Interagency
Air Tactical Group
Supervisor's Guide

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Chapter 1 – Introduction

I. Goal – Promote safe and cost efficient aerial supervision services in support of incident goals and objectives.

II. Objectives:

A. Provide a common interagency Air Tactical Group Supervisor guide.

B. Standardize Air Tactical Group Supervisor (ATGS) role and responsibilities.

C. Standardize operational procedures for ATGS operations.

III. Scope – This interagency air tactical supervisors guide is to be used by Federal and participating state agencies in the accomplishment of the Air Tactical Group Supervisor role under the United States Incident Command System (ICS).

IV. Authority

A. The fire and aviation manuals of participating agencies contain the authority to publish this guide. The Interagency Aviation Management Council (AMC) approves the publication of this guide.

B. The Interagency Air Tactical Group Supervisors Steering Committee is responsible for the update and completion of this guide. The steering committee includes representatives from the USDI (BLM, BIA, NPS, F&WS), USDA Forest Service and state representatives designated by the National Association of State Foresters from the eastern and western states.

V. Publication Mechanism – The Interagency Air Tactical Supervisors Guide will be available through the cache management system upon release. The guide will also be available on the web at:

http://www.fs.fed.us/fire/aviation/av_library/index.html

VI. Review and Revision Schedule – Members of the Steering Committee will review The Interagency Air Tactical Supervisors Guide on an annual basis. Revisions to the guide will be made as necessary to reflect significant changes in interagency policy and procedures as they affect aerial firefighting operations.

Chapter 2 – Administration, Qualifications & Training

I. Introduction – This chapter in concert with the PMS 310-1 qualifications system guide, establishes qualifications, training, certification and currency requirements necessary to perform as an ATGS.

Program administration is assigned at the National and geographic area level. Agency identified fire and aviation managers are responsible for the Air Tactical Group Supervisors program direction, management and general program safety standards.

Aerial supervision operations place a high demand on a person's communication and management skills. Application of fire behavior knowledge combined with ground fire resource capability must be correlated with tactical aircraft mission planning to safely and effectively utilize aircraft to support incident management objectives.

II. Administration – Interagency standards for ATGS operations are developed by the Interagency Air Tactical Group Supervisors Steering Committee and incorporated into this guide.

National Air Tactical Group Supervisor Program Manager – An aviation management specialist selected by interagency aviation management program managers at the National level. This position is responsible to administer the air tactical group supervisor program at the National level.

Roles and responsibilities of this position include:

1. Providing program oversight on an interagency basis for Federal land management agencies.
2. Coordination with States that have or desire to develop an air tactical group supervisor program.
3. Act in the capacity as program liaison with other interagency groups including the Interagency Leadplane Operations Steering Committee and the Interagency Helicopter Operations Program Steering Committee.
4. Coordination of the development and maintenance of an interagency cadre of qualified Air Tactical Group Supervisor Evaluators and Air Tactical Group Supervisor Instructors.
5. Coordination of Air Tactical Group Supervisor recurrency and standardization training at the geographic area level, MAFFS training and other National level training.
6. Coordination of mission evaluation requirements with international cooperators (Canada) for American air tactical group supervisors operating under international agreements.

7. Coordinate the periodic revision of the Interagency Air Tactical Group Supervisor Guide and ensure distribution of program related information updates to Geographic Area ATGS program managers.

Geographic Area Air Tactical Group Supervisor Program Managers – Interagency aviation management program managers at the geographic area level will designate an individual who will manage the ATGS program at the geographic area level on an interagency basis.

Roles and responsibilities of this position include:

1. Coordination of a training program for ATGS trainees on an interagency basis at the geographic area level.

2. Coordinate geographic area level mentoring program for ATGS trainees. May serve as a mentor for ATGS trainees at the geographic area level. Makes recommendations concerning training priorities to interagency aviation managers and geographic area coordination centers.

3. Coordination of the ATGS program with other aviation programs at the geographic area level.

4. Develop, coordinate and conduct initial and recurrency training programs within the geographic area.

5. Acting in the capacity of ATGS Evaluator and/or ATGS instructor.

6. Evaluating the performance of ATGS candidates and providing recommendations for certification to agency certifying officials or recommendations for additional training as appropriate.

7. Acting as the geographic area representative to the Interagency Air Tactical Group Supervisor Steering Committee.

8. Providing program and technical assistance as required to interagency user groups and partners.

9. Disseminates ATGS related program and technical information to user groups at the geographic area level.

Position Requirements:

1. Possess a minimum of three seasons of experience as an air tactical group supervisor following initial certification. Experience must include initial and extended attack as well as large fire experience.

2. Possess experience in the position of air tactical group supervisor in multiple geographic areas, fuel models and incident complexity.

3. Maintain certification as an air tactical group supervisor in accordance with PMS 310-1 or FSH 5109.17 standards as appropriate.

4. A Federal land management agency or State partner must currently employ the individual. Retired individuals currently certified as an air tactical group supervisor are excluded from consideration in this position.

Air Tactical Group Supervisor Evaluator – Interagency program managers at the geographic area level will recommend candidates to the Interagency Air Tactical Group Supervisor Steering Committee to act in the capacity of ATGS Evaluator.

Roles and responsibilities of this position include:

1. Evaluating the performance of individuals seeking to become certified as air tactical group supervisors.

2. Providing mission evaluations for individuals currently certified as air tactical group supervisors to promote delivery of standardized aerial supervision services to interagency users.

3. Providing written documentation of air tactical group supervisor (or trainee) performance to the geographic area air tactical group supervisor program manager or interagency aviation managers along with recommendations for additional training and/or retention of the individual as an air tactical group supervisor as appropriate.

Position Requirements:

This position requires the same experience and certification requirements as the Geographic Area Air Tactical Group Supervisor Program Manager. The requirement to be currently employed by a Federal land management agency or State partner is not applicable.

Air Tactical Group Supervisor Instructor – A cadre of individuals approved at the geographic area level who provide instruction in the capacity as a trainer/instructor during flights in a wildfire environment.

Roles and responsibilities of this position include:

1. Evaluating trainee performance through position taskbook documentation and completion of mission evaluation forms.

Position Requirements:

Possess current certification as an air tactical group supervisor with a minimum of two years experience in the position following initial certification.

Experience must include initial and extended attack in addition to experience gained on a large wildland fire incident managed by a Type 1 or 2 incident management team.

Demonstrating the ability to provide quality instruction to ATGS trainees in a classroom or operational setting.

III. Initial Training and Certification – Candidates will meet or exceed prerequisite experience requirements and mandatory training requirements listed in the PMS 310-1 wildland and prescribed fire qualification system guide or agency equivalent. Agency specific requirements such as those identified in FSH 5109.17 may be more restrictive than those identified in PMS 310-1.

A. Classroom Training: S-378 Air Tactical Operations

B. Flight Training Requirements – prior to initial certification, ATGS candidates should have a variety of on-the-job training. The following flight training requirements provide guidance for evaluating ATGS candidates. Individualized training and evaluation programs should be developed to refine the skills and abilities of each trainee prior to certification. Each flight training program should include a variety of work experience and be of sufficient duration to ensure that the individual can independently function in the position of air tactical group supervisor following initial certification.

1. Observing an ATGS instructor during ongoing incident operations:

Candidates should observe a qualified ATGS for a minimum of two missions or a minimum of four flight hours prior to undertaking on-the-job training assignments under the supervision of an ATGS instructor.

2. On-the-job training under the direct supervision of an ATGS instructor:

Prior to initial certification, candidates should undertake an on-the-job training program under the supervision of an ATGS instructor that provides a variety of experience in initial attack, extended attack and large-scale, complex incidents managed by Type 1 or Type 2 incident management teams.

A minimum of 10 missions (mission - see glossary) under the direct supervision of an ATGS instructor is recommended to ensure the candidate is capable of satisfactorily functioning in the capacity as air tactical group supervisor in a variety of settings, incident complexities and fuel models.

C. Candidate Evaluations - the candidate should receive a written evaluation at the completion of each mission from the ATGS instructor as an integral part of the mission de-briefing. The evaluation form found in the appendix to this guide or it's equivalent should be used to document areas of satisfactory performance as well as areas needing improvement.

The candidate should retain a copy of the mission evaluation to supplement information completed by the ATGS Instructor (evaluator) in the candidate's taskbook.

D. Initial Certification Training Opportunities - The geographic air tactical group supervisor program manager can assist in the development of candidates by providing a variety of training opportunities in different locales, fuel types and incident complexities. Training opportunities may include the following:

- Assignments to work with full-time, dedicated air tactical group supervisors at an air attack base.
- Assignments to a national or geographic area incident management team.
- Details or training assignments in other geographic areas to increase the depth of experience.
- Participating as a passenger on other tactical aircraft during tactical missions (subject to approval from the Contracting Officer, Contractor and Pilot in Command).

Related aviation training opportunities may be valuable in providing additional knowledge related to the position of air tactical group supervisor position including:

- Participation in aerial reconnaissance or aerial detection missions.
- Observing or participating in large helibase operations.
- Orientation to air tanker base and retardant operations.
- Orientation to or observation of aircraft dispatch operations.

E. Initial Certification Process – the taskbook for the position of air tactical group supervisor should be completed within three years of the initiation date as required by PMS 310-1. Upon completion of the taskbook, the home unit certifying official will forward a copy of the task book and mission evaluation forms to the geographic area ATGS program manager for review.

The geographic area ATGS program manager will conduct or schedule a mission evaluation with a designated ATGS Evaluator as the final step in assessing the proficiency of the trainee. Each air tactical group supervisor trainee must successfully complete a mission evaluation conducted by the geographic area ATGS program manager or designated ATGS Evaluator **prior** to initial certification as an air tactical group supervisor.

Upon completion of this mission evaluation, the geographic area ATGS program manager will return the taskbook to the certifying official along with a written recommendation to proceed with one of the following actions:

- Certify the candidate as fully qualified.
- Recommend additional supervised training.
- Terminate the candidate from the ATGS training program.

These added steps in the initial certification process are intended to ensure that the candidate has received a variety of training assignments that represent a cross section of incident complexities and that the candidate is proficient to undertake the responsibilities of the position.

IV. Supplemental Training – the following training opportunities should be considered prior to initial certification or as supplemental or refresher training individuals currently certified as air tactical group supervisors:

- Pinch Hitter pilot course
- Private pilot ground school
- National Aerial Fire Fighting Academy (NAFA)
- Aerial Retardant Application and Use
- Crew Resource Management (CRM) Training

The geographic air tactical group supervisor program manager can assist in the development of candidates by providing a variety of training opportunities in different locales, fuel types and incident complexities.

Training opportunities may include the following:

- Assignments to work with full-time, dedicated air tactical group supervisors at an air attack base.

- Assignments to a national or geographic area incident management team.

Related aviation training opportunities should be made available to candidates to provide valuable knowledge, experience and skills applicable to the air tactical group supervisor position including:

- Participation in aerial reconnaissance or aerial detection missions.
- Observing or participating in large helibase operations.
- Orientation to air tanker base and retardant operations.
- Orientation to or observation of aircraft dispatch operations.

V. Proficiency Requirements – All air tactical group supervisors that have not performed in the position for a minimum of 20 hours (4 operational periods) documented in a mission log, during the **preceding 2 calendar years** (biennial basis), are required to successfully complete a mission evaluation conducted by an Air Tactical Group Supervisor Evaluator and proficiency training through one of the following means:

1. Attendance at a National (when developed) or geographic area ATGS Workshop or Aerial Supervision proficiency training that includes:

a) A minimum of 12 hours of classroom refresher training and exercises

b) One or more ATGS computer simulations or equivalent

OR

2. Attend the National Aerial Fire Fighting Academy (NAFA)

VI. Mission Evaluation – In addition to meeting position recurrency requirements outlined in PMS 310-1, FSH 5109.17 or other agency specific requirements, an Air Tactical Evaluator may conduct and document mission evaluations for all certified air tactical group supervisors on no more than a **biennial basis** (every two years). A mission evaluation will be conducted if an air tactical group supervisor received a deficient performance evaluation on an incident. Mission evaluations may be conducted as part of aerial supervision proficiency training at the geographic area or National level. A mission evaluation may be conducted on a wildfire incident or simulated incident environment. Exemption from this evaluation may be recommended by the Geographic coordinator and approved by the National Program manager.

Unannounced mission evaluations may be conducted by an Air Tactical Group Supervisor Evaluator on a wildfire incident.

A qualifying mission evaluation must be documented in writing by the Air Tactical Group Supervisor Evaluator on the evaluation form found in the Appendix to the the IATGS Guide (or its equivalent).

Mission evaluation documentation should be discussed during the mission debrief. Copies of the mission evaluation documentation shall be provided to the air tactical group supervisor and retained by the ATGS Evaluator.

A copy of the mission evaluation documentation shall be provided to the local Unit Fire and Aviation Manager and the Geographic Area ATGS Program Manager for follow up as appropriate.

VII. Suggested ATGS Workshop Curriculum Components

ATGS workshops conducted at the geographic or National level should include many of the following training components. Individual components may be included in simulator or flight recurrency training in lieu of classroom presentations or exercises.

- Target description exercise
- A review of recent aviation incidents/accidents from the preceding season
- Radio communications exercise
- A review of incident strategy and tactics in local vegetative cover types
- Fire size up exercise
- Development of aviation and ground-based resource needs to meet incident management objectives
- Airspace coordination (civilian/military, FTA, TFRs)
- Map reading/navigation exercise
- Technology updates
- Geographic/National level aviation program updates
- Contract updates
- Radio programming refresher
- Issues and concerns from National and/or Regional user groups (hotshots, incident commanders, etc.)

Ground based simulations i.e. (sand tables) are suitable for recurrency requirements if funding is limited. Ground based simulations are not the preferred method.

Chapter 3 - Equipment, Facilities and Job Resources

I. Aircraft – Tactical and logistical aircraft supervised and coordinated by the ATGS may be procured from the US Department of Agriculture-Forest Service, US Department of Interior-Office of Aircraft Services or Bureau of Land Management, US Department of Defense, or state, county or municipal sources. Contract or procurement agreement requirements and standards will vary among the various sources. For more detailed information about air tactical and logistical aircraft, refer to NFES 2393 Aircraft Identification Guide.

A. Air Tankers – The Incident Command System (ICS) recognizes four categories or types of airtankers based on gallons retardant/suppressant capability. The Interagency Airtanker Board has approved Type 1 and 2 airtankers listed below. Type 3 and 4 airtankers have been approved by various states or Federal agencies and may be used under cooperative agreements. The Air Tractor AT-802F has a gating system approved by the Interagency Airtanker Board.

Type I - 3,000 Gal Minimum			
Airplane	Normal Gallons	Cruise Speed (kts)	Number Doors
KC-97	3,000	210	16
C-130 (MAFFS)	3,000	250	Pressure Tanks
P3 A	3,000	275	Constant Flow
DC-7	3,000	235	8
Type II – 1,800 Gal Minimum			
DC-6	2450	215	8
P2-V	2450	187	6
SP2H	2000	195	Constant Flow
DC-4	2000	178	8
DC-4 Super	2200	200	8
Type III - 800 Gal Minimum			
Super. PBY	1,400	105	2
CL-215	1,400	160	2
CL-415	1,600	180	2
S2 Tracker (turbine)	1,100	230	4
S2 Tracker (recip)	800	180	4
Type IV (SEATS) - Up to 799 Gal			
Air Tractor AT-802	≤799	180	1
Turbo Thrush	380-500	140	1-2
Ag-Cat	300	100	1-2
Ag-Cat G-164BT	350	120	1-2
Dromader	500-550	110	1-2
DeHavilland Beaver (USFS Region 9)	108	100	1

1. **Airtanker Retardant Delivery Systems** – Due to the number of approved airtanker makes/models and the number of airtanker operators there are several approved tank/door systems. The tank/door systems are now evaluated and approved by the Interagency Airtanker Board to ensure that the systems meet desired coverage level and drop characteristics. The four basic systems used today include the following:

   a) **Variable Tank-Door System** – Multiple tanks or compartments controlled by an electronic intervolometer control mechanism to open doors singly, simultaneously or in an interval sequence. Most airtankers are equipped with this system. The pilot may select a low flow rate or a high flow rate.

   b) **Constant Flow Rate System** – A single compartment with two doors controlled by a computer. The system is capable of single or multiple even flow drops at designated coverage levels from .5 GPC to +8 GPC.

   c) **Pressurized Tank System** – Modular Airborne Fire Fighting Systems (MAFFS) C-130s are equipped with a pressurized system to discharge their 3,000 gallons of retardant through two 18-inch tubes. General coverage levels can be obtained by regulating pressure/PSI settings. A few of the MAFFS units are capable of incremental drops of 1000 or 2000 gallons. The maximum flow rate produces a coverage level 4 (4GPC).

   d) **Standard Tank System** – This system is common on Type 3 and 4 airtankers. Single or multiple tanks/compartments controlled manually or electronically. Some tank systems may be controlled by an electronic intervalometer control mechanism to open doors singly, simultaneously or in an interval sequence.

B. Helicopters – The Incident Command System recognizes four categories or types of helicopters based on minimum gallons of retardant/water, lift capability, number of passenger seats, and pound card weight capacity. Operations personnel will refer, to or order, helitankers by type. Commonly used ICS helicopters by type are included below. Density altitude will greatly effect lift/gallon capability. Loads under moderately high density altitude conditions are displayed in the chart.

Helicopter Delivery Capability		
Make & Model	**HOGE (lbs)** 5000' Pres. Altitude/30°C 8000' Density Altitude	**HOGE (lbs)** 8000' Pres. Altitude/25°C 11000' Density Altitude
Type I		
S-64 E	12,700	9,117
S-64F	15,640	10,288
Chinook 234	19,063	15,363
Vertol 107	4,656	3,424
S-61	4,038	2,221
B-214	3,754	2,665
Super Puma AS-332 L	4,328	2,729
Puma AS-330	4,525	3,325
Kaman H-43 Huskie	2,118	1,418
K-1200 KMAX	5,288	4,588
CH-54	11,098	7,978
S-70	6,569	5,669
Type II		
B-212	1,973	1,010
B-205A-1	1,294	642
B-205A-1+	1,596	896
B-205A-1++	2,806	2,120
B-UH-1	1,325	
B-412	1,742	884
S-58T	1,635	597
Type III		
BK-117	1,319	548
Lama 315B	925	925
Alouette III 316B	1,055	870
B-206 B III	715	380
B-206 L III	950	830
B-206 L IV	1,196	767
B-407	1,315	880
AS 350 B2	1,083	700
AS 350 B3	1,972	1,911
Hughes 500 D	515	295

Note: Proposed changes in helicopter typing under consideration at the time of preparation of this IATGS Guide are not reflected in the above chart.

1. **Helitanker Delivery Systems** – There are two basic delivery systems:

   a) **Buckets** – Several variations of two basic types of buckets are used:

      (1) Rigid Shell – 100 to 3,000 gallons

      (2) Collapsible (and some are foldable) 94-2000 gallons

   b) **Tanks** – External tank systems have been developed for various Type 1 to Type 3 helicopters. These include:

      (1) Computerized metered or constant flow tank system.

      (2) Conventional tank/door system

C. **ATGS Aircraft –** Several types of aircraft can be used as an ATGS platform. Each has its advantages and disadvantages. In selecting an ATGS aircraft for a particular assignment, the following should be carefully considered:

1. **Visibility –** For both the pilot and ATGS

   a) **Fixed-Wing**

      (1) **High-wing and low-wing with cockpit forward of wings –** Good visibility

      (2) **Low-wing with cockpit over the wings** – Limited visibility

   b) **Helicopters –** Provide excellent visibility

2. **Speed** – For very large incidents, initial attack incidents, and multiple incidents, aircraft speed is of primary importance. On initial attack incidents in particular, it is critical that the ATGS arrive at the incident before other aerial resources. Twin-engine fixed-wing aircraft are usually the best choice in these situations (150+ knots cruise speed with 200+ knots desirable).

   a) Twin-Engine Fixed Wing – Fast (generally greater than 150 kts)

   b) Single-Engine Fixed Wing – Slower (generally less than 150 kts)

   c) Helicopters – Slowest (generally less than 130 kts)

3. **Maneuverability –** It is essential that the aircraft can be positioned for the particular mission observation requirements. Helicopters are excellent for target identification and for monitoring and evaluating mission effectiveness. A Type 3 helicopter is generally the best platform for a helicopter coordinator.

4. **Economics** – Aircraft costs must be reasonable and commensurate with the cost-benefit to a particular incident. The ATGS aircraft is a very inexpensive resource compared to the cost of other aviation resources, especially if they are not managed for efficiency and effectiveness.

   a) Single-Engine Fixed Wing – Least expensive

   b) Twin-Engine Fixed Wing – More expensive

   c) Helicopters – Most expensive

5. **Noise level –** Excessive noise can interfere with the ability to communicate for prolonged periods of time and can contribute to fatigue. Consider use of an active noise-canceling headset to help mitigate noise related fatigue.

   a) Single-Engine Fixed Wing – Highest cockpit noise level

   b) Twin-Engine Fixed Wing – Less cockpit noise level

   c) Helicopters – Least cockpit noise level (flight helmet is required)

6. **Oxygen requirements** – Flights using call-when-needed vendors must comply with FAA regulations they operate under.

   Part 135 - 14 CFR part 135.89. Supplemental oxygen must be available and used by the flight crew at cabin pressure altitudes above 10,000 feet (MSL) for that portion of the flight more than 30 minutes duration. At cabin pressure altitudes above 12,000 feet (MSL) the flight crew must use supplemental oxygen during the entire flight.

   Part 91.211. Supplemental oxygen must be available and used by the flight crew at cabin pressure altitudes above 12,500 feet (MSL) for that portion of the flight more than 30 minutes duration. At cabin pressure altitudes above 14,000 feet (MSL) the flight crew must use supplemental oxygen during the entire flight. At cabin pressure altitudes above 15,000 feet, (MSL) all passengers must have supplemental oxygen during the entire flight.

