft shall be in compliance with all inspections, inspection intervals and structural component life limits derived from those evaluations.
5. The aircraft shall have an FAA approved maintenance and inspection program developed and implemented for use as an airtanker and shall be in compliance with that maintenance program and have complete records for airframe, engines and components certifying compliance with maintenance and all applicable 14 CFR requirements, manufacturer's SB's or military TCTO that are a safety of flight item or identified by an FAA AD.
6. The Contractor shall obtain documentation of Manufacturer or Design Approval Holder (DAH) support (or FAA equivalent) for maintenance and engineering support of the original aircraft while under contract to the US Forest Service.
7. All modifications to the aircraft which change the configuration to the firefighting role must be FAA approved.
8. Each aircraft shall be equipped with an Operational Loads Monitoring System (OLM) that has been accepted by the US Forest Service IAW requirements of section 4 "Operational Loads Monitoring" of this Part.

B. Standard Category Aircraft (CAR 4b and 14 CFR Part 25 Pre-Amdt 45)

1. FAA Type Certificated in the Standard Category and has also been issued a Restricted TC or 'Equivalent' Restricted TC by the incorporation of a Restricted STC for the Special Purpose Operation of Forest and Wildlife Conservation, Aerial Dispensing of Liquids IAW FAA Order 8110.56.

2. Documentation of a FAA Approved complete baseline (original certificated usage) airframe evaluation for Damage Tolerance and Fatigue to 14 CFR 25.571 at Amendment 25-54 or later. At a minimum this documentation shall be in the form of an FAA 8110-3 **"Statement of Compliance with Federal Aviation Regulations"** Form stating in the "**Purpose of Data**" block that it is for "*the Fatigue and Damage Tolerance evaluations for the baseline mission usage*" and that in the "**Specific Requirements**" block references 14 CFR 25.571 Amendment 25-54 or later.
3. Documentation of a FAA Approved complete Airtanker usage evaluation of the aircraft (airframe and tank) for Damage Tolerance and Fatigue to 14 CFR 25.571 at Amendment 25-54 or later. The evaluation shall identify the loads, internal and external, to which the principal structural elements (PSE's) will be subjected to in the firefighting role and determined the impact of those loads. At a minimum this documentation shall be in the form of an FAA 8110-3 **"Statement of Compliance with Federal Aviation Regulations"** Form stating in the "**Purpose of Data**" block that it is for "*the Fatigue and Damage Tolerance evaluations for the aerial dispersion mission usage*" and that in the "**Specific Requirements**" block references 14 CFR 25.571 Amendment 25-54 or later.
4. The aircraft shall have FAA approved Instructions for Continued Airworthiness (ICAs) that meet FAR 25.1529 at Amendment 25-54 or later for the baseline and airtanker mission formulated from the 14 CFR 25.571 evaluations and the aircraft shall be in compliance with all inspections, inspection intervals and structural component life limits derived from those evaluations.
5. The aircraft shall have an FAA approved maintenance and inspection program developed and implemented for use as an Airtanker and is in compliance with that maintenance program and have complete records for airframe, engines and components certifying compliance with maintenance and all applicable 14 CFR requirements, manufacturer's SB's that are a safety of flight item or identified by an FAA AD.
6. The Contractor shall obtain documentation of Manufacturer or Design Approval Holder (DAH) support (or FAA equivalent) for maintenance and engineering support of the original aircraft while under contract to the US Forest Service.
7. All modifications to the aircraft which change the configuration to the firefighting role must be FAA approved.
8. Each aircraft shall be equipped with an Operational Loads Monitoring System (OLM) that has been accepted by the US Forest Service IAW requirements of section 4 "Operational Loads Monitoring" of this Part.
9. Aircraft that were not originally certificated to but have since shown compliance to Part 25 at amendment level 45 shall have incorporated and complied with all requirements of the currently approved MSG-3 maintenance and inspection program as a baseline for the aircraft.

