

System - Aircraft		08 Aerial Supervision Assessment						
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Avionics	Avionics failures: overheating, faulty wiring, etc.	Occasional	Marginal	Medium	Integrate into preflight checklist. Add to phase/hourly inspections. Thorough post season inspection. Identify radio location to ensure adequate ventilation. Use extra radio sparingly. Proactive maintenance schedule. When one wire fails replace entire wiring harness.	Improbable	Marginal	Medium
	Inaccessible avionics components	Occasional	Negligible	Low	Mount components in accessible areas. Change contract to reflect this? Standardize within AC Models?	Improbable	Negligible	Low
	Flight crew unfamiliar with components.	Occasional	Marginal	Medium	Training, briefings, carding, pre-flight inspection.	Remote	Marginal	Medium
Configuration	Poor visibility	Occasional	Negligible	Low	Avoid low wing for ATGS operations. High wing provides substantially more visibility. Ensure aircraft is appropriate for the mission.	Improbable	Negligible	Low
Performance Standards	Poor engine performance (single/twin, turbin/recip).	Occasional	Catastrophic	High	Avoid high density altitudes. Download cargo/fuel load. Relocate to favorable location. Alter the mission. Upgrade the aircraft. Ensure aircraft is appropriate for the mission. Perform pre-flight planning.	Remote	Catastrophic	Serious
Contracting - CWN VS Exclusive Use	Sub-standard avionics components.	Occasional	Negligible	Low	Add TCAS/AFF to CWN contracts.	Improbable	Negligible	Low
	Low ATGS CWN pilot skill/fire experience leading to sub-standard performance during flight operations.	Remote	Critical	Medium	Conduct thorough briefings. Ride along with veteran fire pilot. Document performance via contract evaluation process. CWN/ARA Contractors need to receive better training, possibly in the form of computer-based training. Require Air Attack pilots to take a check ride every three years.	Improbable	Critical	Medium
Fuel	Bad fuel	Occasional	Critical	Serious	Prior to re-fueling from an unknown source, ensure fuel is tested for type and quality. Monitor quantity pumped.	Remote	Critical	Medium

System - Flight Operations								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Fire Operations	Poor visibility (smoke)	Frequent	Catastrophic	High	Determine effectiveness of the operation (risk vs. benefit) and discontinue if warranted. Limit number of aircraft in operating area. Increase vertical/horizontal separation of aircraft.	Occasional	Catastrophic	High
	Wake turbulence and speed differential (SEATs)	Frequent	Critical	High	Use show me or chase profile. Use lead profile only when necessary. Performance maneuvers (e.g. Steep turns and pushovers) should be communicated to other aircraft. SEAT performance (speed) needs to be pre-determined in order to set the correct drop speed.	Occasional	Critical	Serious
	Weather (turbulence/wind/thunder storms)	Frequent	Critical	High	Adjust tactics or shut down air ops. Increase vertical/horizontal separation of aircraft. Utilize human aided technology (weather radar, etc.). Encourage	Occasional	Critical	Serious
	Fuel management	Occasional	Critical	Serious	Monitor fuel quantities. Follow fuel transfer procedures. Pre-flight the aircraft. Plan the flight; know refueling locations. Query other aircraft.	Remote	Critical	Medium
	Density altitude	Frequent	Catastrophic	High	Relocate aircraft. Consult performance charts. Download fuel.	Remote	Catastrophic	Serious
	Exposure to terrain in low level environment (Lead/ASM).	Frequent	Catastrophic	High	Ensure high and mid-level recon is completed prior to commencing low level flight. ASM - ATS assists ATP with aerial/ground hazard identification and instrument monitoring (airspeed, altitude, hard deck, etc.). Perform only pertinent radio communication.	Remote	Catastrophic	Serious
	Operating in close proximity to other aircraft (collision potential).	Frequent	Catastrophic	High	Conduct only pertinent communication with the ground (line clearance, etc). Maintain "eyes out" for hazards (terrain, vegetation, birds, other aircraft, etc). ASM - ATS assists ATP with tracking other aircraft (spacing, location, closure, etc).	Remote	Catastrophic	Serious
	Obstructions (towers, cables, wires, etc)	Probable	Catastrophic	High	High level recon, hazard/sectional map, consult ground personnel/other AC.	Remote	Catastrophic	Serious
	Reliance on technology: TCAS, WSI, GPS, Laptops. Flight crew members spending too much time looking at things inside the cockpit instead of out.	Frequent	Critical	High	Remember the eyes are the primary tool for spotting traffic. Don't rely too much on TCAS. Don't ignore TCAS traffic warnings with a tanker in tow (Lead). Prioritize tasks (i.e.: mapping vs. looking for traffic/hazards while in low level ops). Utilize good CRM practices.	Occasional	Critical	Serious
	Aircraft emergency	Remote	Catastrophic	Serious	Crew should be trained and remain familiar with a/c systems and emergency procedure checklists.	Remote	Catastrophic	Serious