7. **Base of Operations** – Airport facilities, distance from the incident base and distance from the dispatch center are considerations in determining the best base of operations.

   a) Initial attack incidents – It is generally best to be co-located with airtankers and leadplanes at an airtanker base to facilitate briefings. It may be desirable to be located near a dispatch center for the same reason.

   b) Large incidents – It may be desirable to be located at or near the incident to facilitate briefing and de-briefing with the Operations Section Chief.

   c) Single-Engine Fixed Wing – Can operate from unimproved airstrips.

   d) Twin-Engine Fixed Wing – Require longer runways and usually require an improved surface.

   e) Helicopters – Helicopters are advantageous if the incident is not near any airport and if it is critical for the ATGS to meet with the Operations Section Chief. It may also be desirable for the ATGS, Operations Section Chief and Division Group Supervisor(s) to fly reconnaissance missions in the same aircraft.

Flight Hour Limitations

f) Twin-Engine Fixed Wing – These aircraft are not limited to daylight operations. The aircraft can travel to or work over the incident before sunrise and after sunset.

g) Single-Engine Fixed Wing – Flight time is limited to 30 minutes prior to sunrise and 30 minutes after sunset.

h) Helicopters – Flight time is limited to 30 minutes prior to sunrise and 30 minutes after sunset.

8. ATGS Flight and Duty Limitations

To address cumulative fatigue considerations, the air tactical group supervisor should be limited to eight (8) hours of flight time per day unless extraordinary circumstances dictate otherwise.

Standard flight and duty limitations apply, except the air tactical group supervisor may work up to a sixteen (16) hour duty day without a waiver from the incident commander to facilitate interaction with members of the incident command organization.

9. Cabin Space – Mission requirements may necessitate the need for an observer or an Air Tactical trainee/instructor in addition to minimum flight crew requirements.

10. Safety – Consider performance capability of the aircraft for the density altitude and terrain at which operations are conducted.

11. Aircraft and Pilot Approvals – Aircraft must have interagency approval to be used for an air tactical mission. The approval card must be carried onboard the aircraft. Similarly, pilots used for air tactical missions must possess a current approval card.

12. Radio Communications Systems – As a minimum, the radio system must integrate monitoring and transmitting functions of VHF-AM and VHF-FM systems through the same headphone and microphone. The following avionics features are recommended by type:

Required Equipment	Avionics Typing Standards			
	Type 1	**Type 2**	**Type 3**	**Type 4**
Aeronautical VHF-AM radio transceiver	2 each	2 each	2 each	2 each
Aeronautical VHF-FM radio transceiver	2 each	1 each	1 each	
Panel mounted GPS	1 each	1 each		
Handheld GPS			1 each	1 each
Separate audio control systems for pilot and ATGS	X	X		
Single audio control system			X	X
Audio/mic jacks with PTT capability in a rear seat connected to co-pilot/ATGS audio control system	X	X		
Intercommunication system	X	X	X	
Plug for auxiliary VHF-FM portable radio or one additional VHF-FM transceiver	X	X		
Accessory Power Source				X
Portable Air Attack Kit				X

a) VHF-FM Radio(s) – must be capable of simultaneously monitoring two frequencies (150 to 174 MHz).

b) Air Guard – (168.625 MHZ, Transmit Tone 110.9) is permanently programmed in the VHF-FM radio. Volume must be kept at an audible level.

c) Tactical Frequencies – VHF-FM radio(s) must be capable of storing several tactical frequencies and associated CTCSS tones (if applicable) such as air-to-ground, dispatch, flight following and command.

d) National Flight Following – VHF-FM (168.650) used for point-to-point flight following.

Note: USFS Region 5 and the California Department of Forestry require two VHF-FM radios in the ATGS aircraft to monitor incident communications and to facilitate air-to-air communications respectively.

e) VHF-AM Radio(s) – two VHF-AM radios are required (see table above) that monitor 118 to 136 MHz. Current fixed-wing contracts required 720-channel capability. Effective in 2005, 760-channel capability will be required. Two VHF-AM radios are required to separate helicopter and fixed-wing communications as well as to communicate with air traffic controllers.

f) Avionics Equipment – in addition to the above avionics requirements, the following are typically required:

Headset(s) with boom microphones

Voice Activated Intercom

Separate Audio Panels for the pilot and ATGS

Separate Volume and Squelch controls for the pilot and ATGS

A separate audio panel and voice activated intercom station in a rear seat may be required in aircraft to accommodate an ATGS trainee (observer) of ATGS instructor or check airman.

II. Retardant

A. Definitions

1. Short Term Retardant – A chemical mixture whose effectiveness relies almost solely on its ability to retain moisture, thereby cooling the fire. Agents are added to the water to thicken the water or reduce its surface tension. Once the water evaporates the retardant action ends. Foam is a short term retardant, generally effective for 10-30 minutes. No short term retardant is currently approved for use in Federal multi-engine airtankers.

2. Long Term Retardant – Contains a chemical that alters the combustion process and causes cooling, and smothering/insulating of fuels. Long Term Retardant remains effective until rinsed off the fuel, usually by precipitation.

B. Approved Retardant – A qualified products list is available annually from the Northern Fire Sciences Laboratory in Missoula, Montana. Several different long-term retardants are approved for use. Prior to approval these agents must meet rigid criteria to ensure that they are effective, environmentally safe, possess good drop characteristics, can be efficiently mixed and delivered to the aircraft, and that the chemicals do not harm aircraft surfaces. Agents, prior to mixing, may be dry powder or liquid concentrates, depending on manufacture or type of retardant.

1. Long Term Retardant Ingredients – Long-term fire retardants generally consist of several ingredients. These include:

a) Ammonium Salts – the active fire retarding ingredient. One of the following salts is used:

(1) Ammonium Sulfate

(2) Monammonium Phosphate

(3) Diammonium Phosphate

(4) Ammonium Polyphosphate

b) Thickening Agents – one or both of the following:

(1) Guar gum - some gum thickened retardants.

(2) Attapulgite Clay - hydrated magnesium silicate

c) Coloring Agents - iron oxide is commonly used.

d) Spoilage Inhibitors - for gum thickened retardants.

e) Corrosion Inhibitors - inhibits aircraft metal corrosion.

f) Flow Conditioners - chemical powder to prevent caking in bins and bags.

g) Anti-Foaming Agents - Silicone preparations used to destroy or prevent bubbling and foaming, to ensure tanks and aircraft can be filled completely.

2. Fugitive Retardants – Fugitive retardants are long-term retardants without permanent red pigment, or a retardant that uses a pigment that becomes invisible (from ultra-violet rays) within about two weeks after its application. The lack of color may make the retardant difficult to see where previous drops were made.

C. Retardant Mixing Facilities – Long-term retardants can be mixed and loaded at a variety of locations. Tactical effectiveness and cost effectiveness are greatly enhanced when temporary mixing facilities are established at or near an incident. Temporary retardant plants may be ordered through the dispatch system from agency fire caches or retardant manufacturers. Long term retardants are available or can be produced from:

1. Permanent or Reload Retardant Bases

2. Remote Retardant Base – Modular retardant base entirely transportable by Type 1 helicopter. Excellent for remote areas with no road access.

3. Portable Airtanker Base – Totally portable retardant mixing system used primarily to mix and load retardant into air tankers and helicopters.

4. Portable Helicopter Retardant System – Similar to the Portable Airtanker Base but is more specifically designed for use by helicopters.

The ATGS should consider aerial application options in terms of effectiveness and cost. Type 1-2 helitanker retardant operations can be far more effective/cost effective than airtankers. Consider this option for long-term incidents. Due to the corrosive effect retardant has on magnesium metals, only specific retardants are approved for use in fixed-tank helicopters, i.e. S-64. Check the qualified products list for approved retardants.

D. Retardant Environmental Concerns – Studies indicate that long-term retardants may have a detrimental effect on aquatic systems. Retardant chemicals may enter an aquatic system directly by overland flow, or by leaching into ground water through the soil profile. Refer to Chapter 5 for further information.

III. Air Tanker Base Information – Information regarding the operation of airtanker bases and related information can be found in the following sources:

A. Interagency Air Tanker Base Operations Guide – NFES 2271

B. Interagency Air Tanker Base Directory – NFES 2138

IV. Personal Protective Equipment Requirements – The following PPE requirements are generally required. Local units or jurisdictions may have different requirements.

A. Fixed Wing Aircraft – The following personal protective equipment is **recommended**:

1. **Flight Suit** – fire-resistant polyamide or aramid material or equal.
2. **Protective Footgear** – leather boots of sufficient height to allow legs of the flight suit to overlap the boot to provide sufficient protection.
3. **Gloves** – made of polyamide or aramid material.

B. Helicopter – The following personal protective equipment is **required**:

1. **Flight Suit** – fire-resistant polyamide or aramid material or equal.
2. **Protective Footgear** – leather boots of sufficient height to allow legs of the flight suit to overlap the boot to provide sufficient protection.
3. **Gloves** – made of polyamide or aramid material.
4. **Flight Helmet** – an approved flight helmet equipped with avionics compatible with helicopter VHF - AM/FM radio system. It is recommended that air tactical personnel have individually fitted flight helmets for maximum protection. Helmets should be stored in helmet bag when not in use.

V. Job Aids and Resources

A. ATGS Kit – Each ATGS should maintain a personal kit ready for dispatch. The following items should be considered:

1. Interagency Air Tactical Group Supervisor Operations Guide (IATGSOG)
2. **Work Board** – Leg board/clip board
3. **Maps**
   - **a)** FAA Sectional Charts
   - **b)** Agency Maps
   - **c)** Incident Map
   - **d)** State Highway Map
   - **e)** Local Hazard Map
   - **f)** Retardant Base Coverage Map
4. **Air Tactical Forms** – Refer to Appendix C.

a) ATGS Mission Record (or equivalent)

b) Fire Size-up Forms (or equivalent)

c) FAR 91.137 Worksheet (Temporary Flight Restrictions)

d) Air Tactical Mission Checklist (or equivalent)

e) ICS-225 – Incident Personnel Rating

f) SAFECOM

5. Sunrise and Sunset Tables

6. Local Radio Frequency List

7. List of Available Tactical Aircraft

8. Incident Action Plan

9. Pens and pencils

10. Pocket Calculator

11. Canteen or bottled water

12. Air sickness bag

13. Bladder relief container

14. Radio adaptors and plugs

a) Radio programming plug – Bendix King portable radio

b) Single pin adaptor plug for flight helmet

c) Other miscellaneous plugs and connectors

B. Other Resources – The ATGS should know where to access the following information as needed. These resources are usually available at dispatch centers or from the local unit aviation officer.

1. Interagency Air Tactical Supervisor Guide

2. National Mobilization Guide

3. Geographic Area Mobilization Guide

4. Local Unit Mobilization Guide

5. Interagency aviation management manuals and handbooks

6. USDI/USDA Aircraft Radio Communications and Frequency Guide

7. National Airtanker Contract

8. National Interagency and Geographic Area CWN Helicopter Contracts

9. USDA-FS Air Tanker Base Operations Guide and Directory

10. Unit/Interagency Aviation Plan for the local unit

11. Interagency Helicopter Operations Guide (IHOG)

12. Area Planning AP/1B Charts – Military Training Routes

13. Military Use Handbook – NFES 2175

14. Flight Operations Guide, FSH 5709.16

15. Interagency Air Space Coordination Guide

16. IAMS/CAHIS (download from the internet)

Chapter 4 – Policies & Regulations

I. Air Tactical Supervision Over an Incident – Incident aviation operations are often conducted under extremely adverse flight conditions. Congested airspace, reduced visibility, adverse weather and mountainous terrain all add to complexity of operations.

Situations and complexities dictate the level of supervision required to safely and effectively conduct aerial operations. Aerial supervision may be provided by an Leadplane, ASM1, ATGS or HLCO. Dispatchers and Air Tanker Base Managers, in consultation with aerial supervisors, are mutually responsible for ensuring that policies are applied and limitations not exceeded. Consult Appendix D for Agency restrictions regarding the use of the Leadplane, ASM1, HLCO or ATGS.

A. Retardant Operations and Low Ambient Light (Sunrise/Sunset) – To reduce the hazards of airtanker retardant drops in the early morning and late afternoon hours, the following limitations shall apply. These limitations apply to the time the aircraft arrives over the fire, NOT to the time the aircraft conducts retardant drops.

1. Normally, airtankers shall be dispatched to arrive over a fire not earlier than 30 minutes after official sunrise and not later than 30 minutes before official sunset.

2. Airtankers may be dispatched to arrive over a fire as early as 30 minutes prior to official sunrise and as late as 30 minutes after official sunset provided:

a) A qualified ATGS, ASM1 or Leadplane is on the scene; AND

b) Has determined that visibility and other safety factors are suitable for dropping retardant; AND

c) Notifies the appropriate dispatcher of this determination.

Sunrise		Daylight Hours	Sunset	
30 Minutes Before	30 Minutes After		30 Minutes Before	30 Minutes After
Supervision Required		Agency Policy On Supervision Applies	Supervision Required	

3. In Alaska an airtanker pilot shall not be authorized to drop retardant during periods outside of civil twilight.

4. Single engine airtankers (SEATS) and helicopters are limited to flight during the official daylight hours. Daylight hours are defined as 30 minutes prior to official sunrise until 30 minutes following official sunset, and under visual flight rule conditions (FAR part 91.151 through 91.159). Caution must be taken in mountainous or hilly terrain. One might experience late dawn or early dusk conditions based on terrain features and sun angle, and flight periods should be adjusted accordingly. Daylight hours may be further limited at the discretion of the pilot, aviation manager, ATGS or Leadplane because of low visibility conditions caused by smoke, and/or shadows.

B. Definitions of Key Words Used in this Chapter

1. **Required** – Aerial supervisory resource(s) that shall be over the incident when specified air tactical operations are being conducted.
2. **Ordered** – Aerial supervisory resources that shall be ordered by the controlling entity (Air tactical operations may be continued while the aerial supervision resource is enroute to the incident. Operations can be continued if the resource is not available.)
3. **Over –** The air tactical resource is flying above or is in a holding pattern adjacent to the incident.
4. **Assigned** – Tactical resource allocated to an incident. The resource may be flying enroute to and from, or on hold at a ground site.

C. Mission Supervision Over Incidents – This table summarizes aerial supervision over incidents. References (Ref) are listed below the table*.

Situation	LEAD /ASM1	Ref	ATGS	Ref
Airtanker not IA rated	Required	1		
MAFFS	Required	1		
Retardant drops in congested areas	Order	1	May use until LEAD/ASM1 arrives on scene	
Level II rated SEAT operating over an incident with more than one (1) other tactical aircraft on scene	Required if no ATGS	1	Required if no LEAD/ASM1	1
Foreign Government airtankers	Required if no ATGS	1	Required if no LEAD/ASM1	1
Retardant drops conducted - 30 minutes prior to sunrise until 30 minutes after sunrise	Required if no ATGS	1, 2	Required if no LEAD/ASM1	1, 2
Retardant drops conducted - 30 minutes prior to sunset to 30 minutes after sunset	Required if no ATGS	1, 2	Required if no LEAD/ASM1	1, 2
4 or more airtankers assigned	Order	1	Order	1
2 or more helicopters with 2 or more airtankers over an incident	Order	1	Order	1
Periods of marginal weather, poor visibility or turbulence	Order	1	Order	1
2 or more airtankers over an incident	Order	1	Order if no LEAD/ASM1	3
When requested by airtanker	Required	1	Required	
Smokejumper or paracargo aircraft with 2 or more airtankers over an incident	Order	1	Order	1, 4
Incident has two or more branches			Order	1, 4

*This table summarizes interagency aviation supervision policy, but individual agency policy must be consulted for currency and consistency.

Note: Aerial Supervision Modules (ASM1) may act as either a Lead or ATGS depending on incident requirements.

1. Interagency Lead Plane Operations Guide (and Interagency Air Tactical Group Supervisors Guide (NFES 1393).

2. Requires determination by ATGS or Lead that visibility and safety factors are suitable and dispatch has been notified of this determination.

3. USFS FSM 5716.32 and Standards for Fire and Aviation Operations

4. Both the ILOG and ATGS Guide reference ordering an ATGS only for these missions. FSM 5716.32 classifies these missions as complex. A LEAD and/or HLCO should be ordered as appropriate in addition to the ATGS.

D. Aerial Supervision Not Required

1. **Multiengine Airtankers** – Except for conditions identified above, an airtanker crewed by an initial attack rated captain may be dispatched to drop on a fire without aerial supervision by an ATGS, ASM1, or Leadplane.

2. **SEATS** – do not require supervision except as noted previously in this section.

E. Use of SEATS – Airtankers carrying 799 gallons or less are classified as Single Engine Airtankers (SEATS). SEATS are generally used for initial attack and aerial supervision is usually not required. When an Leadplane, ASM1, or ATGS is providing aerial supervision over an incident using SEATS, the limitations outlined above apply in addition to the following:

1. **Radios** – SEATS aircraft shall have a minimum of one 720 channel VHF-AM and programmable multi-channel VHF-FM radios (See ISOG).

2. **Landing Sites** – Use of off-airport landing sites must be authorized by agency policy. SEATS pilots will approve all landing sites for safety and suitability.

3. **Landing Loaded** – Unless dictated by an emergency, SEATS are not to land loaded.

4. **Daylight/Flight Visibility Requirements** – Flights shall be limited to daylight hours under VFR conditions only. Daylight hours are defined as from 30 minutes before official sunrise to 30 minutes after official sunset. In Alaska, during extended twilight hours when terrain features can be readily distinguished from a distance of at least one mile.

5. **Operational Considerations** – Because of the load capability of the SEATs, quick turn-around time should be a prime consideration.

F. Foreign Government Aircraft On United States Incidents – Under international cooperative agreements the USDA-FS, USDI-BLM and state agencies may enlist the assistance of Canadian air tactical resources on United States' incidents. A Canadian Air Attack Officer flying in a Bird Dog or leadplane aircraft will normally accompany Canadian airtankers. The Canadian Airtanker communications system is compatible with USDA-FS and USDI Systems. Leadplane, ASM1, and ATGS assigned to these incidents will adhere to the following policies and guidelines:

1. **Incidents on Forest Service Lands**

   a) An ASM1 or ATGS shall be assigned to the incident as outlined above in this chapter – Aerial Supervision Requirements on Incidents.

b) A U.S. Federal ATGS, ASM1, or Leadplanes shall supervise Canadian airtankers. In the absence of a leadplane or ASM1, the Canadian Air Attack Officer/Bird Dog is authorized to direct Canadian airtanker drops. **Deviations from this policy must be specifically approved by the appropriate agency.**

c) Airtanker Reloads – The reload base for Canadian airtankers shall be determined by the originating dispatch.

d) Canadian airtanker pilots shall be briefed on standard drop height minimums as they normally drop from lower heights.

e) Canadian airtankers and helicopters operating on Forest Service lands will be managed in the same manner as United States resources.

2. **Incidents on Cooperator Lands** – When an ATGS, ASM1 or LEAD are assigned to a cooperator incident employing Canadian air resources; the incident will be managed as outlined in above in this chapter.

3. **Authorization to Lead United States Air Tankers** – Only federally (U.S.A.) approved s/Leadplane and ASM1 pilots are authorized to lead United States federally procured airtankers on airtanker drops.

II. Flight Conditions – An ATGS must carefully evaluate flight hazards, conditions (visibility, wind, thunder cells, turbulence, terrain) to ensure that operations can be conducted in a safe and effective manner. The following policies and guidelines are designed to do this.

A. Visibility – Regardless of time of day, when poor visibility precludes safe operations, flights will be suspended. It is recommended that incident aircraft fly with landing and strobe lights on at all times. It is required that Leadplanes fly with landing/impulse and strobe lights on at all times. Regular position reporting on Victor is critical in marginal visibility conditions.

B. Wind Conditions – Moderate to high winds and turbulent conditions significantly affect flight safety and water/retardant drop effectiveness. The following guidelines should be considered in making the decision to continue or suspend operations. A number of factors including terrain, fuel type, target location, resources at risk, cross- winds, etc., must be considered.

1. **Airtanker Drops** – Generally ineffective in winds over 20-25 mph.

2. **Helitanker Drops** – Generally ineffective in winds over 15-20 mph. Type 1 helicopters may be effective in higher winds.

3. **Helicopter Operations** – Capability to fly in excessive wind conditions varies considerably with weight class (type) of the helicopter and degree of turbulence. If the helicopter flight manual or the helicopter operators policy does not set lower limits, the following shall be used, but may be further restricted at the pilot's or air operations personnel's discretion. Limits are as follows:

a) Above 500' AGL – All helicopter types: constant winds up to 50 knots.

b) Below 500' AGL.

(1) **Type 3 Helicopters** – Steady winds shall not exceed 30 knots or a maximum gust spread of 15 knots.

(2) **Type 2 and 1 Helicopters** – Steady winds shall not exceed 40 knots or a maximum gust spread of 15 knots.

C. Thunder Cell – Carefully evaluate "thunder cell activity" and flight safety. Consider delaying operations or reassigning resources to safe operation areas. Suspend flight operations when lightning is present.

III. Air Tactical Pilots – Pilots flying air tactical missions must be Agency approved. Pilot cards must be checked prior to air tactical missions.

A. Pilot Approval – Air tactical pilots (for ATGS or HLCO) shall be inspected and approved annually by a qualified Forest Service or OAS Pilot Inspector. Qualification for air tactical missions shall be indicated on the back side of the or Airplane Pilot Qualification Card. Pilots being considered for air tactical missions should be experienced aerial observer pilots or pilots with tactical fire experience.

Note: Helicopter pilots are normally not approved specifically for ATGS missions. Pilots who have not flown air tactical missions must be thoroughly briefed before use on air tactical missions.