C. Standard Category Aircraft (14 CFR Part 25 Post- Amdt 45)

1. FAA Type Certificated in the Standard Category and has also been issued an. 'Equivalent' Restricted TC by the incorporation of a Restricted STC for the Special Purpose Operation of Forest and Wildlife Conservation, Aerial Dispensing of Liquids IAW FAA Order 8110.56.
2. Documentation of a FAA Approved complete baseline (original certificated usage) airframe evaluation for Damage Tolerance and Fatigue to 14 CFR 25.571 at Amendment 25-45 or later. At a minimum this documentation shall be in the form of an FAA 8110-3 **"Statement of Compliance with Federal Aviation Regulations"** Form stating in the "**Purpose of Data**" block that it is for "*the Fatigue and Damage Tolerance*

evaluations for the baseline mission usage" and that in the "**Specific Requirements**" block references 14 CFR 25.571 Amendment 25-45 or later.

3. Documentation of a FAA Approved complete Airtanker usage evaluation of the aircraft (airframe and tank) for Damage Tolerance and Fatigue to 14 CFR 25.571 at Amendment 25-54 or later. The evaluation shall identify the loads, internal and external, to which the principal structural elements (PSE's) will be subjected to in the firefighting role and determined the impact of those loads. At a minimum this documentation shall be in the form of an FAA 8110-3 **"Statement of Compliance with Federal Aviation Regulations"** Form stating in the "**Purpose of Data**" block that it is for "*the Fatigue and Damage Tolerance evaluations for the aerial dispersion mission usage*" and that in the "**Specific Requirements**" block references 14 CFR 25.571 Amendment 25-54 or later.
4. The aircraft shall have FAA approved Instructions for Continued Airworthiness (ICAs) that meet FAR 25.1529 at Amendment 25-54 or later for the baseline and airtanker mission formulated from the 14 CFR 25.571 evaluations and the aircraft shall be in compliance with all inspections, inspection intervals and structural component life limits derived from those evaluations.
5. The aircraft shall have an FAA approved maintenance and inspection program developed and implemented for use as an Airtanker and shall be in compliance with that maintenance program and have complete records for airframe, engines and components certifying compliance with maintenance and all applicable 14 CFR requirements, manufacturer's SB's that are a safety of flight item or identified by an FAA AD.
6. The Contractor shall obtain documentation of Manufacturer or Design Approval Holder (DAH) support (or FAA equivalent) for maintenance and engineering support of the original aircraft while under contract to the US Forest Service.
7. All modifications to the aircraft which change the configuration to the firefighting role must be FAA approved.
8. Each aircraft shall be equipped with an Operational Loads Monitoring System (OLM) that has been accepted by the US Forest Service IAW requirements of section 4 "Operational Loads Monitoring" of this Part.
9. Aircraft Certificated to Part 25 at amendment level 45 or later shall have incorporated and complied with all requirements of the currently approved MSG-3 formulated maintenance and inspection program as a baseline for the aircraft.

D. Foreign Aircraft(14 CFR Part 21.29 Certificated)

1. Aircraft surplus of a foreign military, foreign government, or foreign paramilitary entity are not eligible to be certificated in the United States. These aircraft are also not eligible to contract to the US Forest Service.
2. If not manufactured in the United States, only those aircraft certificated by a country the United States has a bilateral agreement with that incorporates reciprocal airworthiness certification of civil aeronautical products. For example, a Russian new or used Transport Category aircraft would have to meet the requirements of the *Bilateral Aviation Safety Agreement (BASA) with Implementation Procedures for Airworthiness (IPA) dated December 9, 1998* between the USA and the Russian Federation, or the latest revision. In this example it says:
   Section 2.0 General *These Implementation Procedures cover the products and parts identified below, their related approvals, and the provisions set forth in the following paragraphs. Products accepted by the U.S. and Russia must meet the national airworthiness standards defined in paragraph 1.5.*

2.1 *Products and Parts Designed and Manufactured in the Country of the Exporting Civil Airworthiness Authority Accepted for Import Under These BASA Implementation Procedures.*

2.1.2 *U.S. Acceptance of AR/FAAR Export Certificates of Airworthiness for the Following Products:.....*

(b) *new and used transport category airplanes (cargo configuration only), with FAA-certificated engines, propellers, and avionics, and approved for instrument approach procedures under Category I or II operations only.*