## System - Flight Operations (Cont.)

Sub-systems	Hazards	Pre Mitigation			Mitigation	Post Mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Fire Operations	Lack of situational awareness	Occasional	Catastrophic	High	Proper rest, thorough briefing (incoming and change out between aerial supervisors), use TCAS/TCAD, use appropriate tactics, maintain commo with other AC/ground/disp. Utilize CRM.	Remote	Catastrophic	Serious
	Sense of urgency	Frequent	Critical	High	Monitor radio traffic, remain calm, follow incident strategy/tactics.	Remote	Critical	Medium
	Exceeded span of control	Frequent	Catastrophic	High	Ensure roles and responsibilities are assigned and understood within aerial supervision crew. Assign aircraft to common functions and tasks with a single point of contact. Hold aircraft at base to limit the number of assigned aircraft over the incident.	Remote	Catastrophic	Serious
	Urban interface/congested areas	Remote	Catastrophic	Serious	Establish flight paths; avoid creating hazards to persons or property on the ground. Lead/ASM must be on order and ATGS must be on scene prior to airtanker operations. Aerial supervision must have positive communication with the IC or designated ground contact.	Remote	Catastrophic	Serious
	Lack of air to ground coordination	Frequent	Critical	High	Use proper frequencies, maintain positive communication, ensure strategy and tactics are clear and understood, use only common terminology, ensure line clearance, solicit feedback. Move helicopters to Division or tactical frequencies as needed. Request more frequencies as needed.	Occasional	Critical	Serious
	Improper drop heights	Occasional	Critical	Serious	Strictly adhere to minimum drop heights (60 feet for SEATs and 150 feet for heavy tankers). Solicit and utilize feedback from ground. Improve and conduct training for tanker/SEAT pilots.	Remote	Critical	Medium
	Target fixation	Probable	Critical	High	ASM should assist single pilot operations in maintaining situational awareness.	Remote	Critical	Medium
	Missing radio calls/Poor communications (air to air)	Frequent	Critical	High	Make sure Air to Air frequency is clear when lead and tankers are on final drop run. Ensure frequency assignments are understood by air and ground personnel. Ensure volume knobs are adjusted properly. Prioritize radios during fire ops (i.e.: Air to Air vs. dispatch).	Probable	Critical	High
	Missing radio calls/Poor communications (air to ground)	Frequent	Critical	High	Make sure ground contact is available on the radio during tactical operations. A ground contact with a non-scanning radio dedicated to the air to ground frequency is helpful. Provide training to ground personnel.	Probable	Critical	High
	Poor/unclear tactics	Frequent	Critical	High	Maintain positive communications with ground resources. Ensure strategy and tactics are clear/understood. Use only common terminology, solicit/utilize feedback. Provide communication training for ground crews.	Occasional	Critical	Serious
Low aircrew experience levels	Occasional	Critical	Serious	Training/mentoring, qualifications/currency, CRM, brief/debrief, honest feedback.	Remote	Critical	Medium	

System - Flight Operations (Cont.)								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post Mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Fire Operations	PPE not utilized	Occasional	Critical	Serious	Ensure flight crews understand/implement PPE policies and are held accountable.	Remote	Critical	Medium
	Checklists not utilized	Occasional	Critical	Serious	Ensure flight crews are using checklists.	Remote	Critical	Medium
	Shoulder restraints not utilized when available.	Occasional	Critical	Serious	Ensure flight crews are using restraints.	Remote	Critical	Medium
	Inefficient operational use of tactical aircraft	Probable	Critical	High	SOPs for all tactical aircraft types. Right tool for job. Training, feedback, brief/debrief.	Remote	Critical	Medium
Airspace	FTA: Aircraft not complying with procedures.	Frequent	Catastrophic	High	Aerial supervision is trained and enforces FTA procedures. Utilize virtual fences, IP's, quadrants, etc.	Occasional	Catastrophic	High
	Special use airspace: Aircraft not complying with procedures.	Probable	Critical	High	Deconflict SUA. See and avoid. Know SUA areas. Establish comms with controlling agency. Thorough briefings. Training for flight crews.	Remote	Critical	Medium
	TFR: Aircraft not complying with procedures.	Probable	Catastrophic	High	Dispatch in contact with media. Utilize airspace coordinator. Communicate intrusions. Monitor/assign TFR Frequency.	Remote	Catastrophic	Serious
	Incident location: Fires in proximity to congested airspace (airport approaches/high GA traffic areas). Potential for mid-air collision.	Probable	Catastrophic	High	Validate TFR as incident expands, Deconflict SUA, Establish comms with controlling agency, notify other aircraft. Provide TFR transition corridors for non-incident aircraft on large incidents. Increase awareness of GA operators and other agency flight crews not assigned to incident.	Remote	Catastrophic	Serious
Planning	Flight routes need to be planned to account for average terrain height. Sufficient time in emergency to glide to safe landing area.	occasional	critical	Serious	Prepare pre-season route planning to identify best enroute cruise altitude, single engine glide distance, and locations of safe landing areas or back country airports.	Occasional	marginal	Medium