B. Pilot Orientation and Training – Prior to flying their initial air tactical mission, preferably pre-season, the pilot shall receive a basic orientation/training from a qualified ATGS (see Appendix). As a minimum, the following shall be covered:

1. General scope of the mission.

2. Incident air organization – emphasis on ATGS, ASM1 and HLCO roles.

3. Specific responsibilities of the ATGS.

4. Specific responsibilities and expectations of the ATGS pilot.

5. Air resources commonly assigned to, or present on, the type of incident.

6. Communications hardware, procedures, protocol and frequency management.

7. Air space management (TFRs, flight patterns, etc.)

8. Operations safety

9. Standard operating procedures

10. Fuel management

11. Dispatch readiness, availability for duty.

12. Records

C. Mission Briefing for Pilot – Prior to departure on an air tactical mission the ATGS will brief the pilot on the following (see Appendix):

1. General scope of the mission
2. Mission safety briefing
3. Incident Latitude/Longitude and/or distance/heading
4. Resources assigned
5. Radio frequencies
6. Special information including hazards and military operations, etc.
7. Expected duration of mission

IV. Radio Communications

A. General Radio Requirements – Supervision of incident aircraft requires that the ATGS have the minimum capability of monitoring/transmitting on two VHF-FM frequencies, including an Air Guard, which can be continuously monitored, and two VHF-AM frequencies. This allows communications on a primary air- to-air frequency and a secondary air-to-air frequency. The Air Tactical Group Supervisor must have the ability to communicate with ground Operations, all tactical logistical aircraft in the incident airspace and the dispatch unit/controlling agency regarding an in-flight emergency and/or crash. To meet this requirement USDA-FS or OAS interagency carded aircraft will be equipped with a multi-channel or programmable VHF-FM radio system and two 720 channel VHF-AM radio systems.

Note: Effective in 2005 (or as per contract requirements), 760 channel VHF-AM radio systems will be required.

B. Minimum Operating Requirements For All Aircraft – At time of dispatch, all aircraft must have both VHF-FM and VHF-AM radio systems in working order. In the event of a radio system failure the following will apply:

1. **Total System Failure** – No ability to monitor or transmit – seek a safe altitude and route and return to base.
2. **VHF-FM System Failure** – Report problem to other aircraft and Dispatch (if able) on VHF-AM system and return to base.
3. **VHF-AM System Failure** – Report problem to other aircraft, Incident Commander and Dispatch on VHF-FM system and return to base.

C. Frequency Management – Both VHF-FM and VHF-AM frequencies are allocated to wildland agencies. VHF-FM is allocated by the National Telecommunications and Information Administration (NTIA). VHF-AM is allocated by the Federal Aviation Administration (FAA). VHF-AM frequencies may change from year to year. Additional FM and AM frequencies may be allocated during major fire emergencies. The agency dispatch centers may order additional frequencies through geographic area coordination centers.

D. Communications Functions

1. **Flight Following** – A VHF-FM frequency is assigned by the dispatch center for check-ins and incident related information. This can be a local unit frequency of the national flight following frequency (168.650 Tx/Rx). Some agencies, may assign a VHF-AM flight following frequency. Aircraft flying long distance missions (i.e. cross country) may be required to use the national frequency.

2. **Air-to-Ground Communications** – It is essential to have a dedicated air-to-ground frequency that is continuously monitored by appropriate ground resources. Tone guarded frequencies should be avoided. The ATGS must always return to air-to-ground after using other VHF-FM frequencies.

   a) **Initial Attack** – Many agencies have pre-assigned FM or AM air-to-ground for different geographic areas. Other agencies use standard work channel frequencies.

   b) **Extended Attack Incidents** – A discreet frequency should be assigned if there are no radio conflicts with other incidents. These frequencies must be ordered through the dispatch system.

   c) **Project (large scale, long term) incidents –** National Incident Radio Cache (NIICD) radios are programmed with five air tactical frequencies that can be used for air-to-ground communications. Other frequencies can be assigned if there are no radio conflicts with other incidents. These frequencies are assigned by the incident's Communication Unit Leader and are listed in the ICS-220 Air Operations Summary and ICS-205 Incident Radio Communication Plan.

3. **Air-to-Air Communications** – Communication between all airborne incident aircraft is critical to safety and effectiveness. Air-to-air communications is usually accomplished using a VHF-AM frequency. California typically uses a VHF-FM for air-to-air communications.

   a) **Primary Air-to-Air** – The first air-to-air frequency used on an incident is designated as the primary. Agencies may have pre-assigned air-to-air frequencies for initial attack in different geographic areas. Extended dattack incidents often require a discreet air-to-air frequency. Project scale incidents have discreet air-to-air frequencies assigned by the incident's communication unit leader that are listed in the ICS-220 Air Operations Summary and ICS-205 Incident Radio Communication Plan.

   b) **Secondary Air-to-Air** – If needed due to radio congestion, a second air-to-air frequency should be established for helicopter operations. This frequency may also be used for the flight following frequency at the helibase. The ATGS should retain the primary air-to-air frequency for fixed-wing operations so airtankers enroute to the incident can check-in. A discreet air-to-air frequency may be required for the leadplane to lead airtankers.

c) Obtaining Air-to-Air Frequencies – Initial and extended attack air-to-air frequencies are obtained through the local dispatch. Project and incident air-to-air frequencies are obtained through the Communications Unit Leader.

d) Air-to-Air Continuity – The ATGS must maintain continuous air-to-air communications with other incident aircraft. While the LEAD and HLCO may use a secondary air-to-air frequency to coordinate their aircraft, the ATGS must communicate with the LEAD and HLCO on the primary air-to-air frequency. Air resources under the direct supervision of the ATGS must monitor the primary air-to-air frequency.

4. Air Guard – VHF-FM 168.625 (Tx Tone 110.0) has been established as the USDA/USDI emergency frequency. This frequency is permanently programmed and continuously audible in the multi-channel programmable radio system. Authorized uses of the Air Guard frequency include:

a) In flight aircraft emergencies

b) Emergency aircraft-to-aircraft communications

c) Emergency ground-to-aircraft communications

d) Long range dispatch contact (when use of the designated flight following frequency does not result in contacting dispatch)

e) Initial call, recall, and redirection (divert) of aircraft

5. Air-to-Air Enroute Position Reporting – During periods of poor visibility a special VHF-AM or FM frequency may be established for inter-aircraft position and altitude reporting enroute to and from and/or over incidents.

6. Airstrips Without Communications – Whenever there is a potential conflict between agency aircraft and public users of back country airstrips, the pilot should announce "in the blind" intentions to land or take off before initiating the maneuver. This is especially important on incidents before air traffic control measures are established.

E. Conflicting Radio Frequencies – When multiple incidents in relatively close proximity (less than 100 miles) are sharing the same tactical frequencies, interference can seriously impair operations. The ATGS must recognize this and request different frequencies through dispatch or the Communications Unit Leader. A local (geographic area) frequency coordinator and the National Incident Radio Support Cache (NIICD) should be involved when assigning frequencies where several incidents are in close proximity.

F. Tone Guards – Tones have been established by some agencies to allow the use of more frequencies selectively. The tone can be programmed, or selected, in tactical aircraft VHF-FM radios.

G. Radio Frequency Directory – For more information regarding radio frequencies, tone guards, and Emergency Medical Service data consult NFES 0969 National Interagency Aviation Frequency Guide.

H. Communications Protocol

1. Air Resource Identifiers – The following identifiers will be used:

a) ATGS identifier is "AIR-TAC"

(1) Enroute to/from incident – options include:

(a) Unit name (ex. Wenatchee Air Tac)

(b) Unit assigned identifier (ex. Air Tac 621)

(c) Aircraft "N" number (ex. Air Tac 81C)

(2) Working an incident – use incident name (ex. Cougar Air-Tac).

b) HLCO identifier is "HELCO" or "COPTER COORDINATOR" Apply principles in 1 above.

c) ASM1 – identifier is "BRAVO" or "ALPHA" depending on if the aircraft originates from the lower 48 states (BRAVO) or State of Alaska (ALPHA).

(1) This resource (ASM1) can perform either the low level "lead" or a combination of lead and ATGS roles. An ASM1 is staffed by an air tactical pilot (ATP) and an Air Tactical Supervisor (ATS).

d) LEAD – identifier is "LEAD".

(1) Lead-planes – Pilots are assigned a two-digit identifier (Ex. LEAD - 4-1).

(2) Lead is used synonymously with the term ATCO

e) Airtanker – Tanker plus identification number (ex. Tanker 21)

f) Helitanker – Helitanker and identification number (ex. Helitanker 42). Applies to Interagency Air Tanker Board approved Type 1 fixed tank helicopters.

g) MAFFS – MAFFS plus identification number (ex. MAFFS 6)

h) Helicopter – Copter plus last three characters of N-number (ex. Copter 72 Delta) or a locally assigned agency identifier.

i) Smokejumper Aircraft – Jumper plus last two characters of N-number (ex. Jumper 41) or an agency assigned identification number

j) Other Fixed Wing – Other fixed wing are identified by "make or model prefix" plus last three characters of N-number (ex. Cessna 426).

k) Air Ops – Air Operations Director

l) Air Support – Air Support Group Supervisor

m) Operations or 'Ops' – Operations Section Chief

n) Fixed Wing Coordinator – (to be determined)

2. **Message Sequence** – Protocol requires the resource you are calling be stated first, followed by your identification. "Tanker 23, Skookum Air Tac." Make messages as short and concise as possible.

3. **Frequency Identification** – Monitoring several frequencies sometimes makes it difficult to determine which frequency is being heard. When making initial contact, state the frequency you are transmitting on. "Lead 68, Bear Air Tac on Victor 118.250."

4. **Incident Communication Procedures** – Communication procedures are discussed in Chapter 5.

V. Airspace Coordination

A. Interagency Airspace Coordination Guide – Covers all aspects of wildland agency airspace management. The ATGS must be familiar with information in the guide. Dispatch centers and tanker base managers should have a copy available for reference.

B. Special Use Airspace (SUA) – Incidents may be located in, or flight routes to incidents may pass through, areas officially designated as Special Use Areas. Operations through, or within these areas, may require that specific procedures be followed. The ATGS must be aware of these requirements and procedures.

1. **Definition** – Special Use Airspace "consists of airspace wherein activity must be confined because of its nature and/or wherein limitations may be imposed upon aircraft operations that are not part of those activities." These areas include Military Operations Areas (MOA's), Restricted Areas (RA's), Prohibited Areas (PA's) Alert Areas (AA's) Warning Areas (WA's) and Controlled Areas (CFA's).

2. **Special Use Airspace Locations** – All areas except CFA's are identified on NOAA Aeronautical Sectional Charts. Many of these are located in wildland areas throughout the United States.

3. **Procedures** – Appendices 4 and 7 of the Interagency Airspace Coordination Guide and the FAA Handbook 7400.2C (Procedures for Handling Airspace Matters) discuss procedures to be used when wildland aerial fire operations are requested in or through these areas. Flights through, or within SUA's, require authorization from the using or controlling agencies. Depending on the type of SUA involved, contact with the controlling agency may be initiated by the air resource pilot.

C. Military Operations Areas (MOA's) – Many MOA's in the Western United States are located in airspace over agency lands. MOA's are identified on the Aeronautical Sectional Charts, and current information regarding MOA scheduling is published in the AP/IA Handbook and Charts. When wildfires occur within these areas, the responsible agency will notify the FAA and Military Scheduling Activity to de-conflict the affected area. Do not assume that there will be no military activity in the

area. There is a time lag to effectively de-conflict the area. Report (and document) airspace intrusions, or conflicts, to the responsible dispatch center.

D. Military Training Routes (MTR's) – MTR's are located over many agency lands in the United States. Routes are identified on Aeronautical Sectional Charts, and the AP/IB Chart (map). Dispatch centers should have daily schedule information (hot routes) and will notify the FAA and Military Scheduling Activity when incident aircraft may conflict with military aircraft on or near the MTR's. Do not assume an MTR has been de-conflicted. Report (and document) airspace conflicts or intrusions to the responsible dispatch center.

E. Other Military Training Routes and Areas – While the MOA's and MTR's are charted on sectional maps and the AP/IB charts, Slow Speed Low Altitude Training Routes (SR's) and Low Altitude Tactical Navigation Areas (LATN's) and other low altitude flights are not charted and schedules are not published. Dispatch centers should alert you to these flights, if known. The ATGS will notify the dispatch center and other incident aircraft if they observe military aircraft enroute to, near or within the operations area.

F. Temporary Flight Restrictions (TFR) – Under the conditions listed below the responsible agency should request a temporary flight restriction under FAR Part 91.137. A TFR may be initiated by the dispatch center, Incident Commander, Air Operations Branch Director, LEAD, ASM1, or ATGS.

1. Considerations for Requesting a TFR-FAR Part 91.137

a) Length of Operation – Extended operations are anticipated. Local agency policy for the anticipated length of incident operations may apply.

b) Congested airspace involved – Operations are in the vicinity of high-density civil aircraft operation (airports).

c) Incident size and complexity

d) Potential conflict with non-operational aircraft

e) Extended Operations on Military Training Routes

f) Extended Operations within Special Use Airspace

2. ATGS Responsibility & TFRs – During the initial attack phase of an incident, the ATGS may initiate a request for a TFR. The ATGS should complete critical information required on the Interagency Request for Temporary Flight Restriction form and radio this information to the responsible dispatch coordination center. On Type 1 or 2 incidents, the ATGS in consultation with the Lead or ASM1, will advise the Air Operations Branch Director when the dimensions of the TFR should be increased or decreased. These changes must be forwarded immediately to the dispatch center that will initiate a new order to the FAA.

The ATGS should coordinate with the incident Air Operations Branch Director or local dispatch office as appropriate to recommend termination of an existing TFR.

3. **Guidelines for TFR Dimensions** – The Interagency Airspace Coordination Guide covers this subject in detail. Factors which must be considered are:

   a) The type and number of aircraft operations occurring within the incident airspace and their aeronautical requirements.

   b) The operating altitude to provide the ATGS a safe and good vantage point.

   c) Entry and exit points and routes.

   d) Other aircraft operations in the geographical area.

   e) Size, shape and rate of increase of the incident.

   f) Location of incident helibases, water sources, etc.

   g) Location of commercial airports.

4. **TFR Lateral Dimensions** – Normally 5 nautical miles radius from center point of the incident/project. Any aircraft operating base within "reasonable distance" should be included (helibase, heli-dip site). Lateral dimensions may be much greater on large incidents. The lateral dimensions/shape may be irregular to conform to actual requirements. Dimensions should be no more than you need.

5. **TFR Vertical Dimensions** – In general, the airspace should extend up to (but not include) an elevation of 2000 ft. above the highest terrain (above ground level). The vertical and lateral dimensions of the desired airspace may conflict with FAA requirements and what they will approve. The FAA, through the dispatch center, will provide the approved TFR dimensions. If airspace needs are not met, request new air space dimensions. Again, the adjusted airspace requires FAA approval.

6. **TFRs for Multiple Incidents In Close Proximity** – Multiple incidents in close proximity may result in overlapping restrictions. To avoid confusion the respective dispatchers and Air Operations Branch Directors should plot the approximate center point for all affected incidents and request a new TFR for the entire area.

7. **Proper Identification of TFR Part 91.137 Paragraph** – TFR Part 91.137 is divided into three sections referred to as Paragraphs (a)(1), (a)(2), and (a)(3) indicating the type of disaster event normally associated with each designation. The most commonly requested TFR for wildfire is 91.137 (a)(2).

   a) (a)(1) – Volcanic eruption, toxic gas leaks, spills.

   b) (a)(2) – Forest and range fires.

   c) (a)(3) – Incidents/events generating high public interest such as sporting events.

G. News Media Aircraft & TFRs– Under part 91.137 (a)(2), aircraft carrying accredited news representatives may enter the area, if prior to entry a flight plan is filed with the appropriate FSS or ATC specified in the NOTAM. News media flights may be conducted above the altitude used by disaster relief aircraft. The ATGS may

assign a lower altitude and flight pattern if safety and airspace congestion allows. News media often make requests for flights through the Agency or Incident Information Officer. Flights are approved by the Incident Commander and coordinated with the Air Operations Branch Director and the ATGS. Media aircraft should be informed of incident radio frequencies, who to contact before entering the incident airspace and be given an initial altitude assignment.

H. Law Enforcement Aircraft & TFRs – Under FAR 91.137 (a)(2), aircraft carrying law enforcement officials may enter the TFR. Consider State and local laws that may have specific application.

I. Air Operations in Congested Areas – Aerial fire operations occurring over congested and densely populated areas operate under the following requirements:

1. **U.S. Forest Service Operations** – Operations on national forest lands and other agency lands protected by the USFS under cooperative fire protection agreements require that all aircraft conduct air operations under the FAA Grant of Exemption No. 392 from FAR 91.119 (see below).
2. **Other Agency Operations** – Aircraft flying on incidents under other agency jurisdictions, consult that agency's policy.

J. Exemption 392 from FAR 91.119 – Exemption 392 (USDA-FS) authorizes deviations from FAR 91.119 by fixed-wing aircraft (public and civil) when conducting operations in congested areas below 500 feet above the surface (AGL) and closer than 500 feet to persons, vehicles, vessels, and structures.

1. Thorough air survey for obstacles prior to low-flight operations
2. Flights below 500 ft. be confined to immediate operation areas
3. Pilots must avoid creating unnecessary hazard to persons or property on surface
4. Aerial applications of fire retardants:

   a) Conducted only at specific request of the responsible firefighting agency.

   b) A qualified LEAD or ASM1 must be ordered to supervise all airtanker operations.

   c) Positive radio communications between the LEAD/ASM1, airtanker pilot and official directly supervising fire suppression operations.

   d) The on-site Operations person supervising the suppression shall advise the LEAD/ASM1 that all non-essential people and movable property have been cleared from the area to be treated.

   e) The LEAD/ASM1 shall be personally satisfied that no non-essential people or movable property are in the drop area.

   f) The first retardant pass of each series shall be preceded by a dry run flown in the same pattern as the planned retardant drop.

NOTE: An ATGS may assume the roles identified above (b – f) as long as a LEAD/ASM1 is on order.

K. Use of Disaster Aircraft Transponder Code 1255 – All incident aircraft will utilize a transponder code of 1255 unless another code is assigned by air traffic control. Agency and contractor aircraft equipped with traffic collision avoidance systems (TCAS) or similar equipment require the use of this transponder code to provide for the safe and effective use of incident airspace.

L. Responses to Airspace Conflicts and Intrusions – When incident airspace conflicts and intrusions occur the ATGS must:

1. Immediately ensure the safety of incident aircraft.

a) Notify incident aircraft in the immediate area of the position of the intruder.

b) Attempt radio contact with intruder aircraft by use of VHF-AM (known Victor, local unicom) and VHF-FM (assigned, local, or Air Guard) frequencies.

c) If radio contact can be established, inform the intruder of the incident in progress, airspace restriction limitations in effect, and other aircraft in the area.

(1) Request intruder depart restricted area (assign an altitude and heading if necessary). Request intruder stay in radio contact until clear of the area.

(2) If intruder has legitimate need to be in the area and can be accommodated without jeopardizing safety, assign an altitude and location as needed. If the intruder wishes to operate above the airspace restriction, the ATGS may request, but not demand, that it check in with ATGS as needed.

d) If radio contact is not established:

(1) No attempt to drive, guide or force the intruder from the area should be made. The ATGS must monitor intruder's position, altitude, and heading.

(2) Try to ascertain the N-number without imposing a hazard.

(3) ATGS must ensure that incident aircraft are informed and kept clear of intruder. This may require removing incident aircraft and curtailing operations for as long as intruder is considered a potential hazard.

(4) Report intruder immediately to local dispatch office and ask them to contact the Air Route Traffic Control Center (ARTCC). The FAA sometimes has the capability of tracking an aircraft or identifying the aircraft.

2. Report the conflict or intrusion to the appropriate dispatch center, agency Aviation Officer, or Air Operations Branch Director. Conflicts with military and FAA controlled areas need to be brought to the attention of the Airspace Coordinator.

3. Submit a Mishap or SAFECOM Report as per agency policy and procedures.

M. Special Use Airspace Reminders

1. Check with dispatch when receiving the Resource Order

a) Is the incident in a SUA or in a MTR?

b) Is the MOA/MTR "hot" or about to be?

2. Confirm military has been notified and what action will be taken.

3. The pilot must obtain clearance/routing through or around SUAs enroute to the incident.

4. Always be alert for military aircraft even when SUA/MTRs are "not hot."

Chapter 5 – Mission Sequence & Standard Procedures

I. Pre-Mission Responsibilities – Pre take-off responsibilities vary depending on whether the ATGS is operating from the incident or a remote base, from a rotor or fixed wing, and whether mission is initial attack or a project incident. Responsibilities include:

A. Pilot Qualification Card & Aircraft Data Card – Review these cards and verify the pilot and aircraft are properly carded for air tactical missions.

B. Flight & Duty Limitations – Determine when pilot's duty day began and if sufficient flight/duty time is remaining. If not, order a relief pilot.

C. Aircraft Maintenance – Verify aircraft has sufficient time remaining before next scheduled maintenance. If not, order another aircraft.

D. Aircraft Preparation – Both the pilot and ATGS have responsibilities. A handout outlining pilot responsibilities can be found in the Appendix.

1. Pilot Responsibilities – include but not limited to:

a) Calculating weight and balance of passengers and equipment

b) Fueling – Discuss fuel requirements and limitations for mission with pilot

c) Route Planning – Clearance for flights through Special Use Airspace and Military Training Routes.

d) Aircraft pre-flight

e) Filing a flight plan as required

f) Possessing/wearing proper personal protective equipment

g) Obtaining a weather briefing

2. ATGS Responsibilities

a) Check-out communications system. Install NIFC radio package if required.

b) Program VHF-FM tactical frequencies in radio (coordinate with pilot)

c) Load air tactical equipment

d) Assist pilot as requested with crew duties

E. Procurement Agreements – The ATGS should be familiar with the basic terms of the procurement agreement/contract.

F. Obtain Mission Briefing – Whether the air tactical mission is initial attack or a project incident, the ATGS must obtain critical information.