3. FAA Type Certificated or foreign equivalent in the Standard Category and has also been issued an. 'Equivalent' Restricted TC by the incorporation of a Restricted STC for the Special Purpose Operation of Forest and Wildlife Conservation, Aerial Dispensing of Liquids IAW FAA Order 8110.56.
4. Documentation of a FAA Approved or foreign equivalent complete baseline (original certificated usage) airframe evaluation for Damage Tolerance and Fatigue to 14 CFR 25.571 at Amendment 25-45 or later. At a minimum this documentation shall be in the form of an FAA 8110-3 **"Statement of Compliance with Federal Aviation Regulations"** Form stating in the "**Purpose of Data**" block that it is for "*the Fatigue and Damage Tolerance evaluations for the baseline mission usage*" and that in the "**Specific Requirements**" block references 14 CFR 25.571 Amendment 25-45 or later.
5. Documentation of a FAA Approved or foreign equivalent complete Airtanker usage evaluation of the aircraft (airframe and tank) for Damage Tolerance and Fatigue to 14 CFR 25.571 at Amendment 25-54 or later. The evaluation shall identify the loads, internal and external, to which the principal structural elements (PSE's) will be subjected to in the firefighting role and determined the impact of those loads. At a minimum this documentation shall be in the form of an FAA 8110-3 **"Statement of Compliance with Federal Aviation Regulations"** Form stating in the "**Purpose of Data**" block that it is for "*the Fatigue and Damage Tolerance evaluations for the aerial dispersion mission usage*" and that in the "**Specific Requirements**" block references 14 CFR 25.571 Amendment 25-54 or later.
6. The aircraft shall have FAA approved or foreign equivalent Instructions for Continued Airworthiness (ICAs) that meet FAR 25.1529 at Amendment 25-54 or later for the baseline and airtanker mission formulated from the 14 CFR 25.571 evaluations and the aircraft shall be in compliance with all inspections, inspection intervals and structural component life limits derived from those evaluations.
7. The aircraft shall have an FAA approved or foreign equivalent maintenance and inspection program developed and implemented for use as an Airtanker and shall be in compliance with that maintenance program and have complete records for airframe, engines and components certifying compliance with maintenance and all applicable 14 CFR requirements, manufacturer's SB's that are a safety of flight item or identified by an FAA AD.
8. The Contractor shall obtain documentation of Manufacturer or Design Approval Holder (DAH) support (or FAA equivalent) for maintenance and engineering support of the original aircraft while under contract to the US Forest Service.
9. All modifications to the aircraft which change the configuration to the firefighting role must be FAA or foreign equivalent approved.
10. Each aircraft shall be equipped with an Operational Loads Monitoring System (OLM) that has been accepted by the US Forest Service IAW requirements of section 4 "Operational Loads Monitoring" of this Part.
11. Aircraft Certificated to Part 25 at amendment level 45 or later, or foreign equivalent, shall have incorporated and be in compliance with all requirements of the currently

approved MSG-3 formulated maintenance and inspection program as a baseline for the aircraft.

3.0 STRUCTURAL EVALUATION REQUIREMENTS AND CRITERIA, LARGE AIRTANKER

A. Baseline Airframe Evaluation

Due to the technical complexity associated with performing a baseline airframe evaluation to FAR 25.571, the following is provided as minimum criteria.

i. Baseline Airframe Fatigue and Damage Tolerance Substantiation

The analysis of the baseline airframe must include a fatigue and damage tolerance assessment. The assessment must include crack growth analyses for all fatigue critical structure / Principle Structural Elements (PSEs) as well as all structure susceptible to WFD. The technical approach must follow accepted FAA methods and criteria as prescribed in FAR 25.571, AC 91-56B (Ref. 8), AC-25.571-1C (Ref. 10)

ii. Baseline Airframe Residual Strength Capability

All fatigue critical structure / PSE damage tolerance analyses must include an evaluation of the remaining residual strength capability of the airframe.

iii. Structural Test Correlation and Validation of Fatigue Strength

All analyses must be correlated and supported by test evidence (coupon, component or full scale fatigue test data) and/or any representative and validated service data.

