

System Safety Assessment - Heavy Airtanker Program

Heavy Airtanker Program System - Airworthiness

Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Operational Service Life	Forest Service has not historically conducted airworthiness inspections; it has relied upon the FAA for that expertise. The perceived role was one of contract compliance.	Remote	Catastrophic	Serious	Continue contractual requirements commensurate with industry standards required by FAR 25.571 for aircraft continued airworthiness. Incorporate the latest inspection technology.	Remote	Marginal	Medium
	Forest Service has not identified metrics that define the fire environment for the purpose of establishing effects on airworthiness.	Remote	Catastrophic	Serious	Employee additional workforce with the skills to determine airworthiness.	Remote	Marginal	Medium
Maintenance and Inspections	Overloading Structure	Remote	Catastrophic	Serious	Encourage the design and procurement of purpose built aircraft. Incorporate the latest inspection technology.	Remote	Marginal	Medium
	Engine Failures	Probable	Marginal	Serious	Changing to turbine engines.	Remote	Marginal	Medium
Airframe Fatigue Damage	The NTSB surmised that significant exposure to airframe stresses in the firefighting mission profile poses additional fatigue factors that shorten airframe life expectancy.	Remote	Catastrophic	Serious	Incorporate structural health monitors and technologies to detect structural fatigue damage resulting from aircraft operations in the firefighting mission environment.	Remote	Marginal	Medium

Heavy Airtanker Program System - Contract Process

Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Cost	Current contracting fosters best value process which guarantees only minimum standards.	Frequent	Critical	High	Incorporate addition contract incentives that give credit in the competition process for going "beyond minimum programs".	Remote	Marginal	Medium
	Lack of contract incentive to develop a system safety driven program	Frequent	Critical	High	Incorporate addition contract incentives that give credit in the competition process for going "beyond minimum programs".	Remote	Marginal	Medium
	Modernization of the airtanker fleet will take significant funding. As new equipment is brought into the mix of aircraft, unplanned events are inevitable. The agency does not have the skill mix to oversee flight testing and development in house.	Occasional	Catastrophic	High	Implement airtanker modernization and evaluation criteria in best value contracts including but not limited to: performance, sustainable airframes, ergonomics, additional contractor offered innovation and technology, damage tolerant design and technology	Remote	Catastrophic	Serious

Heavy Airtanker Program System - Mission Environment								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Performance Planning	Quality of performance data and reference charts at typically high density altitudes is a concern for safe flight in the fire mission environment.	Probable	Catastrophic	High	Develop a contract requirement for airtanker pilots to complete weight and balance calculations prior to each mission.	Remote	Critical	Medium
Flight Profile	Mission operations below 500' AGL.	Probable	Catastrophic	High	Incorporate human aided technology to assist in decision making including tools to aid in time critical risk assessments. Adapt technology for in flight decision making, post flight mission debriefs, and accident investigation. Consider CVR and cockpit d	Remote	Critical	Medium
Mission Creep	Operations in the urban interface have led to an increase in expectations, exposure to hazards, and cumulative aircraft and pilot fatigue.	Probable	Catastrophic	High	Return to the initial attack mission doctrine as a driving force in aircraft selection and approval, operations standards, and program/infrastructure design.	Remote	Critical	Medium
	Transfer of risk from ground firefighters to airborne firefighters.	Probable	Catastrophic	High	Return to the initial attack mission doctrine as a driving force in policies that govern the airtankers role in wildland fire suppression.	Remote	Critical	Medium

Heavy Airtanker Program System - Facilities								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Tanker Bases	Overloading and mixing errors	Occasional	Critical	Serious	ensure micro motion meters have been calibrated. Vendor and government personnel review mixing procedures.	Remote	Marginal	Medium

Heavy Airtanker Program System - Ground Fire Personnel								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
	Use of tankers for escaped fire situations has increased risk, exposure, and failure. This issue rests outside of the control of the aviation program.	Probable	Critical	High	National leadership through regional/state organizations must promote safe and efficient use of aircraft. Incident Commanders at all levels need to be persistent in working with team members to keep efforts based on obtainable goals.	Remote	Marginal	Medium

Heavy Airtanker Program System - Human Factors								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Pilot Proficiency and Training	Lack of fire mission training and Lack of proficiency flight time.	Probable	Catastrophic	High	Vendors have instituted training programs such as CRM, risk management, and flight safety with the intent to standardize cockpit procedures. Increase the scope and complexity of the NAFA program, develop the McClellan training center for fire environment	Occasional	Critical	Serious
	Aircraft performance planning for successful outcome in a high rate of descent, level off, and climb out profile.	Probable	Catastrophic	High	Address airtanker pilot training and proficiency to reduce frequency of accidents occurring from CFIT.	Occasional	Critical	Serious
	High number of target fixation and tactical maneuvering errors.	Probable	Catastrophic	High	Address human factors including target fixation, situational awareness, task overload, performance/tactical planning errors.	Occasional	Critical	Serious

Heavy Airtanker Program System - Policy, Procedure, and Doctrine								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Management Oversight	No requirement to implement a system safety program that is common between the contractor and the agency.	Probable	Catastrophic	High	Establish a requirement to initiate a safety management system between the contractor and the agency. Require the contractor to designate a safety officer.	Remote	Marginal	Medium
Agency Culture	"Can do" philosophy has developed aviation programs with minimal budgets and staffing.	Probable	Critical	High	The Blue Ribbon Panel stated: "significant funding will provide adequate knowledge of aircraft conditions, training and maintenance, that will serve to improve the safety record".	Remote	Marginal	Medium
	A culture of acceptable loss has evolved in the agency regarding airtanker losses.	Probable	Critical	High	Establish a higher expectation beyond minimum requirements for safety with a lower tolerance for accidents. This will encourage a cultural change away from one of acceptable loss.	Remote	Marginal	Medium
Quality Assurance and Inspections	Lack of an operative quality assurance and inspection program.	Probable	Critical	High	Develop a QA program for improved oversight of the contracted fleet ranging from improved checkrides, workforce efficiency, adequate staffing of trained inspectors, and standardized procedures.	Remote	Marginal	Medium
Public Perception	Influence on the agency	Probable	Marginal	Serious	Establish doctrine	Remote	Marginal	Medium

Heavy Airtanker Program System - Technology								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Human Aided Technology	HAT underutilized	Occasional	Critical	Serious	Incorporate HAT with the intent to raise situational awareness, reduce cockpit workload, reduce distractions, and assist with environmental conditions of high density altitude and low visibility.	Occasional	Marginal	Medium

Heavy Airtanker Program System - Training								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Internal	Pilot currency and proficiency.	Occasional	Critical	Serious	Increase the scope and complexity of NAFA and require tanker crew attendance. Fund the development and implementation of fire simulation training in the flight environment for contract and agency personnel.	Occasional	Marginal	Medium
External	Pilot currency and proficiency	Occasional	Critical	Serious	Increase the scope and complexity of NAFA and require tanker crew attendance. Fund the development and implementation of fire simulation training in the flight environment for contract and agency personnel.	Occasional	Marginal	Medium