System - Dispatch								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Communications	Radio frequency congestion	Frequent	Critical	High	Make alternative frequencies readily available. Publish secondary frequencies.	Remote	Critical	Medium
	Flight following on district frequencies	Probable	Critical	High	Assign local flight following frequencies. Utilize AFF. Utilize National Flight Following.	Remote	Critical	Medium
	Lack of available frequencies	Frequent	Critical	High	Obtain and publish more FM and AM frequencies for fire operations.	Remote	Critical	Medium
	Frequency management - lack of timely response to additional frequency orders.	Probable	Marginal	Serious	ROSS orders through NICC are too slow. Make frequencies available at the GACC level.	Remote	Marginal	Medium
	State/County/Rural resources on different bandwidth.	Probable	Critical	High	Design a system which establishes compatibility between Fed and State/County/Rural radios. Provide training to agency personnel addressing the differences between radio systems.	Remote	Critical	Medium
	Non dedicated/published frequencies within geographic areas.	Frequent	Critical	High	Obtain and publish more FM and AM frequencies for fire operations at the GACC/local level.	Remote	Critical	Medium
	Centers assigning Leadplanes as ATGS	Occasional	Critical	Serious	Ensure dispatchers are aware that most lead pilots are not ATGS qualified.	Remote	Critical	Medium
	Duplicate frequency assignments within same geographic area.	Probable	Marginal	Serious	Better oversight of frequency allocation/use at local/GACC level during periods of high/large fire activity.	Remote	Marginal	Medium
Equipment	Outdated radio equipment/poor reliability.	Probable	Critical	High	Allocate funding for equipment and personnel to repair/replace radio/commo systems.	Remote	Critical	Medium
	Lack of technical support for radio system repair.	Frequent	Critical	High	Establish dedicated positions for radio techs. Scrap outsourcing and centralizing. It's too slow.	Remote	Critical	Medium
Training	Aircraft dispatcher experience/currency	Frequent	Critical	High	Funding for training and proficiency. Establish an aircraft dispatcher position with IADP as a requirement.	Remote	Critical	Medium

System - Personnel								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post Mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
Human Factors	Aircrew fatigue/burnout	Probable	Critical	High	Maintain a sensible diet and hydration. Limit mission time and request relief to allow for adequate rest periods. Monitor fatigue levels of flight crews. Adjust flight schedules to incorporate adequate rest that consider environmental factors that contribute to fatigue.	Occasional	Critical	Serious
	Lack of CRM	Probable	Critical	High	Training, brief/debrief, maintain positive attitude.	Remote	Critical	Medium
	Acceptance of risk as normal.	Probable	Catastrophic	High	Validate mission, solicit feedback from others, reevaluate risk vs benefit, or remove the high risk taking individual from the mission.	Remote	Catastrophic	Serious
	Task saturation	Frequent	Critical	High	Delegate duties, Employ CRM using span-of-control guidelines. Adjust tactics as needed.	Occasional	Critical	Serious
	Hazardous attitude: Anti authority, macho, invulnerability, impulsiveness, and resignation.	Frequent	Critical	High	Remove the individual from the mission. Properly supervise employees. Adhere to work-rest guidelines, flight and duty limitations policy, etc. Validate and stick to incident strategy and tactics.	Occasional	Critical	Serious
	Conflicting personalities	Frequent	Critical	High	Brief/debrief, CRM, honest feedback, maintain positive attitude.	Occasional	Critical	Serious
Government	Lapsed qualifications (currency)	Occasional	Critical	Serious	Track mission/refresher experience annually as per the IASG.	Remote	Critical	Medium
	Lack of AD training/currency	Probable	Critical	High	Track mission/refresher experience annually as per the IASG. Utilize GACC ATGS Reps.	Occasional	Critical	Serious
	Proficiency/currency: Non compliance with established standards.	Probable	Critical	High	Plan/budget for annual, bi-weekly proficiency simulations; include actual flight time.	Remote	Critical	Medium
	Lack of tracking work/rest for relief pilots	Occasional	Critical	Serious	Establish tracking system through CO or COR. Modify contract to indicate relief pilot hours.	Remote	Critical	Medium
	Lack of qualified ATGS in	Frequent	Marginal	Serious	Identify dedicated training platforms. Analyze current ATGS qualifications to develop a training plan.	Occasional	Marginal	Medium
System - Maintenance								
Sub-systems	Hazards	Pre Mitigation			Mitigation	Post Mitigation		
		Likelihood	Severity	Outcome		Likelihood	Severity	Outcome
General Aircraft Maintenance	Maintenance not tracked well (CWN)	Occasional	Critical	Serious	Vendor needs to share maintenance information as aircraft moves between assignments. ATGS should be proactive during the initial briefing. COR/PI should proactively seek maintenance information when the aircraft reports for it's assignment.	Remote	Critical	Medium
	Unqualified maintenance personnel working on the aircraft.	Occasional	Critical	Serious	Ensure task specific qualified mechanics are performing repairs/maintenance.	Remote	Critical	Medium
	Undue pressure on mechanics to keep the aircraft available for assignment.	Occasional	Critical	Serious	Accept the fact that maintenance problems will occur during high use periods. Allow maintenance crews to perform tasks in a stress free environment. COR/PI should encourage maintenance and show latitude when enforcing contract maintenance/availability .	Remote	Critical	Medium