B. Airtanker Airframe Evaluation

The evaluation of the airtanker usage is to be performed in two distinct stages. The first stage involves a preliminary evaluation of the airframe based on historical airtanker load histories as prescribed in Section 1.0 above. The second stage involves utilizing actual recorded data to update the initial preliminary evaluation. The following prescribes minimum criteria which must be met during both stages of the analysis.

i. Preliminary Assessment

This assessment must include a usage evaluation of the fatigue critical structure / PSEs and WFD susceptible structure for the airtanker mission. This assessment must at a minimum meet the following technical criteria:

1. In lieu of aircraft specific load histories, the sources cited in the reference section for Large Airtanker operational loads must be used.
2. Airframe fatigue external and internal loads and corresponding fatigue spectra must be developed for the airtanker specific profiles specified above in Section 1.0.
3. Fatigue and damage tolerance analyses of the baseline fatigue critical structure / PSEs must be re-evaluated utilizing the airtanker fatigue spectra. This evaluation must be performed using fatigue and crack growth analytical methods and include the effects on PSE baseline inspections as well as any structural component life limits established by WFD critical structure. In order to perform a thorough evaluation, fatigue critical structure / PSEs shall be determined by the AC 91-82 fatigue critical structure criteria and with a supportable rational.

4. The evaluation must include an assessment of the airtanker usage on all WFD critical structure. Both Multi Site Damage (MSD) and Multi Element Damage (MED) must be evaluated. This evaluation must also determine the impact to the FAA airframe and structural component life limits for the aircraft as a result of the WFD findings. The evaluation must be performed according to the FAA criteria. At a minimum, no WFD evaluation will employ a scatter factor on the WFD fatigue life of less than 2.0 regardless of the method of analysis. Approved methods for the WFD evaluation are limited to one of the following approaches:

    a. OEM Established Method if Available

    b. Classical Stress Life or Strain Life Methods with the following caveats:
        i. Scatter Factor = 2.0 with full scale fatigue testing
        ii. Scatter Factor = 4.0 with component fatigue testing
        iii. Scatter Factor = 8.0 by analysis only

    c. Crack Growth Analysis Utilizing Small Crack Material Data

    d. Service Based Statistical Analyses with the following caveats:
        i. Number of findings must be statistically acceptable.
        ii. Analysis must include both detail and fleet scatter
        iii. Analysis must include a residual strength assessment
        iv. Resulting scatter factor must be 2.0 at a minimum

5. Based on the results of the re-evaluation of the baseline fatigue critical structure /PSEs to the airtanker usage, the existing Instructions for Continued Airworthiness (ICA) must be updated with the according impacts. If the impacts affect WFD susceptible structure and/or the prescribed airframe and or component life limits for the aircraft, new limits must be established and all structure requiring modification must be identified. The effect to the ICA must be based on the re-evaluated fatigue critical structure / PSEs for the affected structure and **not on any one generic severity factor**.

ii. Continued Evaluation

Once a specific aircraft has operated as an airtanker and has accumulated a sufficient amount of actual recorded usage data (a minimum of 750 hours collectively), the fatigue critical PSE evaluated in the preliminary assessment must be re-evaluated with the recorded data. This evaluation must at a minimum include the following technical efforts:

1. Development of actual aircraft specific airtanker missions based on recorded data and pilot supplemental data. These actual missions must be compared to those utilized in the preliminary assessment.
2. Development of load histories for all flight loads to include maneuver, gust, retardant drop, landing and taxi. These histories must be compared to those utilized in the preliminary assessment.
3. Based on a comparison of the recorded data, the severity of the actual usage must be determined. If the severity is higher for the actual recorded data, then, all fatigue critical structure / PSEs must be re-analyzed utilizing the new data per the criteria presented above in paragraph B.i.
4. As a result of the evaluation, the existing ICA and all related inspections and component life limits must be updated if the actual usage is more severe than initially determined in the preliminary evaluation.

4.0 OPERATIONAL LOADS MONITORING

An essential requirement of the airtanker usage evaluation is validation and continued monitoring of the airframe loads and stresses experienced during operations. This validation and monitoring must be performed thru instrumentation and recording of aircraft parameters. The following specifies the necessary criteria, instrumentation and equipment and support which must be met for these efforts.