1. **Initial Attack Briefings** – The following information can be recorded on an ATGS Mission Record or similar form (see Appendix).
   - **a)** Incident name or number
   - **b)** Agency responsible
   - **c)** Incident location – legal location, latitude/longitude and VOR's
   - **d)** Frequencies and tones
     - *(1)* Flight following
     - *(2)* Air-to-Ground
     - *(3)* Air-to-Air (FM and/or AM)
   - **e)** Contacts – ground and air
   - **f)** Air resources assigned or to be assigned, ETAs, type, and identifier
   - **g)** Other resources dispatched (as practical)
   - **h)** Approximate incident size and fire behavior
   - **i)** Other available air resources
   - **j)** Special information – (watershed, wilderness, urban interface, etc.)
   - **k)** Airtanker reload base options and turnaround times.
2. **Project Incident Briefings** – If possible the ATGS should attend incident briefings. If this is not possible critical information should be relayed by phone, radio, FAX or messenger. A copy of the Incident Action Plan is essential. The ATGS may have to seek some of this information:
   - **a)** Incident Objectives by Division
   - **b)** Organization Assignment List (ICS 203) or list of key operations people
   - **c)** Air Operations Summary (ICS-220) or list of assigned aircraft
   - **d)** List of all aircraft by make/model and identification
   - **e)** Incident Radio Communication Plan (ICS 205) or list of frequencies
   - **f)** Incident Map
   - **g)** Fire Behavior Report and local weather
   - **h)** Air resource availability/status
   - **i)** Incident Medivac Plan and medivac helicopter assigned

G. Conduct Pilot Briefing & Orientation – If you have not flown with the pilot this season or if the pilot has not flown an air tactical mission before, give an orientation before the mission (see Appendix ATGS Pilot Briefing and Expectations).

H. Pre Take-Off Responsibilities

1. Pilot Responsibilities

a) Complete pre-flight including passenger safety briefing

b) Confirm fuel supply

c) Obtain route clearances through Special Use Airspace as required (refer to a discussion of clearance requirements in Chapter 4).

d) Set GPS to incident location

2. ATGS Responsibilities

a) Record altimeter setting

b) Program VHF-AM radio – when approved by pilot (may have to do this enroute)

c) Confirm fuel supply and flight time available for mission

d) Give pilot incident location – Lat/Long, VORs and Heading

e) Notify pilot of other air resources assigned

f) Check with dispatch regarding current status of military aviation operations (MOA's, MTR's) and Temporary Flight Restrictions.

II. Enroute Responsibilities

A. After Take off

1. Record take off time

2. Observe sterile cockpit protocol as previously agreed to with pilot

3. Notify dispatch of ETA at incident

4. Notify pilot of any information or situation affecting the flight.

5. Assist pilot as requested. Be a proactive crewmember

B. General Enroute Communications – The ATGS maintains communications with dispatch and may communicate with other aircraft concerning:

1. Incident air resource updates

2. Status of MTR's & MOA's.

3. Coordination with responding air resources can be done on the assigned Air-to-Air frequency, provided it does not interfere with operations over the incident.

C. Flight Following – Enroute to and from the incident, the ATGS contacts dispatch on the assigned FM frequency as per agency/local Unit policy (check designated frequency with local dispatch center) with a position and heading report. Long flights may require communications with more than one dispatcher or dispatch center. Be sure to close out with the current dispatcher when communications have been established with the next one. The ATGS can request dispatch centers close out for them by telephone.

Flight following for cross country flights may best be accomplished via a FAA Flight Plan. Updating flight plans with NICC may also be a viable option at refueling stops.

D. Before Entering Incident Airspace (i.e. Fire Traffic Area) – 12 nautical miles (see FTA) from the center point of an incident, the ATGS must implement appropriate procedures listed below. Procedures vary depending on whether or not the airspace is active with aircraft and whether or not the airspace is managed.

1. Notify the dispatch center of your position.

2. Change frequencies to incident frequencies.

3. If aircraft are over the incident:

a) Notify controlling aircraft of your location and altitude.

b) Obtain briefing on location of all incident aircraft.

c) Request approval to enter Fire Traffic Area (FTA).

d) Enter the incident airspace, as agreed to with controlling aircraft, at a specific altitude, altimeter setting, location, and pattern.

4. If no aircraft are observed or overheard on the radio:

a) Request status report on all air resources from ground contact(s).

b) Make an announcement "in the blind" on the Air-to-Air frequency communicating your identification, location, altitude, altimeter setting, and intention to enter the incident airspace.

5. Notify dispatch center that you have arrived at the incident.

E. Entering Incident Airspace

a) Fixed wing enter the airspace in a right hand pattern at 2,000 feet AGL unless situation dictates a different elevation.

b) Observe for aircraft – make visual contact with each assigned airborne aircraft.

III. Incident Management

A. Critical Initial Responsibilities – Safety and effectiveness are often established in the first minutes of the mission. The ATGS must:

1. **Determine Flight Hazards** – powerlines, antennas, excessive wind, poor visibility, airspace conflicts, etc. Request powerlines be de-energized as needed.
2. **Contact Aircraft** – that are over or approaching incident to:
   - **a)** Determine identifier, altitude, flight patterns and mission.
   - **b)** Assign altitude, flight pattern and routes as needed.
   - **c)** Confirm primary and secondary radio frequencies.
   - **d)** Inform that you will assume control of incident air operations.
3. **Contact Ground** – Operations on type I & II incidents, IC on type III & IV:
   - **a)** Announce location
   - **b)** Request status of resources
   - **c)** Request strategy, tactics, and mission priorities
4. **Determine Ground Elevations** – In order to determine appropriate aircraft working altitudes (may get elevations from lead plane or helicopter).
5. **Establish Air Traffic Control**
   - **a)** Determine procedures already in place (ask Lead Plane or Contract Pilots)
   - **b)** Add or modify as needed.
6. **Size Up Fire** – Make initial assessment and communicate critical safety, strategy, and tactics inputs to ground contact and/or dispatch. Size up form is in Appendix.
7. **Get Oriented** – develop a mental or sketched map of the incident that includes:
   - **a)** Cardinal directions.
   - **b)** Landmarks – roads, streams, lakes, mountains, improvements, etc.
   - **c)** Fire flanks, head, etc.
   - **d)** Visible work accomplished – dozer lines, handline, retardant line, etc.
   - **e)** Record GPS coordinates to identify reference points.
   - **f)** On type I & II incidents, review Incident Action Plan Map – division boundaries, helispots, etc.
8. **Assign Air Resources –** per Operations/ICs strategy, tactics, & mission priorities.
9. **Determine TFR Requirements** – vertical and horizontal dimensions. If needed, order through dispatcher or Air Operations Director.
10. **Check for Airspace Conflicts** – MOA's, MTR's, etc.

B. Inbound Aircraft Briefing – When aircraft check-in 12 miles from the center point of the incident (refer to discussion of Fire Traffic Area under section IV of Chapter 5), the ATGS provides the following information:

1. Assigned altitude and altimeter setting

2. Location and altitude of other aircraft

3. Flight hazard information

4. Holding pattern – or – clearance to enter airspace

C. Mission Briefing & Target Description – The ATGS directs aviation resources to mission areas and targets. Concise messages using standard terminology expedites the task and increases safety.

1. Mission Briefing – should include:

a) Objective and target or mission location

b) Frequencies – ground and air contacts

c) Clearance to do mission

d) Use a consistent message sequence – systematic communication of information in the same order assists the receiver in understanding the message under high stress and poor audio conditions.

e) For Helicopters – if possible, pilots should be briefed on ground before flight:

(1) Dip sites

(2) Flight routes

(3) Position report procedures

(4) Drop heights

(5) Avoiding "targets of opportunity."

(6) Identify from whom pilots will receive target information

2. Target Description – use these methods to describe operation areas and targets:

a) GPS reference points – in limited visibility (inversions), lat & long references can significantly increase safety while reducing radio traffic.

NOTE: Be aware that the standard datum for aviation GPS equipment is WGS 84 whereas many GPS units used by ground personnel default to a NAD 27 datum. The use of different datums may result in misinterpreting the location of a specific target. Ensure that the target location is confirmed with affected ground resources.

b) Fire anatomy – left and right flank, head, heel, etc.

c) Geographic Features – ridges, saddles, spur ridges, lakes, streams, etc.

d) Cardinal Directions – specify true or magnetic. Be exact! Often directions are generalized and create confusion.

e) Specific Activity – dozer working, previous drop, etc.

f) Elevation – specify above sea level (MSL)or above ground level (AGL)

g) Incident Features – helibase, helispots, fireline, division breaks, etc.

h) Standard Terminology – standard terms are in the Glossary.

3. Guiding Aircraft

a) Clock directions, left or right, etc.

b) Signal mirrors, ground panels, lights, etc.

c) Have an on-scene aircraft lead new aircraft to target area

d) Discuss targets when other aircraft is in a good position to see the target.

D. Coordination with Air Operations and/or Dispatch – Depending on whether the incident is initial attack or a large-scale incident; and how the agency/unit has set up dispatch protocol; the ATGS has some basic responsibilities to the dispatch center, or the Air Operations Branch Director. These include:

1. Advise with need for and dimensions of Temporary Flight Restrictions (TFR).

2. Notify of airspace conflicts with civilian or military aircraft.

3. Advise on need for airtankers to reload and return or standby.

4. Advise on aircraft incidents/accidents.

5. Project needs for next day – number of aircraft by type, time requested, etc.

6. Update on ATGS flight/duty hours used and projected needs to complete mission.

7. Request where airtankers should RON when day's operations are completed.

8. Advise on need for aircraft maintenance and projected availability for next day.

9. Advise if airtanker has in-flight difficulty, must abort load, and return to base.

10. Advise on need for ATGS relief.

E. Coordination with Ground Personnel – On type I & II incidents the ATGS works with the Operations, Division Supervisors, and other line personnel. On type III & IV incidents the ATGS works primarily with the IC and dispatch. The ATGS receives provided assistance to receives tactical briefings from operations personnel.

1. Provides Fire Intelligence – for tactical planning.

a) Current fire size and potential size estimate

b) Fuel models and rates of spread

c) Fire behavior elements (wind, terrain, aspect, etc.)

2. Recommends Tactics & Use of Resources

a) Target Locations

b) Access

c) Anchor points

d) Water sources

e) Potential helispots

f) Location of spot fires

g) Number and types of aircraft required

h) Direct versus indirect attack (ground and air resources.)

i) Use of specialized resources (helitack, rappellers, smokejumpers, paracargo.).

3. Provides Air Drop Safety for Ground Resources

a) Advises personnel of impending airtanker, helitanker, or paracargo drops in their work area and the need to clear the area.

b) If drops are near powerlines, determine status of lines (live or de-energized?) Advises ground personnel of danger of being near powerlines during drops.

c) Confirms with ground if run is to be a dry or live.

d) Notifies ground when drop is complete and personnel can return to work area.

4. Assists with Provision of Fire Safety for Ground Resources

a) Monitors personnel locations relative to fire perimeter, blowup areas, etc.

b) Assists with locating safety zones and escape routes. Final determination must be made from ground.

c) Monitors weather – advises personnel of approaching fronts or thunderstorms.

d) Advise personnel on adverse changes in fire behavior.

e) Directs air resources, as top priority, to protect and aid in evacuation of endangered personnel.

5. ATGS & Operations/IC Establish Authority for Ordering Drops – Determine who has authority to order drops and with whom the ATGS should communicate.

a) Before Containment – For ordering airtankers and helicopters, authority is usually given to Division Supervisor. Operations may serve as a clearinghouse.

b) After Containment – Division Supervisor has authority. May delegate authority to order helicopter support to Crew Boss level.

F. Coordination with Leadplane – Each incident is unique and circumstances dictate that ATGS and LEAD share the workload or temporarily assume some of the other's duties. Although ATGS and Leadplane pilot have distinct roles and responsibilities, their responsibilities overlap in several areas. Many Leadplane pilots have not had tactical firefighting experience and are not ATGS qualified. Conversely, most ATGS's are not Leadplane qualified. By prior agreement and after receiving a good briefing, a positive working relationship can be established.

It is critically important that ATGS and Leadplane pilot work as a team and share workload commensurate with fire complexity, training and position authority.

1. **Airtanker Mission Sequence** – typical procedures follow:

   a) ATGS and ground operations jointly determine tactical objects.

   b) ATGS briefs Leadplane on next target, coverage level, etc. (Leadplane may have already copied briefing from ground personnel to ATGS).

   c) Airtanker makes 12 nautical miles (see FTA) check-in with ATGS.

   d) ATGS briefs airtanker on altimeter setting, assigned altitude, other aircraft, and holding pattern.

   e) ATGS clears airtanker to enter incident airspace and contact Leadplane.

   f) Leadplane briefs airtanker on target, coverage level, etc. (Airtanker may have copied briefing from ground personnel to ATGS or ATGS to Leadplane).

   g) ATGS clears conflicting air resources from the airspace.

   h) ATGS clears ground personnel from target area.

   i) ATGS maintains radio silence on Air-to-Air while Leadplane and airtanker are working, particularly when on final approach or exiting the drop area. Note: If incoming airtankers reporting 12 nautical miles (see FTA) out are in conflict leadplane and airtanker in tow, then a separate airtanker briefing frequency for the Leadplane and airtanker in tow should be established. This can be VHF-AM or FM).

   j) Leadplane may do low level recon to determine hazards, targets, elevations, location of people, equipment, facilities, safe patterns and exit routes, etc.

   k) Leadplane briefs airtanker on objectives, flight route, coverage level, drift potential and hazards.

   l) Leadplane may make a dry run with airtanker on the intended drop route.

   m) ATGS confirms ground personnel are clear of target area.

   n) Airtanker makes drop(s). Airtanker may or may not require a lead.

   o) ATGS pilot positions aircraft to monitor and evaluate drop

   p) ATGS evaluates drop and gets ground feedback. Leadplane may also be able to evaluate drop. Evaluation includes; accuracy, coverage level, coverage uniformity, etc. Evaluation may reveal need to adjust to left or right. These adjustments are expressed in wing-spans or rotor-spans, not feet or yards.

   q) ATGS gives feedback to Leadplane and airtanker pilot after clear of drop area (Leadplane and airtanker may have already heard same feedback from ground).

   r) Leadplane and airtanker make adjustments as needed on subsequent drops.

   s) ATGS informs airtanker to load and return or hold at base.

t) ATGS informs ground when clear to return to work area.

u) Airtanker informs dispatch on airtanker status – load and return or hold.

2. Assuming Leadplane Duties – When a Leadplane is unavailable due to days off, arrival delays, out of flight hours, or refueling, the ATGS will assume the air tanker coordinator duties. The ATGS must maintain a minimum altitude of 500 ft AGL while assuming the air tanker coordinator role.

G. Maintaining Air Tactics Continuity – Complex air operations or air operations involving a mix of air resources requires continuous supervision by either a LEAD and/or ATGS. To maintain continuous supervision, the following procedures should be followed. Good planning will ensure continuity:

1. Stagger aircraft refueling so all aircraft are not down simultaneously.

2. Stagger airtankers to maintain continuous coverage.

3. Monitor flight times. Anticipate the need for a relief pilot, Leadplane or other air resource. Notify dispatcher or Air Operations Director in a timely manner.

4. Anticipate fuel needs and facilitate obtaining fueling facilities near the incident.

5. Recommend activation of portable reload bases to reduce turn-around time.

6. Coordinate refuel and relief needs with the Leadplane and/or HLCO to ensure continuity of airspace management/supervision.

H. Relief ATGS Guidelines – The ATGS job is mentally demanding. Long flight hours results in mental fatigue, reduced effectiveness, and compromised safety. Consider the following ATGS staffing guidelines:

1. If the ATGS will fly more than 4 hours on any one flight, assign a relief ATGS.

2. On multi-day incidents, assign a second ATGS and rotate about every 4 hours.

I. Diversion of Air Resources – Occasionally higher priority incidents require diversion of air resources. A reassignment may be given through dispatch or through IC/Operations. The ATGS may also be diverted to manage the new incident.

1. Briefing Diverted Resources – Upon receiving a divert notice, the ATGS must release and brief the requested resources on the following:

a) Incident location

b) Air and/or ground contact

c) Radio frequencies

NOTE: Tactical aviation resources may be diverted to a higher priority incident. The ATGS should be advised by Dispatch and amend incident strategy tactics as appropriate in coordination with incident Command and General staff.

2. **No Divert Request** – Under the following situations, the IC can request through dispatch that no airtanker be diverted to other incidents unless negotiated.
   - **a)** Danger to human life
   - **b)** Threat of excessive property damage
   - **c)** Critical tactical operation planned or underway

J. Before Leaving the Incident – The ATGS will:

1. Coordinate with LEAD, ASM1, ATGS or HLCO to ensure continuity of aerial supervision.
2. Notify Operations of ETD, and who will supervise air operations.
3. Notify air resources of ETD and whom they will report to.
4. Notify Operations/LEAD/HLCO/Incident Commander/Helibase when departing.
5. Notify dispatch of ETA.
6. If End of Day:
   - **a)** Plan release to allow for return within legal daylight flight restrictions (not necessary for twin-engine aircraft).
   - **b)** Update Operations on fire status.
   - **c)** Remind remaining resources of daylight restrictions.
   - **d)** Confirm with dispatch status of air resources – RON or return to home base. Inform air resources of their status.

K. Post Mission Responsibilities – Upon return to base, ATGS shall do the following as appropriate to the incident:

1. Confirm need for ATGS aircraft for next day and notify pilot of time, etc.
2. Debrief with available air resources (ATGS pilot, airtanker pilots, HLCO, leadplane pilot, helitanker pilots).
3. Debrief with Air Operations Branch Director and/or dispatch.
4. Attend or provide input to incident planning meeting for next day's operations.
5. Request and review Incident Action Plan and map for next day's operation.
6. Complete required records and reports.
   - **a)** SAFECOMs
   - **b)** Forms may be required for documenting retardant or aircraft performance, etc.
   - **c)** Documentation required for contracted aircraft
   - **d)** Organize, file and edit individual mission record

IV. Air Traffic Control – Terrain, visibility, number and type of aircraft, and TFR dimensions, and other factors influence requirements for maintaining safe separation.

A. General Air Traffic Control Principles

1. **Pilots** maintain aircraft separation by:
   - **a)** Using standard aviation 'see and avoid' visual flight rules.
   - **b)** Having access to the appropriate air-to-air frequency for position reporting – this is critical.
   - **c)** Adhering to Fire Traffic Area (FTA) procedures.
2. **ATGS** ensures aircraft separation by:
   - **a)** Structuring the incident airspace and briefing pilots.
   - **b)** Monitoring radio communications for:
     - *(1)* Pilot-to-pilot position reports.
     - *(2)* Blind call position reports.
   - **c)** Visually tracking aircraft as needed
   - **d)** Giving specific directions to pilots as needed
   - **e)** Advising pilots on the location and heading of other aircraft
   - **f)** Implementing (or amending) Fire Traffic Area procedures as appropriate for the incident.

B. Fire Traffic Area – Key components of a standard Fire Traffic Area include:

1. **Initial Contact Ring** – A ring 12nm from the center point of the incident. At this point, inbound aircraft contact the ATGS or appropriate aerial supervision resource for permission to proceed to the incident. Briefing information is provided to the inbound aircraft by the aerial supervision resource over the incident (ATGS, LEAD, ASM1, HLCO).
2. **No Communication (NOCOM) Ring** – A ring 7nm from the center point of the incident that should not be crossed by inbound aircraft without first establishing communications with the appropriate aerial supervision resource.
3. **Three (3) C's of initial contact** – Communication requirements and related actions to be undertaken by the pilot of the inbound aircraft:
   - **a) Communication** – Establish communications with the controlling aerial supervision resource over the incident (ATGS, LEAD, ASM1, HLCO).
   - **b) Clearance** – Receive clearance from aerial supervision resource to proceed to the incident past the NOCOM ring. Inbound pilot will acknowledge receipt of clearance or 'hold' outside the NOCOM ring until the clearance is received and understood.