A. Criteria

To properly monitor the airtanker usage of a specific model aircraft, a complete instrumentation package and recording device are required. The package must include both recorded flight parameters as well as strain gages to measure the stress induced on the airframe. One aircraft shall be instrumented with a functioning operational loads monitoring system capable of characterizing the missions performed by these aircraft. The following section details the minimum required parameters and instrumentation to be recorded at a minimum sample rate of 8Hz or 32 Hz depending on the system being used for Initial Usage Evaluation or Continuous Monitoring. Accelerations shall be recorded as close to the aircraft Center of Gravity as practicable or correction algorithms may be validated and applied. Systems shall have functional and calibration flights recorded annually.

B. Initial Usage Evaluation OLM System

These are minimum system requirements for at least one aircraft of a particular model in airtanker operation for data to perform an initial usage evaluation. The instrumentation and equipment utilized must include all mechanical components required to measure the flight parameters as well as strain gages at selected locations on the airframe. The system shall have detailed installation instructions, drawings and instructions for continued airworthiness (ICAs). The ICAs will also include an installation validation plan for system and scheduled calibration check due annually. The following are minimum required parameters to be recorded at 32 Hz:

Table 4 Initial Airtanker Evaluation OLM Minimum Channel List				
Channel Description	**Number of Channels**	**Discrete / Analog Channel**	**Sample Rate (Hz)**	**Record Rate (Hz)**
1. Altitude (GPS)	1	Analog Channel	32 Hz	32 Hz
2. Equivalent Airspeed (GPS)	1	Analog Channel	32 Hz	32 Hz
3. Vertical Speed (GPS)	1	Analog Channel	32 Hz	32 Hz
4. Heading (GPS)	1	Analog Channel	32 Hz	32 Hz
5. Date and Time in GMT (GPS)	1	Analog Channel	32 Hz	32 Hz
6. Latitude (GPS)	1	Analog Channel	32 Hz	32 Hz
7. Longitude (GPS)	1	Analog Channel	32 Hz	32 Hz
8. Engine Start (one engine oil pressure)	1	Discrete Channel	32 Hz	32 Hz
9. Pitot Pressure or Airspeed Transducer (If Indicated Airspeed is able to be collected from an airspeed transducer this channel would not be needed)	1	Analog Channel	32 Hz	32 Hz
10. Static Pressure	1	Analog Channel	32 Hz	32 Hz
11. Outside Air Temperature	1	Analog Channel	32 Hz	32 Hz
12. Altitude (Static Pressure)	1	Analog Channel	32 Hz	32 Hz
13. Indicated Airspeed (must be derived from Pitot / Static differential)	1	Analog Channel	32 Hz	32 Hz
14. Cabin Pressure	1	Analog Channel	32 Hz	32 Hz
15. Tank Door Actuation(All Doors)	1 to 8	Discrete Channel	32 Hz	32 Hz
16. Retardant Quantity	1	Analog Channel	32 Hz	32 Hz
17. Power On/ Off	1	Discrete Channel	32 Hz	32 Hz
18. Landing Gear Squat Switch	1	Discrete Channel	32 Hz	32 Hz
19. Flap Extend (or as an analog in Degrees)	1	Discrete or Analog Channel	32 Hz	32 Hz
20. Flap Retract (not needed if Flaps are collected as an analog channel)	1	Discrete Channel	32 Hz	32 Hz
21. Speed Brake / Spoiler Extend (if	1	Discrete or	32 Hz	32 Hz

installed)		Analog Channel		
22. Speed Brake / Spoiler Retract (not needed if it is collected as an analog channel)	1	Discrete Channel	32 Hz	32 Hz
23. Fuel Quantity (Manually collected.)	1	Supplemental Data		
24. Normal Acceleration (Nz)	1	Analog Channel	32 Hz	32 Hz
25. Pitch	1	Analog Channel	32 Hz	32 Hz
26. Pitch Rate	1	Analog Channel	32 Hz	32 Hz
27. Roll	1	Analog Channel	32 Hz	32 Hz
28. Roll Rate	1	Analog Channel	32 Hz	32 Hz
29. Yaw Rate	1	Analog Channel	32 Hz	32 Hz
30. STRAIN GAGES: A total of 6 Strain gages located on the center wing at the same wing station on the upper and lower front spar cap, the upper and lower wing panel, and the upper and lower rear spar, location based on F&DT	6	Analog Channel	32 Hz	32 Hz
31. Two sets of 6 strain gages for a total of 12 gages located on the outer wing on the upper and lower front spar cap, the upper and lower wing panel, and the upper and lower rear spar, location based on F&DT.	12	Analog Channel	32 Hz	32 Hz
32. One rosette gage on the front spar web	2	Analog Channel	32 Hz	32 Hz
33. One rosette gage on the rear spar web	2	Analog Channel	32 Hz	32 Hz
34. Two gages on the center fuselage on the upper crown	2	Analog Channel	32 Hz	32 Hz
35. One gage on the vertical tail at the wing root	1	Analog Channel	32 Hz	32 Hz
36. One gage on the horizontal tail at the wing root	1	Analog Channel	32 Hz	32 Hz
37. Aircraft Gross Weight (as manually collected supplementary data)	0	Supplemental Data		

C. Continuous Monitoring OLM Requirements for Additional Aircraft

If multiple aircraft of the same model are employed in the airtanker role, the OLM system and instrumentation requirements may be less comprehensive so long as the one aircraft with full instrumentation is maintained in continued operation as an airtanker until the initial usage evaluation is completed. These are minimum system requirements for all other aircraft of a particular model in airtanker operation for continuous monitoring while in airtanker service. The instrumentation and equipment utilized must include all mechanical components required to measure the flight parameters listed. The system shall have detailed installation instructions, drawings and instructions for continued airworthiness (ICAs). The ICAs will also include an installation validation plan for system and scheduled calibration check due annually. The following are minimum required parameters to be recorded at 8 Hz:

The following are the minimum requirements for a Continuous Monitoring OLM system:

Table 5 Continuous Monitoring OLM Minimum Channel List

Channel Description	Number of Channels	Discrete / Analog Channel	Sample Rate (Hz)	Record Rate (Hz)
1. Altitude (GPS)	1	Analog Channel	4 Hz	8 Hz
2. Equivalent Airspeed (GPS)	1	Analog Channel	4 Hz	8 Hz
3. Vertical Speed (GPS)	1	Analog Channel	4 Hz	8 Hz
4. Heading (GPS)	1	Analog Channel	4 Hz	8 Hz
5. Date and Time in GMT (GPS)	1	Analog Channel	4 Hz	8 Hz
6. Latitude (GPS)	1	Analog Channel	4 Hz	8 Hz
7. Longitude (GPS)	1	Analog Channel	4 Hz	8 Hz
8. Engine Start (one engine oil pressure)	1	Discrete Channel	8 Hz	8 Hz
9. Pitot Pressure or Airspeed Transducer (If Indicated Airspeed is able to be collected from an airspeed transducer this channel would not be needed)	1	Analog Channel	8 Hz	8 Hz

10. Static Pressure	1	Analog Channel	8 Hz	8 Hz
11. Outside Air Temperature	1	Analog Channel	8 Hz	8 Hz
12. Altitude (Static Pressure)	1	Analog Channel	8 Hz	8 Hz
13. Indicated Airspeed (must be derived from Pitot / Static differential)	1	Analog Channel	8 Hz	8 Hz
14. Cabin Pressure	1	Analog Channel	8 Hz	8 Hz
15. Tank Door Actuation(All Doors)	1 to 8	Discrete Channel	8 Hz	8 Hz
16. Retardant Quantity	1	Analog Channel	8 Hz	8 Hz
17. Power On/ Off	1	Discrete Channel	8 Hz	8 Hz
18. Landing Gear Squat Switch	1	Discrete Channel	8 Hz	8 Hz
19. Flap Extend (or as an analog in Degrees)	1	Discrete or Analog Channel	8 Hz	8 Hz
20. Flap Retract (not needed if Flaps are collected as an analog channel)	1	Discrete Channel	8 Hz	8 Hz
21. Speed Brake / Spoiler Extend (if installed)	1	Discrete or Analog Channel	8 Hz	8 Hz
Speed Brake / Spoiler Retract (not needed if it is collected as an analog channel)	1	Discrete Channel	8 Hz	8 Hz
23. Fuel Quantity (Manually collected)	1	Supplemental Data		
24. Normal Acceleration (Nz)	1	Analog Channel	32 Hz	32 Hz
25. Pitch	1	Analog Channel	32 Hz	8 Hz
26. Pitch Rate	1	Analog Channel	32 Hz	8 Hz
27. Roll	1	Analog Channel	32 Hz	8 Hz
28. Roll Rate	1	Analog Channel	32 Hz	8 Hz
29. Yaw Rate	1	Analog Channel	32 Hz	8 Hz