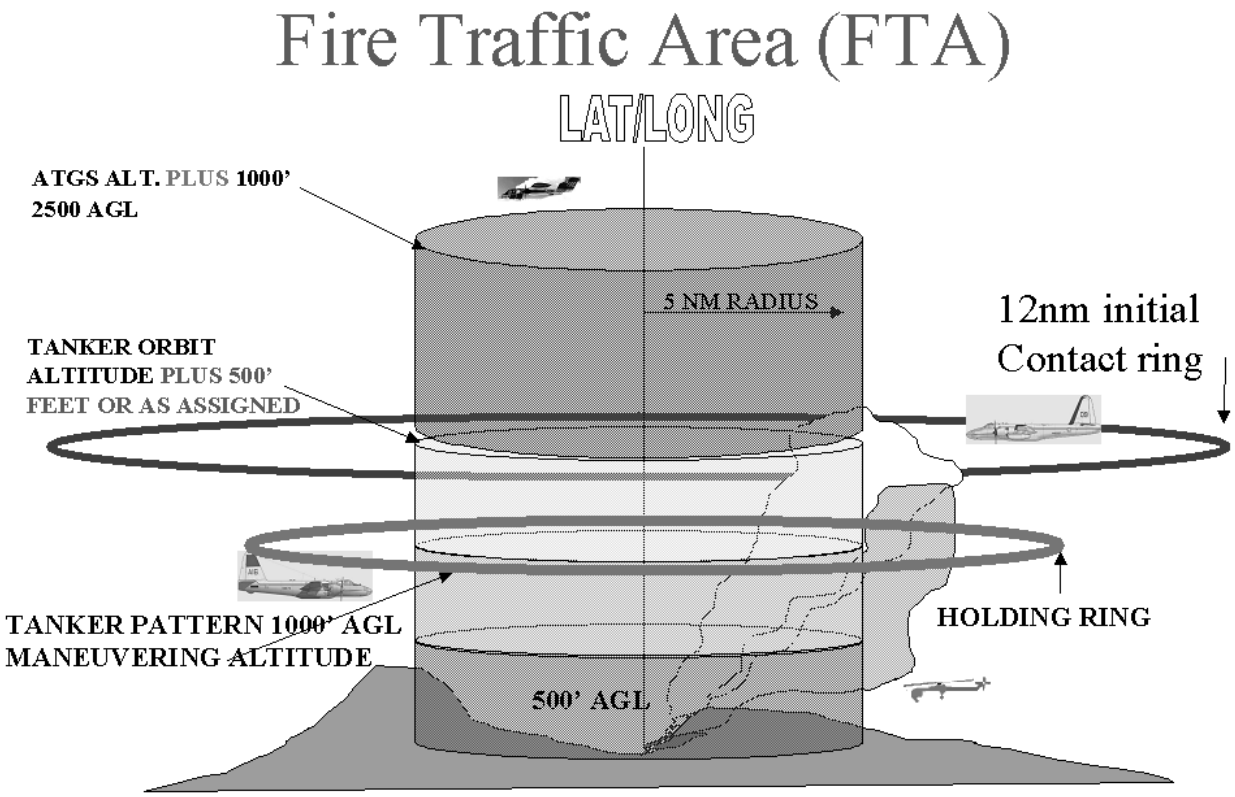
c) Comply – Inbound aircraft will comply with clearance from aerial supervision resource. If compliance cannot be accomplished, the inbound aircraft will remain outside the NOCOM ring until an amended clearance is received and understood.

4. Incident Ingress/Egress - The ATGS or other aerial supervision resource should advise inbound/outbound aircraft to remain ½ mile right of the centerline between the operating base and the incident to provide adequate horizontal separation between aircraft.

Use of VFR cardinal altitudes may be specified by the ATGS or aerial supervision resource to achieve vertical separation between aerial resources.

a) Eastbound: Odd thousand feet plus 500 feet (0 through 179 degrees)

b) Westbound: Even thousand feet plus 500 feet (180 through 359 degrees)



NOTE: The coordinates of the incident must be verified, updated as needed, and communicated to Dispatch to ensure that inbound incident aircraft can determine the appropriate points at which to initiate initial contact and/or hold if communications with controlling aircraft are not established.

C. Vertical Separation

1. 500 feet is the minimum vertical separation for missions in the same airspace.
2. 1000 feet should be used when visibility is poor or other factors dictate.
3. Assigning block altitudes (with vertical range up to 500 feet) to orbiting fixed-wing is preferred in windy or active thermal conditions.
4. Stacking more than two airtankers is discouraged due to increased flight costs, added air congestion, and the difficulty of airtankers to gain and lose altitude.
5. Standard operational altitudes are:

Mission	AGL (feet)	Normal Pattern
Media	As assigned	Right or left
ATGS – Fixed Wing	2000 to 2500	Right
ATGS – Helicopter	500 to 2000	Right or left
Airtanker (#2)	1000 to 1500	Left – outside to observe
Airtanker (#1).	150 to 1000	Left
Lead plane	150 to 1000	Left
Helicopters	0 to 500	Left or right
Smokejumper Ram Air Chute	3000	Left
Smokejumper Round Chute	1500	Left
Paracargo	150 to 1500	Left

D. Horizontal Separation

1. **Visibility** must be good.
2. **Flight Patterns** must be adequate, i.e. not hindered by terrain.
3. **Consult Pilots** before finalizing patterns and routes.
4. **Advise Pilots** on location of other aircraft if visual contact has not been reported.
5. **Air-to-Air Frequency** must be accessible for pilots to give position reports.
6. **Geographic References**, such as a ridges or a river, can be used to separate aircraft provided aircraft maintain assigned flight patterns.
7. **No-Fly Zones** must be established to ensure safe separation when simultaneous missions at the same elevation are within close proximity.

   a) **Below Ridges** – For operations separated by a ridge, a "no-fly zone" 500 feet vertically below the ridge top can be established to ensure separation.

   b) **Near Geographic Dividing Lines** – If simultaneous operations near the dividing line are in conflict, a horizontal "no-fly zone" must be established or missions must be sequenced to ensure adequate separation.

E. Incident Entry & Exit Corridors – ATGS, HLCO and LEAD shall determine incident entry/exit corridors as needed. All aircraft must be notified of corridors. If an entry corridor and exit corridor cannot be separated horizontally, then they must be separated vertically (refer to Incident Ingress/Egress discussion above).

F. Holding Areas – The ATGS assigns aircraft to non-conflicting airspaces, or holding areas, as needed.

1. **Airtankers** can be held near an incident, two or three at a time, in the same holding area. More than one holding area may be used. Considerations include:
   - **a)** Pilots must be aware of other aircraft in the holding area.
   - **b)** Pilots must be able to communicate position reports to each other
   - **c)** Holding area must be clearly defined – by a geographic reference point or distance and direction relative to the incident. Usually a "race track" pattern with one tanker following the other at the same altitude providing their own visual separation.
2. **Helicopters** can be held on the ground or in the air as needed to maintain adequate separation. Considerations include:
   - **a)** Common helicopter holding areas include obvious landmarks, helispots, helibase, dip sites, etc.
   - **b)** Pilots should be able to maintain forward flight rather than constant hover.
   - **c)** Long periods of holding helicopters should be done on the ground.

G. Sequencing – Aircraft may be sequenced into the same area provided each aircraft can complete its mission and exit the area before the next aircraft enters the area. Sequencing requires close supervision. **Caution** – Consider wake turbulence when sequencing type I and II resources with type III and IV resources.

1. **Sequencing Airtankers & Helicopters** – Helicopters can be held at a safe distance from drop site until an airtanker has completed its drop.
2. **Sequencing Airtankers & Paracargo** – Stage aircraft 180^0 apart in the same flight pattern so flights over the target area are controlled by position in orbit.

H. Interval Dispatching – To reduce the problem of too many airtankers over an incident at the same time:

1. Determine number of airtankers to be used without excessive holding or stacking.
2. Request dispatch launch airtankers at intervals (usually 10 to 15 minutes).

I. Check Points – Effective for maintaining air traffic control with minimal radio traffic on the Air-to-Air frequency. Pilots are instructed to report their location and destination "in the blind" when crossing check points. Or pilots may be required to report arrival at a check point and wait for clearance from ATGS before proceeding.

1. **Fixed-Wing Checkpoints** – Orbit location (turning base, on downwind, on final), crossing highway, over mountain, etc.
2. **Helicopter Checkpoints** – Departures from helispots or dip sites, arrival at target or helispots, etc.

J. Helicopter Routes – Established for repetitive missions from helibase to helispots or sling points, from dip sites to targets, etc. For safety, efficiency and monitoring, the ATGS, in consultation with the helibase manager and/or helicopter pilots, will ensure flight routes and communications procedures have been established and are known:

1. **Well Defined Routes** – up one stream and down another, up one side of drainage and down the other side, up one side of a spur ridge and down the other, etc.
2. **Air-to-Air Communications** – Pilots must have ready access to the Air-to-Air frequency in order to maintain separation. If needed, separate Air-to-Air frequencies should be established for helicopters and airtankers. The original Air-to-Air frequency should be retained for airtankers.
3. **Check Points** – determine as needed for blind calls.

K. Helicopter Daisy-Chains – Two or more helicopters can be assigned to the same targets and dip sites for repeated water drops. The ATGS, in consultation with helicopter pilots, will establish a "daisy-chain" flight route for these operations.

L. Helicopter Recon Flights – These flights can be difficult to monitor. Consider the following procedures to maintain safe separation of aircraft:

1. Schedule recon flights during slow periods, i.e., when airtankers are loading.
2. Assign a specific route for the recon, ex. clockwise around and 100 yards outside the incident perimeter.
3. Establish Check Points, i.e. division breaks, helispots, drainages, etc.

M. Intersecting Routes – Intersecting aircraft routes shall be clearly identifiable geographically. Intersections shall have a minimum of 500 feet vertical separation.

N. Non-Standard Patterns – Occasionally terrain, visibility, wind direction or other factors require flight patterns be modified or reversed. The mission pilot, LEAD, or HLCO shall advise ATGS of situation and request a deviation from standard procedures. The ATGS will advise other aircraft before granting the request.

V. Retardant Effectiveness, Coverage Levels, & Drop Patterns

A. Factors Affecting Drop Effectiveness & Coverage Level – A number of factors affect drop accuracy, line width and length, and coverage level required for a particular fuel model and fire intensity. These factors include:

1. **Pilot Skill Level** – Ability to make accurate drops.
2. **Aircraft Make & Model** – Each aircraft make and model has advantages and disadvantages in different operating environments. Performance elements include power, maneuverability, pilot's visibility and airspeed control.
3. **Tanking, Gating, or Door System** – Quantity of liquid, tank configuration, flow rate and door release mechanism.

   a) Airtanker Delivery Systems

   (1) **Variable Multiple Tank/Door System** – This system uses an electronic intervolometer to activate door openings singly, simultaneously, or in sequence at specified intervals. The pilot programs the intervolometer to deliver the ordered coverage level. The number of doors in airtankers varies from 1 or 2 in Type IV to 16 in the largest Type 1. Most Type I and II airtankers equipped with multiple tanks have 6 or 8 doors. If in doubt, confirm with the airtanker pilot. Knowing the number of doors is a must when you want a number of separate drops.

   (2) **Constant Flow System** – This system uses one tank reservoir with two doors, controlled by a computer. The computer controls the door opening interval and quantity of retardant dropped. This will produce an even coverage level. The pilot programs the coverage level desired and the computer delivers the retardant evenly at the programmed coverage level and line length. A few of the Type 1 and 2 airtankers have the constant flow system. Multiple drops of varying coverage level and distance are possible. A gauge indicates the amount of retardant remaining in the tank.

   b) Helicopter Delivery Systems – Some systems can regulate flow rate and are capable of multiple or partial drops. Many helicopters are equipped with units for injecting foam into the bucket or tank.

   (1) **Buckets** – Two basic types of bucket are currently being used:

   (a) Rigid Shell Buckets – Some capable of multiple drops

   (b) Collapsible buckets (and foldable) - Some capable of single drop only

   (2) **Fixed Tanks** – A variety of tank systems have been developed by different operators and agencies. Most these can be quickly attached to the fuselage. The tanks are generally filled using a snorkel while the helicopter is hovering over a water source. The helitanker can also be filled on the ground using standard cam-lock hardware.

   Minimum water depth requirements for the snorkel fill system are 18 inches to 3 feet. (Ex., S-64 Sky Crane with a 2500 gallon tank, foam injection, hover fills from 18 inches in 45 seconds, and provides prescribed coverage level from metered flow door system).

4. **Drop Height**

   a) **Airtankers** – The minimum safe drop height is 150 feet above vegetation. Normally drops are made from 150 to 250 feet above vegetation. Increased height reduces coverage level and increases line width. The most uniform and efficient retardant distribution is attained when near vertical fall of the retardant occurs. The optimum drop height is when the momentum of the load stops its forward trajectory and begins to fall vertically. SEAT minimum drop height is 40 feet.

   b) **Helicopters** – Height is critical in terms of accuracy, effectiveness, and effect of rotorwash on fire behavior. Helicopter must be high enough to not cause flare-ups. Forward air speed results in less rotorwash. Type 1 helicopters, even with a 200 foot longline, produce strong rotorwash.

5. **Aircraft Speed** – Airtanker drops, depending on the type of aircraft, range from 120-140 knots. Faster speeds generally reduce peak coverage levels, increase pattern momentum, and increase low coverage length.

6. **Diving vs Climbing** – A diving maneuver tends to shorten the pattern and increase coverage levels. Conversely, a rising maneuver tends to toss or loft retardant and elongate the pattern.

7. **Wind** – The effect of wind is to deflect retardant and greatly increase the pattern's fringe area. The effectiveness of retardant/water drops should be closely evaluated when wind velocities reach 15 mph. Retardant drops are generally not effective in winds 25 mph or greater.

   a) Headwind – the effect of dropping into the wind is to shorten the line length and reduce coverage level.

   b) Cross-wind drops will result in increased line width and cover a larger area at reduced coverage levels.

8. **Types of Long Term Retardant** – Two basic types of retardant are used. These are water-like and gum-thickened. At higher drop speeds gum-thickened retardants are generally best.

9. **Flight Route**

   a) **Route Safety** – Approaches and exits must allow for a level or downhill flight maneuver. No uphill flight routes for airtankers!

   b) **Visibility** – Poor visibility from smoke or sun may preclude using the safest and most effective route. Alternate routes may be acceptable, but may result in less effective drops.

10. **Flame Lengths** – Direct Attack with retardants at the prescribed coverage level are generally effective in flame lengths up to 4 feet. Flame lengths from 4 to 8 feet require increasingly higher coverage levels. Retardant, unless applied in heavy coverage levels and greater widths, is not generally effective when flame

lengths are greater than 8 feet. Long term retardant is most effective when applied to available fuels outside of the fire perimeter.

11. **Canopy Density** – Drops in timber or fuel models with a dense concentration of tall trees (west coast old growth timber or dense stands of advanced reproduction) are often ineffective. Canopy interception significantly reduces penetration to ground fuels. An open canopy allows for better penetration.

12. **Availability of Ground Forces** – Except in light fuels where extinguishing the fire with retardant may be possible, the ATGS must determine if ground forces will be able to take advantage of the retardant within reasonable time limits (generally 1 hour or less).

B. Retardant Coverage Levels

1. **Definition** – Coverage level refers to the number of gallons of retardant applied on fuels per 100 square feet. Fire scientists have determined how many gallons per 100 square feet (GPC) it takes to effectively retard flammability in fuel models under normal flame lengths. Coverage levels range from .5 to greater than 8. The ATGS instructs airtanker pilots to make drops at specific coverage levels.

2. **Recommended Coverage Levels** – The chart below identifies the recommended coverage level for each fuel model. The coverage level may need to be increased under more adverse burning conditions or when retardant does not effectively penetrate a heavy tree canopy.

Coverage Level	Fuel Models		
	NFDRS	**NFFL FB**	**Description**
1	A,L,S	1	Annual Perennial Western Grasses, Tundra
2	C	2	Conifer with Grass, Shortneedle Closed
	H,R	8	Conifer, Summer Hardwood.
	E,P,U	9	Longneedle Conifer, Fall Hardwood.
3	T	2	Sagebrush with Grass
	N	3	Sawgrass
	F	5	Intermediate Brush (green)
	K	11	Light Slash
4	G	10	Shortneedle Conifer (heavy dead litter)
6	O	4	Southern Rough
	F,Q	6	Intermed. Brush (cured), Black Spruce
Greater Than 6	B,O	4	California Mixed Chaparral; High Pocosin
	J	12	Medium Slash
	I	13	Heavy Slash

C. Airtanker Drop Patterns – By opening one or more doors simultaneously or in quick succession, a variety of patterns and coverage levels can be achieved. The ATGS must know the number of doors that can be dropped singly or in combination, various drop pattern options, and the coverage level required for various fuel models.

1. **Salvo Drop** – One or more doors are opened simultaneously. Generally used on small targets such as spot fires or targets requiring heavy coverage levels. Rarely is a full salvo ordered.
2. **Trail drop** – With multiple tank systems, two or more doors are open sequentially and at specified intervals giving continuous overlapping flow over a desired distance at the required coverage level. The same result is obtained with constant flow systems by opening the doors partially.

D. Helicopter Drop Patterns – In a hover a helicopter can deliver a salvo drop, while in forward flight it can deliver a trail drop.

E. Airtanker Line Length Production Chart – This chart displays line production by coverage level and gallons dropped for drops made at the recommended drop height and airspeed. The chart should be used as a general guide and will need to be adjusted for specific tank systems, airtanker make and model and the actual drop conditions.

	Airtanker Line Length Production Chart						
Volume Dropped (Gallons)	**Coverage Level**						
	0.5	**1**	**2**	**3**	**4**	**6**	**8**
800	2,246	1,114	526	311	189	38	0
1,000	2,337	1,202	607	384	255	90	0
1,200	2,429	1,289	687	458	321	142	9
1,400	2,520	1,377	768	531	387	194	46
1,600	2,611	1,465	848	604	454	245	84
1,800	2,702	1,552	929	678	520	297	121
2,000	2,794	1,640	1,009	751	586	349	158
2,200	2,885	1,728	1,090	824	652	400	196
2,400	2,976	1,815	1,170	897	718	452	233
2,600	3,068	1,903	1,251	971	784	504	270
2,800	3,159	1,991	1,331	1,044	850	556	308
3,000	3,250	2,078	1,411	1,117	916	607	345

VI. Strategy & Tactics

A. Aerial Application Strategy – Strategic principles that apply to ground operations also apply to air operations. Based on fire intensity, rate of spread, resource availability, and estimated line production rate – select a strategy that is achievable. As in ground tactics, the most effective strategy is usually anchor, flank and pinch.

Water scooping aircraft (CL-215 or CL-415) can be used to support suppression actions by dropping water and/or foam. Refer to pg. 6-7 4f) for further information.

1. **Large Fire Strategies –** On project incidents the incident action plan may employ one or more of the following aerial application strategies:

   a) **Direct attack** – drops next to fire edge in support of ground forces.

   b) **Parallel attack** – generally parallel to and within a hundred feet of perimeter. Anticipates lateral fire spread, worker comfort/safety and line construction rates. Multiple parallel drops can be used on unburned fuels of fast moving high intensity fires to increase line width.

   c) **Indirect attack** – supported by pre-treatment

   d) **Flanking attack**

   e) **Burnout and backfire support**

   f) **Fireline reinforcement**

   g) **Structure protection**

   h) **Augmentation of personnel safety** – i.e. pre-treatment of a safety zone

2. **Small Fire Strategies** – The following strategies are effective on small fires. The strategies can provide a temporary containment line or a combination containment line and general retardant coverage of the entire fire

   a) **Direct Attack** – Use when ground support is available and containment or extinguishment is likely. Direct attack the head when you are assured you won't be outflanked, fire behavior is low to moderate, and your initial load has a good chance of achieving the objective.

   b) **Box or "V" Pattern** (Relatively flat terrain) – A single airtanker often can make multiple drops forming a retardant line around a small fire.

   c) **Parallel or Stacking Pattern** (Steep Ground) – When steep terrain precludes boxing a fire, flight routes must be contoured to the slope. Generally, drops are started at the top and progress to bottom of the fire.

   d) **Full Coverage Drop** (Delayed attack fires and spot fires) – To control fire intensity and spread, drops should blanket the entire fire. Multiple drops may be required to get a heavy coverage level. On small fires the chance of a partial hit on the first drop is significant. It is wise to drop a partial load on the first pass. The experience of the first drop plus feedback from the ATGS and the ground will likely increase the accuracy on the next drop.

B. General Tactical Considerations – Tactical plans are based on the chosen strategy and a working knowledge of the following principles. The following will help in developing and carrying out an aerial tactical plan.

1. **Simplicity & Flexibility** – Stick to a few basic tactical objectives. Be ready to change priorities as needed to achieve strategic objectives.

2. **Retardant versus Water or Foam** – Unless there are environmental constraints, retardant application may be preferred compared to the use of water or foam. If long term retardant is required, don't rely on water or foam – they normally require immediate (0-30 minute) follow up.
3. **Proper Coverage Level** – Use the proper coverage level for the fuel types.
4. **Dense Canopies** – Multiple drops may be required to penetrate canopies and treat surface fuels with proper coverage level.
5. **Sustained Attack** – To effectively lay a retardant line under normal fire conditions, continuous drops supported by ground forces are required. Calculate turn-around time and order enough aircraft to maintain a sustained attack.
6. **Use Down Sun Routes** – Avoid flight routes directly into sun on the horizon.
7. **Blow Ups** – Direct or parallel attack is usually ineffective. Shut down operations until conditions are more favorable or concentrate on pre-treatment targets.
8. **Target Priorities** – Retardant use is usually prioritized in the following order:
   - **a)** Human Safety
   - **b)** Structure Protection
   - **c)** Natural Resources
9. **Portable Retardant Plants** – Where long turn-arounds or lack of large airtankers will not provide a sustained attack, consider ordering a portable retardant plant and type I /II helicopters or SEATS. Within 24-36 hours portable plants can be delivered and set up on or near an incident. Some operators can provide a module consisting of a type I helicopter, portable plant, retardant and mixing crew. Not all retardants are approved for fixed tank helicopters. Consult the qualified products list for approved retardants.
10. **Staggered Duty Hours** – Stagger aircraft duty hours to provide availability during early morning through end of daylight.
11. **Early Morning Drops** – Often the most effective. Don't wait until it's too late to order retardant. Use drops to prevent problems, not to cure them!
12. **Wind Drift** – An increase in coverage level may be required to reduce the effects of drift. Caution – Maintain safe drop height.
13. **Critical Targets** – On initial attack incidents, identify targets for attaining quick containment and drop on these first.
14. **Anchor Points** – Work from an anchor. Re-establish the anchor if it is lost. Terrain may dictate flights are flown toward, rather than from, an anchor point.
15. **Maximize Line Production by**:
    - **a)** Keeping lines relatively straight – minimize angles
    - **b)** Taking advantage of natural barriers and lighter fuels

c) Allowing pilot to select the best and safest flight route

16. **Gaps in Line** – Observe for gaps in retardant, foam or water line. Pickup gaps with subsequent drops or with ground resources.

17. **Plan for Extending & Intersecting** – Plan current drops so they can be extended or intersected effectively by future drops.

18. **Anticipate Spot Fires** – Generally downwind of smoke columns.

19. **Control Fire Intensity** – With direct drops on or next to fuels. Effective only when immediately followed up by ground forces.

20. **Reduce Spotting Potential** – With pretreatment drops on fuel beds.