D. Data Acquisition and Transmittal Requirements

The flight data recorder utilized for the data acquisition must be capable of recording all of the flight parameters as well as the strain gages, when applicable. Recorders shall be capable of recording flight data for up to 100 flight hours without replacing the data capture media. Recorded data shall be compatible with Forest Service Data Library software solution. The following are minimum characteristics which the box must possess:

i. The FDR must be easily accessible to change data card.

ii. The FDR must have crash hardened recording media in excess of the removable data card with evidence of crash survivability.

E. Monitoring and Submittal of Data

Regular maintenance and monitoring of the instrumentation must be performed in order to ensure proper working order. All FDR data cards must be regularly submitted to the USFS for uploading into the Forest Service OLM Data Library.

5.0 MAINTENANCE AND INSPECTION CRITERIA

The culmination or goal of the entire airtanker usage evaluation is to determine what, if any, impacts there are to the Instructions for Continued Airworthiness (ICA). This is not limited to just the Airworthiness Limitations Section (ALS) of the ICA but also includes all of the maintenance programs for the airplane. The following itemizes the programs and documents which must be evaluated for the airtanker impact.

a. FAA Approved Maintenance Program

As mentioned above, the entire aircraft maintenance program must be evaluated for any resulting impacts due to the airtanker usage. The following itemizes all of the programs which must be evaluated:

i. Airworthiness Limitations
ii. Basic MRB Manual to include any MSG type Programs
iii. Corrosion Prevention and Control Programs (CPCP)
iv. Supplemental Structural Inspection Documents (SSID)
v. Service Bulletins
vi. STC Related ICA
vii. Previous Structural Repairs

b. Updates to FAA ICA

As a result of both the initial and continued evaluations outlined above in Paragraph B, ICA supplements must be developed accounting for the airtanker usage. These supplements must account for any and all impacts to the above cited aircraft maintenance documents. The development of the ICA supplements and the actual documents themselves must at a minimum meet the following requirements:

i. ICA Supplement must have FAA Approval
ii. All changes in inspection procedures must be validated
iii. All supplemental NDT procedures must be validated thru the use of calibration standards.

Appendix A

Acronym	Term
AC	Advisory Circular
ASM	Aerial Supervision Module
ATGS	Air Tactical Group Supervisor
CAR	Civil Aeronautics Regulations
CWN	Call When Needed
DER	Designated Engineering Representative
EU	Exclusive Use
F&DT	Fatigue and Damage Tolerance
FAA	Federal Aviation Administration
FEPP	Federal Excess Personal Property
FS	Forest Service
FSAPB	Forest Service Airworthiness Practices Board
FSH	Forest Service Handbook
FSM	Forest Service Manual
GIS	Geographic Information System
GMT	Greenwich Mean Time
Hz	Hertz
IAW	In Accordance With
IAAPB	Interagency Airworthiness Practices Board
ICA	Instructions for Continued Airworthiness
MOU	Memorandum of Understanding
NIFC	National Interagency Fire Center
NTSB	National Transportation Safety Board
OEM	Original Equipment Manufacturer
OIG	Office of Inspector General
OLM	Operational Loads Monitoring
PSD	Plastic Sphere Dispenser
SMAAG	Special Mission Airworthiness Assurance Guide
SME	Subject Matter Expert
STC	Supplemental Type Certificate
WSU	Wichita State University

US Forest Service
Fire and Aviation Management

Flight Profile Definition Worksheet (ASM)

The following list of typical details is required to perform a durability and/or damage tolerance evaluation of the aircraft structure. An associated tolerance for the information required is presented in parenthesis after each item.