21. **Maintain Honest Evaluations** – To assist pilots with making corrections.

22. **Use Correct Resources** – Match resources to correct tactical objectives.

23. **Retardant Drops Near Water Resources** – Agency policy and Unit level tactical plans may restrict the use of airtankers and helicopters near water resources. When drops are planned in sensitive areas, the ATGS should contact the local unit or a Resource Advisor for applicable policy restrictions (e.g., Interagency policy prohibits dropping retardant within 300 feet of stream courses).

    a) Locate and map water resources within the tactical air operations area.

    b) Determine safe drop distances.

    c) Monitor wind conditions and drift and adjust restrictions as necessary.

    d) Use helicopters to maximize drop accuracy.

C. Airtanker Tactical Considerations

1. **Airtanker Advantages –** Often reserved for initial attack because:

    a) High Cruise Speed – Airtankers fly fast and arrive at most fires long before helicopters can be dispatched. Airtankers may be the only aerial resource available if an incident has no dip sites or portable mixing plant options.

    b) Long Range – High speeds and fuel loads allow airtankers to cover broad geographical areas. They often respond to multiple incidents on one flight.

2. **Permanent Reload Bases** – Airtankers are loaded at permanent bases. Portable bases able to serve all types of airtankers may be set up for special situations.

D. Helicopter Tactical Considerations

1. **Helicopter Advantages & Use** – Helicopters are often a very cost effective resource on extended attack and project incidents because of the following:

    a) Short Turnaround Times – A type I helicopter with a 3-minute turn-around can deliver upwards of 45,000 gallons per hour (Boeing 234, S-64). By

comparison a type I airtanker will typically deliver 2000 to 3000 gallons per hour based on a one-hour turn-around.

b) Low Speed & Drop Accuracy – The ability to do hover or low speed drops makes helicopters very accurate if flown by an experienced pilot. Helicopters are an excellent choice for; targets in confined airspaces in steep and dissected terrain, small targets where airtanker drops may be wasted by covering a larger than required area, to treat gaps in airtankers line, in low visibility situations (smoke, low ceiling) where airtankers cannot fly, near water resources to minimize the potential for water contamination, and in the urban interface environment where accuracy is paramount. Caution – Drops on steep slopes may dislodge rocks onto crews below.

2. Dip Sites – For an effective helicopter operation, good water sources are required. Sources can include wide mouth portable tanks. The ATGS should inventory suitable dip sites. Following are considerations:

a) Approaches should be into wind. Determine if wind direction is the same at hover level as it is at the dip site level when using a longline.

b) Helicopters equipped with a tank and snorkel require water depth of 18 inches to 3 feet for hover filling.

c) Be aware of any local resource concerns and fire management plan restrictions – ask the local fire managers and/or dispatch for specifics.

d) Approach, departure, and dip site must be free of hazards.

e) Avoid fast moving streams and rivers.

f) Avoid contamination of water resources from buckets or snorkels that have previously been used in foam or retardant dip sites and/or any other resource contamination concerns (i.e. Whirling disease).

g) On private lands, attempt to secure permission from the landowner before using a private water source. This may be addressed in a pre-attack plan. Anticipate the need and secure permission before the need arises.

h) Utilize dipsite managers (when available) to provide an added margin of safety at established dipsites.

3. Longline Bucket Operations

a) Effective for dipping out of close quarters (ex. dipsite surrounded by tall timber)

b) Reduce rotor wash on the fire.

c) Effective for filling portable tanks.

4. Establish Direct Communications between Helicopters & Ground Contacts – If Air-to-Ground is too congested; assign Division frequencies for direct communications between ground contact and helicopters.

5. **Allow Pilots to Select Drop Approach**

   a) Cross-slope, usually most preferred

   b) Downslope, second choice

   c) Upslope or downwind, least desirable approach

6. **Helicopter Utilization by Type**

   a) Type II and III helicopters can work together but do not integrate Type I helicopters unless all pilots involved are comfortable with pattern and separation.

   b) Type I and II helicopters can be effective for line production.

   c) Use type III helicopters on isolated targets requiring lower volumes of water.

7. **Helicopter Drop Height** – Is critical in terms of accuracy, effectiveness, and effect of rotorwash on fire behavior. Look for flare-ups after drops.

VII. Initial Attack & Multiple Fire Operations

A. Assuming Control of Air Operations In Progress – The ATGS often arrives after other air resources have arrived. Before assuming control the ATGS should:

1. Monitor air traffic and Operation's frequencies while inbound to the incident
2. Contact air and ground resources to determine status of air resources on-site.
3. Allow safe operations in progress to continue temporarily.
4. Make assessment of the incident.
5. Brief the IC of assessment and make recommendations and/or request IC's strategy and tactics and mission priorities. The experience level of an initial attack IC determines the ATGS role.
6. Establish contact with key ground operations personnel.

B. Initial Attack Mission Priorities – Often during initial attack several aircraft arrive at the same time. Each resource has different altitude, route, and time requirements. While some missions can be done simultaneously, the confined airspace usually requires priorities be established based on:

1. **Time** – Typical time requirements for common missions are:

   a) Helitanker drop: 1-2 minutes

   b) Helitack: 3-5 minutes

   c) Helicopter rappel: 5-8 minutes

   d) Airtanker: 7-15 minutes (one vs. multiple drops)

   e) Smokejumper: 15-30 minutes. (depends on number of jumpers to be dropped)

2. **General Considerations**

a) Which resources are ready?

b) Can any resources be held or parked?

c) Can any missions be done simultaneously?

d) Can any mission be done in stages?

e) Conditions that if delayed may preclude mission completion, i.e. fuel remaining, pilot duty/flight time remaining

3. Normal Priority – Considering all factors, the normal priority is:

a) Helitanker

b) Airtanker

c) Helitack

d) Heli-rappel

e) Smokejumper

C. Initial Attack Responsibilities with no IC – The ATGS, in consultation with dispatch, has the following responsibilities on initial attack incidents with no IC:

1. Make initial fire size up (form in Appendix).

2. Recommends specific resources based on fire behavior, access, response time, resource availability and capability.

3. Develops tactical plan.

4. Gives periodic status reports to dispatch or responding resources.

5. Assists responding resources with locating the incident.

6. Brief ground resources on potential safety concerns and fire behavior.

7. Assigns arriving resources based on tactical plan until a qualified IC arrives.

D. Multiple Fire Situations – An ATGS may be activated during predicted or active lightning storms when multiple fire starts are likely to assist with:

1. Fire Detection – lat and longs, legal descriptions, VOR and distance, etc.

2. Incident Priorities – based on:

a) Threat to life and property

b) Land management designation

c) Fire behavior – current and expected spread

d) Environmental sensitivity

e) Political considerations

f) Potential resource loss

3. **Determining Access** – Roads, trails, distance, and time requirements.
4. **Recommend Initial Attack Resources** – based on resource capability, mode of access, probable availability and response time.
5. **Develop Initial Attack Strategy & Tactics –** based on fire behavior, resource objectives, type and numbers of air and ground resources responding within specific time frames.
6. **Direct Resources –** per strategic and tactical plans until a qualified IC arrives.
7. **Report Intelligence –** to dispatch and/or IC.
8. **Reassign Resources** – to higher priority incidents if they develop.

E. Delayed Attack Fires – When many small fires have started in a widespread area, resources are usually in short supply. An ATGS may be assigned to assess and prioritize fires. Delayed attack fires, or fires that cannot be staffed within a few hours, may require a holding action until ground resources are available. Timely drops while the fire is small can be effective in holding or containing a fire temporarily. Retardant is much more effective than water. One type II or II airtanker can make holding drops on three or four small fires. During these situations the ATGS will:

1. Determine delayed attack fires requiring retardant. Request resources as needed
2. Set priorities. Consider flight time between fires. If priorities are equal, consider dropping on fires in close to each other before moving to fires some distance away.
3. Direct retardant drops. General covering of the entire fire is recommended when controlling both fire spread and fire intensity. While drops covering the fire reduce fire intensity, they also make burnout operations difficult if not impossible.
4. Monitor status of fires. Change priorities as necessary.

VIII. Urban Interface Incidents – Airtankers and helitankers can be effective on urban interface incidents. If improperly managed they can be a serious hazard to the public and a liability to the responsible agency. Consider the following in the urban interface:

A. Policy and Regulations – Fires in the urban interface are considered to be in "congested areas." Refer to Chapter 4 for more detail.

1. **Assign a Lead Plane** – as required under FAR 91.119 – USDA Grant of Exemption 392. Refer to Chapter 4 for specific requirements.
2. **Implement a Temporary Flight Restriction** (TFR) – under 14 CFR 91.137 if the incident meets the criteria for implementation. Refer to the Interagency Airspace Coordination Guide, TFR and NOTAM chapter.
3. **Assign an ATGS**

B. Urban Interface Hazards – The following hazards to aircraft are often associated with urban interface incidents.

1. Dense smoke and poor visibility

2. Power lines (may have to be de-energized)

3. Antennas

4. Tall buildings

5. Media aircraft

6. Propane tanks

C. Ground Safety – Urban interface incidents often have many citizens and homeowners scattered through the operations area. This can seriously impair tactical air operations and expose ground personnel to extreme risk.

D. Effectiveness of Resources – As urbanization increases tactical effectiveness decreases. It becomes more critical that airtanker and helitanker drops be closely supervised to prevent inadvertent drops on non-incident persons and unnecessary damage to improvements. The ATGS is responsible for providing the best available resources that can:

1. Minimize risk to people and improvements.

2. Provided there is an adequate water source, the type 1 helicopter, with its maneuverability, drop accuracy, and quick turn-around time, is the best resource in the classic occluded urban interface.

3. Drops are generally not effective on structures that are burning beyond the initial start phase or if the fire is inside the structure.

E. Urban Interface Tactical Planning Principles – Apply the following principles in developing the tactical plan and making air resource assignments:

1. Assess the situation and identify the following:

a) Identify air operation hazards

b) Locate non-incident people in operations area

c) Protection of evacuation routes

d) Triage structures

e) Identify possible dip sites and portable retardant plant sites

f) Determine how air resources can best support suppression objectives

2. Request electrical transmission lines are de-energized. Don't assume that they will be. Warn ground personnel not to be under or near power lines during drops.

3. Determine where airtankers or helitankers can be most effective.

4. Recommend location of portable retardant or water dip sites.
5. Use airtankers in areas where visibility, hazards, flight routes, crowd control and target selection ensure reasonable effectiveness and acceptable risk.
6. Use helitankers on targets requiring more maneuverability and accuracy under conditions that would preclude safe and effective airtanker operations.
7. When possible, avoid holding patterns with air tankers over populated areas.

IX. Risk Management

Risk Management and Risk Assessment. The terms 'risk management' and 'risk assessment' are often used synonymously when, in fact, they are different.

A. Risk Management. Risk management enables personnel at all levels to do exactly what the term implies: manage risks. The term is best applied generically, as individuals are confronted by a variety of risks: training risks, fiscal risks and safety risks. Safety risk management, however, is a specific type of risk management.

Alternative methods (for example, performance of the mission by ground) should always be considered. In accordance with Federal Aviation Regulations (FAR's), the pilot always retains final authority for the operation when safety of the aircraft and occupants is a factor.

Hazards might not always be limited to the performance of flight, but may include hazards to personnel if the flight is not performed.

Any flight mission has a degree of risk that varies from 0% (no flight activity is conducted) to 100% (aircraft and/or personnel experience a mishap).

Risk Continuum

0% (No Flight Activity) |----------→ ----------→ ----------| **100% (Accident Occurs)**

B. **Risk Assessment.** Risk assessment is <u>part</u> of the risk management process. Risk assessment can range from simple to complex. The process of assessing risk causes personnel to identify hazards, analyze the degree of risk associated with each, and place hazards in perspective relative to the mission or task. It is understood that any risk management decision is a subjective process. The risk assessment may include the Air Tactical Group Supervisor, Air Operations Branch Director, Duty Officers, agency Fire Management Staff, Incident Commanders, Dispatchers and Line Officers/Managers. Ultimately the pilot in command has the authority to decline a flight mission that he or she considers excessively hazardous.

C. **Applied Risk Management.** Prior to and during ongoing aviation operations, the Air Tactical Group Supervisor must identify hazards, analyze the degree of risk associated with each, and place hazards in perspective relative to the mission or task.

While there is no way to define an exact trigger point for ceasing aviation operations, the factors listed below will be evaluated to determine whether additional aerial supervision resources need to be ordered or aviation operations should be suspended:

- Complexity of aviation operations
- Communications
- Geography/terrain (fire size, position on slope, location, etc.)
- Firefighter and public safety
- Poor Visibility
- ATGS Fire Orders & Watch Out Situations – in Appendix.
- Fire weather and fire behavior

It is the Air Tactical Group Supervisor responsibility to consider these factors and make the determination whether to order additional aerial supervision resources to meet the situation or terminate the operation.

Various interagency manuals and operating guides contain tools that can be used by the ATGS as risk management analysis and documentation tools. Examples include:

- Incident Response Pocket Guide
- Interagency Helicopter Operations Guide
- Interagency Standards for Fire and Aviation Operations (Red Book)

1. **Mitigating Risks** – In some cases the ATGS may have to shut down air operations. Air operations must not proceed until risk mitigation measures are implemented. Risk mitigation measures to consider:

   a) **Plan Special Missions Carefully** –When discreet radio frequencies are used during special operations, ensure air-to-ground, and air guard frequencies are monitored by appropriate ground personnel as well and that they are aware the ATGS can be contacted on these frequencies.

   b) **Order Additional Frequencies** – Order additional frequencies as needed for flight following, position reporting, or briefing. Obtain discreet frequencies for helicopter flight following and/or airtanker tactical briefing.

   c) **Document Poor Performance** – Advise dispatch/Air Operations Branch Director or COR.

d) Establish Specific Communications Procedures – Use check-points and blind call air-to-air position reporting. Encourage concise radio communications and discourage unnecessary radio traffic.

e) Establish Positive Air Traffic Control – Hold aircraft in the air or on the ground until structured traffic patterns can be established.

f) Require Landing Lights Be On – to increase aircraft visibility.

g) Limit Number of Airborne Aircraft – Limit number of aircraft working an incident per visibility, routing procedures and communications capability.

h) Monitor Pilot Stress – Carefully monitor communications for pilot comfort and airspace safety. Ensure rest breaks are provided as needed.

i) Obtain Input – Discuss operations safety with Leadplane, Helicopter Coordinator and contract pilots. Pilots must be consulted before establishing complex routes or patterns.

X. Emergency Procedures

A. Flight Emergencies – When a flight emergency is declared, possibly as "Mayday, Mayday, Mayday" or ATGS manages emergency using appropriate procedures from list below:

1. Emergency is highest priority until aircraft lands safely.

2. Determine pilot's intentions for managing situation.

3. Clear the airspace for the pilot as needed.

4. Dedicate and clear a frequency for the emergency.

5. Direct the aircraft to depart mission area and climb to a safe altitude.

6. Jettison load in remote areas (or specified jettison areas) if feasible.

7. If problem persists, instruct aircraft to return to base or alternate landing site.

8. Alert incident medivac units.

9. Prepare for suppression of a fire associated with an aircraft crash.

10. Notify dispatch or airport tower for necessary crash/rescue protocol.

B. Missing Aircraft & Aircraft Crash/Mishap – When an aircraft crash has occurred or an aircraft is missing, ATGS manages situation using appropriate procedures below:

1. Assign aircraft as needed to conduct search.

2. Determine location. Monitor ELT frequency (121.5) if crash site is not known or if aircraft is missing and its status is unknown.

3. Assign remaining aircraft to holding areas or return to base.

4. Activate incident medivac plan through medical unit.

5. Assign on-site aircraft and personnel to control aircraft fire and initiate life saving measures if they can do so without jeopardizing their own safety.

6. Advise IC/Operations – be discreet about aircraft and flight crew identity.

7. Direct ground resources to crash site.

8. Direct air support operations.

C. Medivacs of Incident Personnel – Consider the following as appropriate:

2. Serve as a relay between accident site, helibase, and medical personnel.

3. Determine accident site location – latitude and longitude.

4. Obtain Medivac helicopter frequency – may be listed in Medivac Plan.

5. Assist rescue personnel with helispot location, etc.

6. Provide helispot dust abatement with helicopter buckets as needed.

7. Guide medivac helicopter to accident site.

Chapter 6 – Military & Other Aviation Resources

I. Modular Airborne Firefighting System (MAFFS)

A. Policy – the National Interagency Coordination Center (NICC) mobilizes Modular Airborne Firefighting Systems (MAFFS) as a reinforcement measure when suitable contract airtankers are not readily available within the contiguous 48 states.

MAFFS may be made available to assist foreign governments when requested through the State Department or other diplomatic memorandums of understanding.

The Governors of California, North Carolina and Wyoming may activate MAFFS units for missions within State boundaries under their respective memorandums of understanding with military authorities and the Forest Service. Approval from the Forest Service Director, NIFC is required prior to activation.

B. MAFFS Aircraft Locations – Air National Guard and Air Force Reserve units utilizing C-130 are based at the following locations:

1. Charlotte, North Carolina – Air National Guard

2. Port Hueneme, California – Air National Guard

3. Cheyenne, Wyoming – Air National Guard

4. Colorado Springs, Colorado – Air Force Reserve

C. Operational Requirements – the following operational requirements pertain to utilization of MAFFS:

1. Aerial Supervision (MAFFS Airtanker Coordinator) – MAFFS missions will be conducted under the supervision of a MAFFS Airtanker Coordinator (Leadplane pilot or Aerial Supervision Module pilot) that has been certified for the MAFFS mission. A list of certified pilots is included in chapter 60 of the National Interagency Mobilization Guide.

2. International MAFFS Missions – Supervision requirements are the same as domestic missions except the MAFFS Airtanker Coordinator will be present on the flight deck of the MAFFS aircraft instead of a separate aerial platform.

3. Low-Level Lead Requirements – Low-level leads will be conducted for one MAFFS aircraft at a time. Daisy chaining multiple aircraft in trail is not authorized.

4. MAFFS Flight Crew Certification – Military flight crews are certified annually.

a) 90 Days to 6 Months – If 90 days but not more than 6 months have elapsed following the annual refresher training, the first retardant drop may be made on the fire, but will be restricted to a target that presents few hazards as determined by the MAFFS Airtanker Coordinator.

b) More Than 6 Months – If more than 6 months have elapsed since the annual refresher training, a water drop outside the fire area that is supervised by a MAFFS Airtanker Coordinator will be required.

5. **MAFFS Aircraft Identification** – A high visibility day-glo number taped to portions of the aircraft fuselage will identify each MAFFS aircraft.

6. **Flight Duty Limitations**

a) Flight Time – Flight time will not be planned to exceed 8 hours per day for a flight crew. Replacement flight crews are often available to extend the period of flight operations over the incident.

b) Duty Day – A normal duty day for MAFFS flight crews is 12 hours. Aircrews shall have a minimum of 12 hours off duty prior to the beginning of any duty day. Replacement aircrews may be used to extend the period of flight operations over the incident.

c) Days Off – Aircrews shall be off duty for two full calendar days during a 14-day consecutive period.

D. Operations Considerations – The procedures for using MAFFS over an incident are the much the same as those used for contract airtankers. The ATGS should be aware of the following "key" differences when using MAFFS aircraft:

1. **Incremental Drops** – MAFFS 4 and 7 are units capable of incremental drops of 1,000 to 2,000 gallons each. All remaining MAFFS units should be used on targets where trail drops are appropriate.

2. **Trail Drop Length** – Trail drops can extend up to one-half (1/2 mile) in length.

3. **Load Limit** – Existing MAFFS units are limited to 2,700 gallons.

4. **Coverage Levels** – Existing MAFFS units are limited to a maximum coverage level of 3. Drops requiring a higher coverage level must be reinforced or duplicated by a second drop on the same target.

5. **Effective MAFFS Use** – The most effective use of MAFFS retardant application is a trail drop on ridge top targets in light to moderate fuel loads. System limitations may require re-application of retardant on the same 'line' in steep, dissected terrain and/or closed canopy timber.

E. Communications Considerations

1. **Aircraft Identifier** – the number displayed on the aircraft fuselage, i.e., MAFFS 2, will identify MAFFS aircraft.

2. **Radio Hardware** – MAFFS aircraft are equipped with one VHF-FM aeronautical transceiver that operates over the frequency band of 150 to 174 MHz. Communications may be conducted using a VHF-AM frequency in the 118 to 136 MHz bandwidth in the same manner as other contract air tactical resources.

3. **Check-In Procedure** – The ATGS (or LEAD in the absence of an ATGS) must identify the location and altitude of all other aircraft operating over the incident as well as the incident altimeter setting to all MAFFS aircraft 'checking in' enroute to the incident.

4. **Handoff Communications** – Handoff communications of MAFFS aircraft from the ATGS to the LEAD should include target identification, drop sequence, and egress from the incident. Egress is usually the same as that used for contract airtanker operations.

5. **Dispatch Communications** – The ATGS will notify dispatch whether additional loads of retardant will be required to meet operational objectives on the incident.

II. Modular Airborne Firefighting System (MAFFS) – Upgraded Delivery System

A. Development – A new generation of Modular Airborne Firefighting Systems (MAFFS) is under development. This delivery system is designed to replace MAFFS units currently in service (see discussion above). This system designed by Aero Union has a maximum capacity of 3,600 to 4,000 gallons depending on the model of C-130 used by Air National Guard and/or Air Force Reserve Units.

B. Projected Deployment – Deployment of the new delivery system is tentatively scheduled to begin in 2003.

C. System Capability – The new MAFFS units have onboard compressors in contrast to their predecessors and are capable of delivering incremental loads of retardant up to a coverage level 8 in a similar manner to the contract fleet of heavy airtankers.

The new MAFFS systems can reload at any tanker base as opposed to the operating requirements of their predecessors that required the aircraft to return to the tanker base where the flight originated due to the presence of air compressors at the facility (external to the aircraft).

D. Operational Requirements – The operational requirements discussed above for MAFFS will remain in effect until rescinded or amended. Following the completion of operational testing, the new MAFFS units should have many (if not all) of the operational characteristics of their commercial airtanker counterparts.

E. Operations Considerations – Operations considerations identified above for existing MAFFS will be largely inapplicable for the new generation of MAFFS systems.

III. Regular Military Helicopter Operations –

Regular Military refers to active military, reserve units and "federalized" National Guard aviation assets. For an in depth discussion of military helicopter operations, refer to Chapter 70 of the Military Use Handbook (2001). Key portions of the parent text are included below.

A. Policy – Regular military helicopter assets may be provided by the Department of Defense as requested by NIFC when civilian aviation resources are depleted.

B. Mission Profiles – Mission profiles for regular military helicopter units are normally limited to:

1. Reconnaissance or Command and Control activities
2. Medivac
3. Crew transportation
4. Cargo transportation (internal and external loads)
5. Crew and cargo staging from airports to base camps for incident support
6. Bucket Operations – Rarely conducted with regular military helicopters. If bucket operations are conducted, a **Helicopter Coordinator** (HLCO) shall be utilized whenever regular military helicopters are engaged in bucket operations.

C. Communications

1. **Military Radio Hardware** – Regular military aircraft are equipped with VHF-AM aeronautical radios that operate in the 118 to 136 MHz bandwidth.
2. **Agency Provided Radio Hardware** – VHF-FM aeronautical transceivers compatible with agency frequencies may be provided by the agency.

   Note: Until agency furnished VHF-FM radio systems can be installed, a Helicopter Coordinator (HLCO) is required. Multi-ship operations may be conducted without a Helicopter Coordinator if at least one helicopter has compatible communications capability with civilian bandwidths.

IV. National Guard Helicopter Operations

A. Policy – The use of National Guard helicopters for federal firefighting purposes within their state boundaries is addressed in applicable Regional, State or local agreements or memorandums of understanding between federal agencies and specific National Guard units.

The ATGS should coordinate with local agency officials, agency aviation management specialists or the Air Operations Branch Director to ensure planned use of National Guard assets complies with applicable policy and procedures specific to the local area and/or participating jurisdictions.

B. Mobilization Authority – The Governor can mobilize National Guard aviation assets at the request of local or State jurisdictions for incidents on private land or multi-jurisdictional incidents.

C. Mission Profiles – In addition to the mission profiles discussed for regular military helicopters above, National Guard helicopters routinely engage in water bucket operations in many States.

D. Communications & Helicopter Coordinator – Lack of VHF-FM communications capability may be a problem to be addressed prior to use of National Guard aviation assets on federal or multi-jurisdictional incidents. Use of a Helicopter Coordinator (HLCO) should be considered to mitigate communications issues with ground and aviation resources on an incident.

E. Training & Proficiency Assessment – Operational procedures, mission training, and proficiency vary between States, National Guard units and flight crews. The ATGS should assess the proficiency of the resource and make adjustments as appropriate to provide for the safe and effective use of National Guard resources.

V. Canadair CL-215 & 415 (Multi-Engine Amphibious Water Scooping Aircraft)

A. Policy & Availability

1. **United States** – Currently, Water Scooping Airtankers (Canadair CL-215) are owned by and located in the states of Minnesota and North Carolina. Besides working in their home states, it is likely that these aircraft will be encountered elsewhere in the U.S. under contract or on a call-when-needed (CWN) basis where water sources are conducive to operations.
2. **Canada** – Canadair CL-415 and CL-215 Airtankers are widely used in Canada, especially from Quebec west to Alberta. States bordering Canada may have agreements such as the Great Lakes Compact that outline procedures for sharing resources on fires within a specified distance from the border. There may also be provisions for extended use of Canadian Airtankers in the U.S. when needed and if available. ATGS's should obtain a briefing on these agreements or procedures when assigned, if applicable.

B. Operations

1. **Airport Requirements**
   a) **Runway** – A 5000 foot hard surface runway with a taxiway and ramp capable of supporting 36,000 lbs. is required.
   b) **Fuel** – The CL-215 requires 100 octane low lead (100 LL) while the CL-415 requires Jet A fuel.
   c) **Foam** – A supply of foam (3-55 gallon drum capacity per fuel cycle) and the necessary equipment for handling it and pumping or loading the concentrate on the aircraft should be anticipated.
2. **Scooping Site Requirements** – The water source (or pickup lake) should be a minimum of one mile long, free of obstructions, and at least six feet deep. The scooping path does not have to be straight, as the aircraft are somewhat

maneuverable while scooping. Factors such as wind, elevation, and surrounding terrain will have a bearing on water source suitability. Less than a full load can be scooped on slightly smaller lakes. Both aircraft scoop at 80 kts, are on the water for about 15 seconds, and cover a distance of about 2,000 feet.

3. Foam Use

a) Concentration – Foam can be injected into the load at a concentration of 0.3% up to 3% in some aircraft models. Useful concentrations typically range from 0.3% to 1.0%. Foam concentrations greater than 0.6% are prone to drift.

(1) **Wet Foam** – A typical method in using foam is to attack a hot fire with straight water or a wet foam (0.3%)

(2) **Dripping Foam** – After a fire has been knocked down, follow up with dripping foam (0.5%).

(3) **Dry Foam** – Dry (0.6-1.0%) foam may be used instead of dripping foam after initial knockdown with wet foam.

b) Consistency & Water Temperature – The consistency or aeration of the foam is affected by water temperature. A slightly higher concentration may be needed for cold water and adjustments downward may be necessary for extremely warm water.

c) Evaluating Consistency – Foam consistency is best evaluated by ground personnel. Drops can be evaluated from the air using visibility criteria. Wet foam is visible for about 5 minutes, dripping foam for about 15 minutes, and dry foam is visible for 30+ minutes.

d) Environmental Limitations

(1) Foam is not recommended within 300' of lakes and streams.

(2) In steep drainages or sensitive areas, check local agency policy on foam use.

(3) When scooping during foam operations, some residual foam may flush out of the vent/overflow. While very diluted, some foam may be visible on the water for a short time.

(4) Obtain a briefing from the IC or responsible agency on the limitations of foam use, if any, prior to using.

e) Rinsing Tanks – Provide for two rinse loads of water prior to departing a fire.

4. Tactical Considerations

a) Tank Configuration – The CL-215 has two compartments totaling 1400 gallons, and the CL-415 has four compartments totaling 1600 gallons. Loads can be dropped salvo, in trail, or split into separate drops. A salvo load for both airtankers is about 280' long and 65' wide. A trail drop is about 400' x 40'.

b) Drop Height – Drop height ranges from 100'-150', depending on factors such as foam vs. straight water and direction of run (into wind vs. downwind).

c) Clearance – When dropping near ground crews, personnel must be moved at least 200' to the side. When drops are made 1000 feet or more in advance of crews, no clearance is necessary except to confirm no one is on the line.

d) Flight Patterns & Turnaround Times

(1) **Typical Flight Pattern** – The typical flight pattern (or circuit) is oval, with a pickup into the wind and a downwind drop on the fire. This is the most common and efficient circuit and preferred by most pilots.

(2) **Turnaround Times** – When water sources are located next to the fire, a 90-second turnaround time is possible.

(a) **CL-215** – A rule of thumb for turnaround times for the CL-215 in an oval circuit is; turnaround time equals miles from lake to fire plus two minutes scooping (ex. 5 miles to the fire from the lake is a 7 minute turn).

(b) **CL-415** – Typical turnaround times for the CL-415 are: 1 mile - 3 minutes, 3 miles - 4 minutes, 6 miles - 6 minutes, 10 miles - 9 minutes, and 15 miles - 12 minutes.

(3) **Alternative Flight Patterns –** If fire intensity or other reasons indicate a need for drops into the wind or crosswind, then a U-shaped circuit or a Figure 8 will be necessary. Turnaround time will be slightly longer.

e) Fuel Cycle Duration – Average fuel cycle is about 4 hours. A quick turn from a close lake can shorten the cycle to 3.5 hours due to increased fuel demand.

f) Direct Attack & Initial Attack – Scoopers are best suited for initial attack fires. They are most commonly used for direct attack on the fire's edge with drops made half-in/half-out. Like other air resources, they are most effective when worked closely with ground resources, although drops should not be delayed while waiting for ground resources. High intensity fires may require drops to be made into the wind.

g) Parallel Attack – In the event ground resources are delayed or drops advance faster than the crews, a parallel attack is effective. Drops should be placed parallel to the fire's edge at a distance governed by rate of spread and

progression rate of ground resources. The ATGS should consider an increase in foam proportion to dripping (.5%) or dry foam (.6-.8%).

If the fire does not reach the drops in 30 to 45 minutes, reinforcement drops should be made. If progress by ground crews is too slow, retardant may be a better option, with foam and water used for knockdown and cooling the line.

h) Indirect Attack – While many scooping aircraft can be loaded with retardant at a tanker base, they are not designed to efficiently and effectively drop retardant. Therefore, their capabilities at indirect attack are limited. Narrow, wind-driven fires can be successfully attacked indirectly using foam drops, taking advantage of light fuels or fuel breaks. CL-215's and CL-415's are effective in supporting indirect tactics when used to reinforce retardant or other control lines, hot spotting, and knockdown of slopovers and spot fires.

C. Supervision – Water scoopers usually require close supervision due to frequent drops (quick turns) and working closely with ground resources. The ATGS should consider the need for additional supervision in the form of another ATGS, LEAD, or HLCO as appropriate.

1. Scooper Aircraft Communications – Generally, communications with scooping tankers are not much different than conventional air tankers with respect to target description, clearing the line, and drop evaluations, etc.

a) Scooping Operation – During the scooping operation, including approach and departure from the lake, communications with the tanker should cease to allow the crew to concentrate on the pickup. The tanker will call when "up" or off the water, which will signify to the ATGS that it's okay to transmit.

b) Foam Instructions – Instructions can be given after the scooping operation on whether or not to inject foam and at what percent so the load has time to mix.

c) Long Turnarounds – On long turnarounds, request the tanker to give a one-mile final call and give your target description at that time.

d) Standard Communications – Confirm the line is clear, make the drop, and after the drop, evaluate the load. Instructions for the next load, including foam concentrations, can be given at this time if possible. Otherwise, wait until the tanker is "up" for the next target description.

2. Scooper Aircraft Separation – Once in the circuit on the fire, CL-215's and CL-415's work 500 feet AGL and lower.

a) Separation of Scoopers in the Circuit – If two tankers are working the same circuit, which is very common, the ATGS can choose to daisy chain the two tankers or they can be worked in tandem.

(1) **Daisy Chaining** – One tanker is on the lake while the other drops. Generally works best for quick turn arounds.

(2) **Tandem** – One tanker leads the other. Generally works best, is more efficient, and requires less supervision for long turn arounds. Also allows ground resources more time between drops to work the line.

(3) **Four Airtankers** – If four tankers are in a circuit, they can be sequenced singly in a daisy chain, or they can be worked in two tandem pairs.

(4) **Mixing CL-215's & CL-415's** – Both can work in the same circuit, however the CL-415's are faster and will overtake the 215's on the circuit. If possible, keep separate.

b) Integrating with Other Aircraft – Scooping Tankers can be successfully integrated with suppression and logistical missions of other aircraft.

(1) **Horizontal Separation** – The most common separation method is to assign different aircraft types to separate parts of the fire, ex., scoopers on the right flank, helicopters on the left, or conventional tankers on the left.

(2) **Sequencing** – Sequencing of aircraft can be very efficient and often is necessary but requires close supervision.

(a) Have the scooper extend the circuit if there is a need for another aircraft to work the same area as the scooper for a short time, such as a sling load, personnel drop, or a quick recon.

(b) If another aircraft needs to work the same area as the scooper for a sustained period, either orbit the tanker or reassign.

(c) Sustained bucket operations in the same target area as scoopers is usually not advised, except for very long scooper turnaround times.

(d) CL-215/415 airtankers can support conventional airtankers by sequencing them in between retardant drops to cool the fire in advance of the retardant or to assist in holding the fire as it approaches the retardant.

3. Canadian Airtankers on U.S. Border Fires – On fires near the Canadian/U.S. border, a Canadian Air Attack Group may be dispatched to a U.S. fire.

a) Normally this group includes two scooping tankers and a Bird Dog.

b) On board the Bird Dog is an Air Attack officer, very similar to an ATGS.

c) Typically on a ‘quick strike’ across the border, the Bird Dog would assume control of the airspace and work the fire until/unless an ATGS is present.

d) When a U.S. ATGS is on scene, the ATGS has overall responsibility for the airspace. The Bird Dog is in charge of directing Canadian Airtanker operations much like an LEAD under the supervision of the ATGS. The ATGS is responsible for the direction of all U.S. resources and the Bird Dog.

e) Refer to policies of the local agency or your home agency with regard to utilization of Canadian air resources.

f) The local unit Dispatch should coordinate flights with Air and Marine Interdiction Coordination Center at 1-866-AIRBUST.

D. Canadian Scooper Operations Terminology – Following is a short list of terms relating to the use of the scooping airtankers used by Canadian Air Attack officers. Some of the terms are common to the U.S. and a few are slightly different.

1. Bombing Circuit Terminology

a) Circuit – flight route taken by scooping airtanker from the water source to the fire and return.

b) Typical Circuit – oval or rectangular flight route that is defined by an 'into the wind' pickup on the lake and a downward drop on the fire.

c) U-Shaped Circuit – a flight route resembling a "U" that is defined by an 'into the wind' pickup on the lake and an 'into the wind' drop on the fire.

d) Figure-8 Circuit – an intersecting flight route in the shape of an "8" that is defined by an 'into the wind' pickup on the lake and can accommodate either a crosswind drop on the head or an 'into the wind' drop elsewhere on the fire.

e) Base Leg – the leg of the bombing circuit immediately preceding and perpendicular to the final leg (base leg for pickup or base leg for the drop).

f) Final Leg – the last leg of the bombing circuit direct to the target or the lake.

g) Bomb Run or Run – flight path of the tanker to the target.

2. Target Description Terminology

a) Tie-In – connect the drop to a specific reference point or anchor point.

b) Tag On – connect the tail end of the drop to a given point, usually the head end of the last drop.

c) Extend – tag on and lengthen the line in a specific direction.

d) Lap On – cover a previous drop entirely or to one side or the other. Reinforce.

e) Lap on Left/Right – cover a previous load to the left or right to widen the drop pattern, (Usually about 1/3 overlap).

f) Roll Up – connect the head end of the drop to a given point or the tail end of a previous drop.

g) Half On /Half Off – half the load on the fire, half on unburned fuel. Half & half or half in/half out.

h) Span – distance equal to one wing span of the tanker being used.

i) String Drop – trail drop

j) Train Drop – trail drop

k) Bulls Eye – load was placed exactly where requested.

l) Head End of Drop – where the last of the load hits the ground.

m) Tail End of Drop – where the load first hits the ground.

3. Other Terminology

a) Bird Dog – ATGS platform except Bird Dog combines low level lead-ins when deemed necessary with an orbit and direct method.

b) Orbit and Direct – method of supervision where Bird Dog is above the fire in a right hand pattern and gives verbal targets and direction to airtankers as opposed to providing low level lead-ins.

c) Lead In – same as a lead.

d) Inspection Run – same as a low pass or dry run.

e) Dummy Run – same as a 'show me'.

f) Hold – Canadians may use this term for "go around - do not drop" as well as orbit outside the incident airspace.

g) Stay – may also be used to instruct a tanker to proceed to a designated location and await instruction. Hold & orbit.

h) Reload – load and return.

i) Period of Alert – duty day or duty time.

VI. Tractor Plow Operations and Coordination

A. Mission Parameters – In many Southern states, tractor plow units are used as a primary means of wildland fire suppression. Coordination of these suppression resources is accomplished from an aerial platform.

B. Aerial Supervision Limitations – The effective coordination and management of tractor plow units from a fixed-wing air tactical aircraft is limited by dense tree canopies that reduce the visibility of individual units and their proximity to the fire perimeter. Effective coordination of these resources is also limited by the presence of multiple tractor plow units, the tactics employed and the need to coordinate multiple aviation and ground-based suppression resources responding to the incident.

C. Tractor Plow Coordination – One viable method of enhancing a safe and effective suppression resources is delegating the coordination of tractor plow operations to a local fire supervisor utilizing a light fixed-wing or Type III helicopter platform.

The local fire supervisor is responsible to coordinate tractor plow operations with the incident Operations Section Chief, Division Group Supervisor or Initial Attack Incident Commander or to carry out these responsibilities in the absence of these positions on the incident. The position of Tractor Plow Coordinator may be filled by the pilot of the aircraft is he/she is qualified to fulfill this role.

D. Operational Requirements – The airborne tractor plow coordinator orbits at 1,000 to 1,500 feet AGL in a fixed-wing platform and at 500 feet AGL if a Type III helicopter is used. If the pilot is acting as the Tractor Plow Coordinator, fixed-wing aircraft will use a counterclockwise (left hand) orbit.

E. Air Tactical Group Supervisor Considerations – The use of a Tractor Plow Coordinator position enhances the safety of tractor plow resources due to the experience of the individual with local resources, vegetative cover types and fire behavior.

The air tactical group supervisor needs to be made aware of the proposed use of this resource during the incident 'in brief'.

The air tactical group supervisor must manage this aviation resource in combination with other tactical aviation resources with consideration given to the integration of the safe and effective use of assigned aviation and ground-based resources.

Glossary

The terms included in this glossary are commonly used in fire and aviation operations. Use of these terms will help standardize communications and promote more efficient aviation operations.

ABEAM – An aircraft is abeam of a fixed point of object when the fixed point or object is approximately 90 degrees right or left of the aircraft track.

ABORT – To terminate a planned aircraft maneuver.

AGL – Above ground level.

AIR TAC – ICS identifier for the Air Tactical Group Supervisor

ANCHOR POINT – A strategic and safe point or area, usually a barrier to fire spread, from which to start construction of the control line.

ASSIGNED TO – Refers to a tactical resource allocated to an incident. The resource may be flying enroute to and from the incident or on hold at a ground site.

ASM1 – A fixed wing platform that utilizes a crew of two including an Air Tactical Pilot (ATP) and an Air Tactical Supervisor (ATS). This module can perform aerial supervision and low-level operations including the lead profile.

ATCO – This term is used synonymously with the term LEAD. An airborne position supervised by the Air Tactical Group Supervisor. Assigns airtankers to specific targets. Supervises and evaluated drops. This position may be filled by a Leadplane, ASM1 or ATGS.

ATP – Air Tactical Pilot(s) are pilots that are trained and qualified to operate as LEAD in the low-level environment. They are part of an ASM1 crew.

ATS – Air Tactical Supervisor are Air Tactical Group Supervisors that are trained and qualified to operate in the low-level environment. They are part of an ASM1 crew.

BACKFIRE – A fire set between the control line and the main fire to consume unburned fuels to stop the advance of the main fire. A backfire is only use when the main fire is burning actively enough to draw the backfire against the wind.

BARRIER – Any obstruction to the spread of the fire. Typically an area devoid of flammable fuel (rock outcrop, plowed field, etc.).

BASE (OF A FIRE) – The part of the fire perimeter opposite the head, often at or near the point of origin. Also referred to as the 'rear' or 'heel' of the fire.

BLOWUP – A significant increase in fire intensity or rate of spread that precludes direct control actions.

BREAK (LEFT OR RIGHT) – Means turn left or right. Direction given to an aircraft in flight, usually on the drop run that implies immediate compliance. (Tanker 75, break right – a small plane is crossing the target).

BURN OUT – Fire set at the inside edge of a control line to consume unburned fuels between the main body of the fire and the control line. Usually associated with indirect attack.

CANOPY – The stratum containing the crowns of the tallest vegetation (living or dead); usually 20 feet or more above ground level, except in plantations (reproduction).

CARDINAL POINTS – The four chief points of the compass: North, South, East and West.

CLOCK METHOD – A means of establishing a target or point by reference to clock directions where the nose of the aircraft is at 12 o'clock, the right wing is at 3 o'clock, the tail of the aircraft is at 6 o'clock and the left wing is at 9 o'clock.

CONFIGURATION – How an aircraft is equipped, outfitted or modified for a mission or segment of a mission. Also refers to the use of drag devices (flaps, landing gear) to modify flight characteristics.

CONGESTED AREA – A FAA non-specific term for areas that require additional precautions and procedures to conduct low-level flight operations. The regulation is applied on a case-by-case basis to "any congested area of a city, town or settlement, or over any open air assembly of persons" (14 CFR 91.119).

CONSTANT FLOW TANK SYSTEM – A single compartment with two doors controlled by a computer intervalometer. The system is capable of single or multiple even flow drops at designated coverage levels ranging from 0.5 GPC to 8 GPC.

CONTROL LINE – An inclusive term for all constructed or natural barriers and treated fire edge used to control fire spread.

COVER ASSIGNMENT – Airtankers ordered to a different base to provide initial attack coverage. Sometimes referred to as 'move up and cover'.

COVERAGE LEVEL – A number representing the number of gallons of retardant mixture dropped or prescribed to cover fuels in a 100 square foot area (GPC).

CUT OFF TIME – Time when operations involving low-level flight maneuvers must be suspended.

DELAYED ATTACK FIRE – A fire which due to its lower priority and/or unavailability of ground resources will not be staffed for several hours or possibly several days.

DENSITY ALTITUDE – Pressure altitude adjusted for temperature and humidity. The higher the density altitude, the lower the aircraft performance.

DIRECT ATTACK - Control effort (retardant line or fireline) conducted at the fire edge (usually under low fire intensity conditions).

DIVERT – A change in aircraft assignment from one target to another or to a new incident.

DRIFT CORRECTION – A prescribed offset in the flight path to a target to compensate for wind induced retardant drift.