This data is for an average Leadplane mission for B90, S/N LJ-472, N148Z. The aircraft does perform a limited amount of "normal" flight profile (as defined in the SIRM) work during the off season, but this is limited to approximately 50-75 hours per year. Total average flight time is 250-300 hours per year.

1. Gross weight of aircraft at takeoff (±100 lbs).

   9,200

2. Fuel weight of aircraft at takeoff (±50 lbs).

   2573

3. Total flight time (±20 Minutes).

   3.0 Hours

4. Time associated with each segment of flight (±10 minutes or POH values where appropriate).

   Takeoff @ approximately 4,500 MSL. Climb to 8,500-9,500 MSL (5 Minutes) and cruise for approximately 20 minutes (3,000-4,000 AGL). Descend to approximately 7,000 MSL (1,000-1,500 AGL). Then for approximately 2 hours climbing and descending between 7,000 and 5,000 feet (150-1,500 AGL), with less than 5% of the time in the low level "lead" environment (<500 AGL). Then climbing back to approximately 8,500-9,500 MSL (3,000-4,000 AGL) for return to base.

5. Altitude of each cruise segment in feet AGL (±1000 feet if <10,000 feet or ±2500 feet if ≥10,000 feet).

   3,000-4,000 AGL

6. Velocity in KIAS associated with each segment of flight (±25 KIAS or POH values where appropriate).

   Climb 140 KIAS

   Cruise 160 KIAS

   Mission 110 – 130 KIAS, flaps approach

7. If Touch and Go's are performed, the number and location, i.e., first, middle or last of flight (±2 Touch and Go's).

   None

8. If more than 1 distinct profile is flown, list all profiles and the estimated percentage of time each will be flown (±5%).

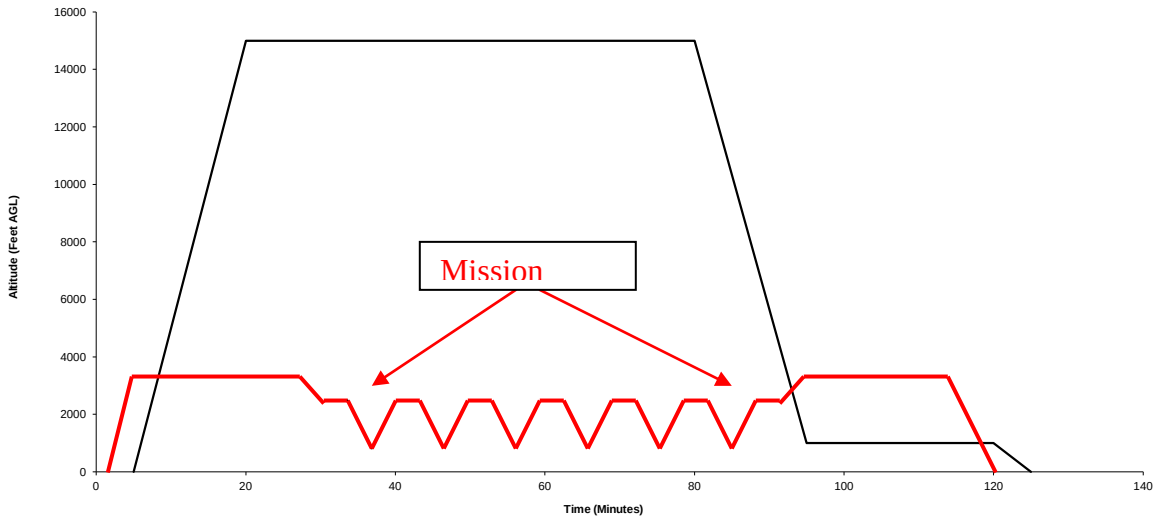
   None

9. If multiple flights are conducted before refueling the aircraft, please provide the information from items 1 – 7 above for each leg of the mission.

   None

10. In order to have a clear understanding of the above requested information, a schematic of the flight profile(s) showing altitude versus time, which appropriate detailed information included, will help to expedite the analysis. An example of such a schematic is shown below.

Bottom of red "V" represents flight < 500 AGL. Top of red "V" (flat areas) represents flight > 500 AGL, which is typically 1,000-1500 AGL.



5 30 150 180

Time (Minutes)

Figure 2