DRIFT SMOKE – Smoke that has drifted from it's point of origin and has lost any original billow form.

DROP – The aerial release of para-cargo, retardant, water or foam.

DROP CONFIGURATION – The type of drop the airtanker or helicopter pilots selects to achieve the desired coverage level based on the aircraft door/tanking system.

SALVO – To drop the entire load or compartment at one time.

TRAIL – To drop doors in sequence resulting in a long unbroken retardant line.

SPLIT LOAD – The dropping of a partial load (2 doors at a time).

DROP ZONE – The area around the target to be dropped on.

DRY RUN – A low pass over the target without dropping to evaluate drop conditions and/or alert ground resources of an impending live run.

EARLY – Indicating the drop was early or landed short of the target.

ENGINE – In a fire context, a ground vehicle staffed by firefighters that dispenses water or foam with hoses and nozzles.

ESCAPE ROUTE – The safest, quickest or most direct route between the location of firefighters and a safety zone.

EXIT – A term used to indicate the flight route away from the drop area or a command used to indicate the direction the airtanker coordinator wants the aircraft to fly following the completion of a specific maneuver ("exit southbound over the lake").

EXTEND – To drop retardant in such a way that the load slightly overlaps an lengthens the previous drop.

FALSE ALARM – A reported smoke or fire that aerial/ground resources are unable to locate.

FINGER – A long, narrow or elongated portion of a fire projecting outward from the main body of the fire.

FIRE BREAK – A natural, man-made or constructed barrier used to stop or check the spread of a fire or to provide a control line from which to work.

FIRE LINE – A control line that is devoid of burnable material usually constructed by hand crews, dozers or tractor plows.

FIRE PERIMETER – The active burning edge of a fire or its exterior burned limits.

FIRE SHELTER – An aluminized, heat reflective pup tent shaped piece of personal protective equipment used by firefighters in the case of a fire entrapment. The heat reflection capability is the primary function of the shelter. DO NOT drop fire retardant on the fire shelter as it will compromise the heat reflecting capability of the shelter.

FIXED TANK – A tank mounted inside or directly underneath an aircraft that contains water/foam or retardant to be dropped on a fire.

FIXED-WING COORDINATOR – A non-fire airborne position supervised by the Air Tactical Group Supervisor that is responsible to assign and supervise fixed-wing aircraft (paracargo, search and rescue or spraying projects).

FLANKING ATTACK – An attack made along the flanks of a fire either simultaneously or successively from a less active portion of the fire or an anchor point endeavoring to connect the two lines (flanks) to the head.

FLANKS – The parts of the fire perimeter that are roughly parallel to the main direction of fire spread. The 'left flank' is on the left side as viewed from the base of the fire looking toward the head.

FLIR – Forward looking infrared.

FLIR/ATGS – An ATGS aircraft equipped with FLIR or FLIR used in ATGS operations.
FM – Refer to VHF-FM.

FUEL BREAK – A wide strip or block of land where the vegetation has been permanently modified to a low volume fuel type so that fires burning into the fuel break can be more readily controlled.

FUGITIVE RETARDANT – A clear retardant, without iron oxide (red pigmentation agent), or retardant with a red color agent that fades or becomes invisible after exposure to ultraviolet radiation (sunshine).

GO AROUND – Abort the retardant run.

GPC – A term relating to retardant coverage level – meaning gallons of retardant per 100 square feet.

HEAD – The most rapidly spreading portion of the fire perimeter, usually located on the leeward or upslope side.

HLCO – The ICS mnemonic (call sign or identifier) for a helicopter coordinator.

HELITANKER – A helicopter configured with a fixed tank or bucket for dropping water, foam or retardant.

HERE – A term communicated by the leadplane pilot to the airtanker or helitanker identifying the target location and the starting point of the drop.

HOLD (Holding Area) – A predetermined flight pattern that keeps aircraft within a specified airspace while awaiting further clearance from the aerial supervisor.

HOLDING ACTION – The use of aerially applied water, foam or retardant to reduce fire intensity and fire spread until ground resources arrive on scene. This term is commonly associated with delayed attack fires.

HOSE LAY – An arrangement of connected lengths of fire hose and accessories beginning at the first pumping unit and ending at the point of water delivery.

HOTSHOT CREW – A highly trained hand crew used for fireline construction.

HOTSPOT – A particularly active portion of the fire.

INDIRECT ATTACK – Control line located along natural or man-made firebreaks, favorable breaks in topography or at a considerable distance from the fire perimeter.

INTERVALOMETER – A cockpit mounted electronic device/selector box that acuates the compartment door(s) singly, or multiple doors simultaneously, or in sequence at preset time intervals. The pilot or co-pilot selects the number of doors and the time interval between doors to produce the desired coverage level and line length.

ISLAND – A green or unburned area within the fire perimeter.

KNOCKDOWN – A technique used to reduce the flame or heat in a specified target to assist ground resources. This term implies that the retardant or water/foam should fall directly on the object or a specified portion of the fire perimeter.

LATE – A term indicating that the drop was late or overshot the target.

LEADPLANE – An airplane crewed by a qualified leadplane pilot tasked to lead airtankers in low-level drop runs.

LEADPLANE PILOT – This position performs air tanker coordinator (ATCO) duties including low-level passes through the drop area to identify the target, assess flight conditions, and flight hazards.

LIVE RUN – A flight over the drop area in which a discharge of cargo, retardant or water/foam will be made.

LOAD AND HOLD – The airtanker is being ordered to reload and hold at a designated retardant base awaiting further instructions. NOTE: Airtankers on load and hold can be reassigned to higher priority incidents. The use of 'load and hold' is discouraged because a resource order is often cancelled and the aircraft is left sitting with a full load.

LOAD AND RETURN – The airtanker is being ordered to reload and return to the incident with a load of retardant.

LOW PASS – A low altitude run over the target area used by the leadplane or airtanker pilot to identify the target and assess flight conditions during the approach and exit.

MAFFS (Modular Airborne Firefighting System) – Air National Guard (ANG) and Air Force Reserve (AFRES) aircraft equipped to drop retardant during emergency situations to supplement the commercial airtanker fleet. These C-130 aircraft carry 2,700 gallons and can apply a maximum coverage level of 3.5 GPC. The MAFFS system will be replaced by the AFFS system currently under development (2002).

MAIN RIDGE – A prominent ridgeline separating a river or creek drainage. The 'main ridge' usually has numerous smaller ridges (spur ridges or finger ridges) exending outward from both sides. This term can be confusing is not addressed during orientation.

MAYDAY – The international distress signal/call. When repeated three time, it indicates imminent and grave danger and that immediate assistance is required.

MISSION – A flight undertaken by incident aircraft to accomplish a specified tactical or logistical objective. An ATGS mission consists of operating and directing a mix of tactical aircraft. Each additional fire flown during a single flight counts as an additional mission.

MOA – A Military Operations Area (Special Use Area) identified on aeronautical sectional charts.

MSL – Mean sea level.

MTR – A Military Training Route found on aeronautical sectional charts and AP/IB maps. Routes accommodate low altitude training operations (below 10,000 feet MSL) with aircraft operating in excess of 250 KIAS.

ON TARGET – An acknowledgement to the pilot that the drop was placed accurately.

ORBIT – See Hold (Holding Area).

ORIGIN – The point on the ground where the fire started (is often referred to as the 'base', 'heel', or 'toe') of the fire.

OVERTAKE – The unintentional passing of an aircraft in the lead by the trailing aircraft.

PARALLEL ATTACK – A control effort generally parallel to the fire perimeter usually conducted several feet to 100+ feet away from the fire perimeter. This tactic allows the completion of line construction before the lateral spread of the fire outflanks line construction operations.

PERIMETER – The outside edge of the fire.

POCKETS – Areas of unburned fuel along the fire perimeter.

PORTION OF THE LOAD – A portion of the total retardant load dropped (or to be dropped). Portions are identified by fractions of the load (1/4, 1/3, or whole load) using specified start and stop points on the ground.

PRE-TREAT – Laying a retardant line in advance of the fire where ground cover and/or terrain makes it feasible for ground resources to undertake control actions, or to reinforce a control line. Pre-treatment is often associated with indirect attack.

RACE TRACK – An oval pattern used hold air tankers at the same altitude away from the fire traffic area.

REBURN – The subsequent burning of an area where the fire had previously burned but left burnable material that ignites when burning conditions are more favorable. Reburns are often associated with needlecast where a running crown fire has previously occurred.

RETARDANT

> **LONG TERM** – Long term retardant contains chemicals that alter the combustion process and act to cool, smother, or insulate fuels. Long term retardant remains effective until diluted or rinsed off by precipitation.
>
> **SHORT TERM** – A chemical mixture whose effectiveness relies mostly on its ability to retain moisture, thereby cooling the fire. Common short term retardants are water and foam.

ROTOR SPAN – Synonymous with rotor diameter. Used to make adjustments in the flight route when dropping water/foam or retardant ('Move one rotor span to the right on the next pass').

ROUTE (Flight) – The path an aircraft takes from the point of departure to the destination (and return).

SADDLE – A topographic feature that appears as a depression or a 'pass' in a ridgeline.

SAFETY ZONE – An area where firefighters (ground resources) can stay until the flaming front passes and conditions are safe to resume work activities. Ground resources may move into a safety zone when it appears imminent that the fireline will be overrun or outflanked or a spot fire renders a portion of the fireline unsafe. During an emergency situation, air tankers may be asked to create a safety zone in fine fuels (grass, etc.) using retardant drops.

SCRATCH LINE – A preliminary control line hastily built with hand tools as an emergency measure to check the spread of a fire.

SECONDARY LINE – A fireline built some distance away from the primary control line used as a backup against slop overs and spot fires.

SEAT PILOT RATINGS

All Single Engine Airtanker (SEAT) pilots shall be rated and carded as either a Level 1 or Level 2 based on the following criteria.

> **Level 1 Rated pilots**: The Level 1 rated pilot is qualified to perform SEAT missions during all complexities of fire air operations, with or without benefit of aerial supervision.

Level 2 Rated pilots: Level 2 permits pilot performance of missions without benefit of aerial supervision in the fire environment airspace with the SEAT plus one other aircraft. With more than two aircraft on the scene, aerial supervision for the Level 2 pilot is required.

SLASH – Vegetative debris remaining after logging, pruning, thinning or brush cutting.

SLOP OVER – An unplanned extension of a fire that crosses a control line.

SMOLDERING – Low intensity fire behavior characterized by a lack of flame and a low rate of spread.

SNAG – A standing dead (defoliated) tree.

SPECIAL USE – A term used to denote flight operations that require specialized pilot skills and experience and/or aircraft equipment required to perform a mission.

SPOT FIRE – A fire outside the perimeter of the main fire usually started by embers transported through the air into a flammable fuel bed.

SPOTTING – Fire behavior characterized by embers carried through the air that start new fires outside the perimeter of the main fire.

SPUR RIDGE – A small ridge that extends 'finger-like' from a main ridge.

SUA – Special Use Airspace including Military Operations Areas (MOA), Restricted Areas, Prohibited Area, Alert Areas, Warning Areas and Controlled Firing Areas. Special Use Airspace is identified on aeronautical sectional charts.

SUPPRESSANT – A water or chemical solution that is applied directly to burning fuels. A suppressant is intended to extinguish the fire rather than to retard fire spread.

SURFACE FIRE – A fire that consumes surface litter and other vegetative material such as shrubs and brush.

TARGET – A specific area or object to be covered by retardant or water/foam.

TCAS (Traffic Collision Avoidance System) – An electronic aid that provides the azimuth, distance and relative altitude of transponder equipped aircraft in relation to a TCAS equipped aircraft.

TFR (Temporary Flight Restriction – 14 CFR 91.137) – Airspace over and around an incident defined by vertical and horizontal dimensions that restricts the entry of most non-incident related aircraft.

TIE-IN – Directions provided to an airtanker to connect a retardant drop with a specified location such as a road or a previous retardant drop.

TRAFFIC PATTERNS – The recommended flight path for aircraft arriving or departing from an airport or while engaged in tactical missions over an incident.

> **CROSSWIND** – A flight patch at right angles to the landing runway or target oriented off the upwind end.
>
> **DOWNWIND** – A flight path parallel to the landing runway or target in a direction opposite to the landing or drop direction.
>
> **BASE** – A flight patch at right angles to the landing runway or target oriented to the approach end.
>
> **FINAL** – A flight patch in the direction of, and prior to the landing or drop.
>
> **UPWIND** – A flight path parallel to the direction of the 'final' before turning crosswind.

UHF – Ultra High Frequency. This frequency range (300 to 3000 MHz) is commonly used by military resources and is incompatible with VHF radio systems.

VHF – Very High Frequency. This is the type of aircraft radio that all civilian and most military aircraft use to communicate with other aircraft and air traffic controllers.

VHF-AM – Amplitude modulation aircraft radio in a range of 118.0 MHz to 130.0 MHz commonly used on emergency incidents for air-to-air communications between aircraft.

VHF-FM – Frequency modulation radio that Federal land management agencies use in a range of 150.0 to 175.0 MHz for air-to-ground communications between aircraft and ground resources and dispatchers. VHF-FM frequencies are also used for air-to-air communications in certain parts of the United States.

VARIABLE FLOW TANKING SYSTEM – A tanking system characterized by multiple tanks or compartments controlled by an electronic intervalometer mechanism to open doors singly, simultaneously or multiple doors in an interval sequence.

VICTOR – A synonymous term for a VHF-AM radio.

WATERWAY – Any body of water including lakes, rivers, streams and ponds whether or not they contain aquatic life.

WINGSPAN – The length of an airtankers wing from tip to tip. The term 'wingspan' is used to make low level ground track adjustments. Wingspan adjustments are specified as 'right' or 'left' from the pilots' vantage point.

NOTE: Adjustments less than one-half a wing span are given in 'feet'.

Available AM Frequencies		
Helicopter Operations	122.975 122.850 123.025 123.050 123.075	Available nationwide on a first user basis for any private or government helicopter operation. 122.975, 122.850, 123.025, and 123.075 are for air-to-air only. 123.050 is for air-to-ground only. On incidents, appropriate frequencies may be used temporarily for Helicopter Flight Following, Helicopter Air-to-Air, or Take-Off and Landing Control. Must be replaced as soon as possible.
Natural Resource Agency	122.925	Authorized for air-to-air or air-to-ground use by any Federal Natural Resource Agency on a first-come-first-served basis. On incidents, it may be used temporarily for Fixed-wing or Helicopter Air-to-Air, Helicopter Flight Following, or Take-Off and Landing Control. Must be replaced as soon as possible. This frequency cannot be assigned to an incident.
Air-to-Air	***.***	Assigned to Air Tanker Base Zones - only during fire season. Obtained from dispatchers. Additional frequencies may be made available for incidents.
Commercial Airports	***.***	Assigned to Air Traffic Control Towers, Ground Controllers, and Flight Service Stations. Shown on aeronautical charts and other publications.
Unicom Airports	***.***	Used by all pilots to receive advisories at limited control airports. 122.800 is commonly used.
Multicom Airports	122.900	Used by all pilots for communication in transit and advisories at uncontrolled airstrips.
ELT	121.500	Emergency Locator Transmitter - sends an audio tone for 48 hours after activation in a crash.
Ramp	***.***	Some government ramps have different frequencies assigned (NIFC non-tanker base ramp 135.975) other than the National Ramp frequency of 123.975

Available FM Frequencies		
Air Guard	168.625 TX Tone 110.9	Monitored by all pilots flying for UDSA/USDI. Used for in-flight emergency contact, emergency ground to air contact, initial call, recall, and redirection.
Local Air Dispatch	168.650	If it is not practical to dispatch aircraft on the agency dispatch frequency, dispatch centers and tanker bases may use 168.650.
National Interagency Incident Contact	168.550	Initial contact frequency for land-mobile units arriving at incidents. Also used for smokejumper parachute operations.
FCC Common User Frequency	163.100 168.350	Authorized by FCC for use by any US citizen for ground communications. Available on a first use basis and may be tone encoded. 123.0 is the suggested tone. Do not use these frequencies while airborne.
National Incident Radio Support Cache	3 Tac 1 Command Pair 5 Air Tactical 166.675 169.150 169.200 167.950 170.000	These frequencies are sent to incidents with Incident Starter Kits. Portable radios are programmed with three Tactical frequencies, a Command and Command Repeat pair, and five Air Tactical frequencies. Each kit contains one of two different sets of Tactical frequencies, and one of six different Command pairs. Air Tactical frequencies are the same in all kits. Air Tactical frequencies are authorized for use west of longitude 100 west for air-to-air or air-to-ground communications. 170.000 usually does not provide good reception.
Agency Dispatch	***.***	Dispatch frequencies are listed in the National Interagency Aviation Frequency Guide.
Emergency Medical Services	***.***	Contact local dispatch for EMS Helicopter services.

Technisonic TFM-138 VHF-FM Radio

Direct Channel – Allows rapid loading of simplex frequency. Duplex frequencies cannot be loaded. Direct channel is automatically loaded in channel "000." Direct channel cannot be scanned or toggled between programmed channels.

Programmed Channels – 120 possible channels, all containing receive & transmit frequencies (simplex or duplex), receive & transmit tones, and settings for band, display, and scan. All standard CTCSS tones are available. Channel bandwidth can be set to 25.0 kHz (wideband) or 12.5 kHz (narrowband). There are 9 spaces for alphaneumeric displays settings. Early S/N radios (1-1499) have scan either on or off. Later S/N radios (1500 & up with F14 software) also have 5 scan groups available. Note: All federal VHF-FM frequencies must be 12.5 kHz (narrowband) on January 1, 2005.

Tones – Assigned by channel. All standard CTCSS tones are available along with a number of non-standard tones. Tone 64 is used as "no-tone". Digital tones (DPL) are also available. Note: Do not use both CTCSS and DPL tones on the same entry for a frequency. They are not compatible.

Guard – The guard receiver is independent from the main receiver; however, they both use the main transmitter. Both guard receiver pre-sets must be set to 168.625 MHz (Air Guard). This is the National Interagency Fire emergency channel. Set guard 1 to 25.0 kHz wideband and guard 2 to 12.5 kHz narrowband. All aircraft and most ground forces monitor Air Guard.

Additional Information

1. **MN/GD switch** – Sets transmitter to main (upper window) or guard (lower window).
2. **Gl/G2 switch** – Selects presets for guard 1 or guard 2.
3. **HI/LOW switch** – Selects HI (10 watts – normal) or LOW (1 watt) power output.
4. **Time-Out-Timer** – Automatically shuts off transmissions after 90 seconds. Select by pushing FUNC then M.UP. Use M.UP & M.DN to toggle between off/on and push ENTER. To continue transmitting after 90 seconds, release & push PTT again.
5. **Display Brightness** – Adjustable by pressing UP (brighter) and DN (dimmer).
6. **Keypad Lockout** – Locks out all keypad entries. Push FUNC then LOCK. To return keypad to normal operation hold LOCK until "UNLOCK" is displayed.
7. **Enable Scan** – Push FUNC then SCAN. New radios (+1500) will want to know which scan group (1-5) to operate on. To stop scanning push SCAN. Scanning will stop when a signal is received on a scanned channel and resume 5 seconds after the transmission has ended.

8. **MAFFS Programming Note** – TFM-138B's cannot be programmed through SCNS.

Changing Channels

Press M.UP or M.DN (radio scrolls through channels).

Or

Press RCL, then three-digit channel number (i.e. 023), then ENTER.

Loading a New Direct Channel

1. Press FUNC
2. Type in a frequency (i.e. 168.650) & press ENTER.
3. Select bandwidth (Normally 25.0) & press ENTER.

Programming Channels

1. Press FUNC, then PROG.
2. Type in receive frequency & ENTER.
3. Type in transmit frequency & ENTER.
4. Select bandwidth (Normally 25.0) with M.UP & M.DN, then ENTER.
5. Change alpha/numeric display with M.UP & M.DN. Press ENTER to load each of 9 characters.
6. Set Channel to "SCAN" (scan on) or "LOCKOUT" (scan off) with M.UP & M.DN, then ENTER. (Assign scan groups (1-5) on radios S/N 1500 and up).
7. Enter 3-digit channel number & ENTER <u>twice.</u> (do not change G?).

Loading Tones

1. Change to the channel requiring tone.
2. Press FUNC, then TONE.
3. Change main receive tone with M.UP & M.DN, then ENTER. (normally no tone is used - number 64).
4. Change main transmit tone with M.UP & M.DN, then ENTER.
5. Change G1 transmit tones with M.UP & M.DN, then ENTER. (should not need modification from tone 110.9 - number 15). Repeat for G2.
6. Change main and guard receive & transmit DPL tones (not normally used). Set to "000" & press ENTER for all four entries.

King KFM 985 VHF-FM Radio

Channel Programming – Following are instructions for programming channels within a group. Most groups can be pre-programmed, however at least one group should be reserved for incident frequencies. A 0 or invalid entry in any receive frequency may cause the radio to malfunction. Radio can also be cloned one group at a time to a master radio.

1. Select MAIN or AUX radio with toggle.
2. Turn radio on.
3. Adjust squelch.
4. Turn SCAN and PRI off - toggles down.
5. # once – current group number displays.
   # twice – current group label displays.
   #, then number – to change group.
6. FCN for 3 seconds to access program mode.
7. Enter password – 000000.
8. ENT – (Ch 00) displays.
9. Enter channel number to be programmed.
10. FCN – current RX frequency displays.
    If correct – FCN, go to step 16.
    If incorrect, CLR.
    Key in new frequency numbers.
    ENT – loads new RX frequency.
11. Repeat step 10. for RX CG, TX Frequency, and TX CG.
12. Current Channel Label displays.
    If correct – FCN, go to step 17.
    If incorrect – CLR.
    PRI to first character.
    FCN – loads first character.
    Repeat for other characters.
    # for period after a character.
13. ENT – Channel number displays.
    FCN back to Channel Number – reviews channel settings.
14. CLR, then key in numbers of next channel to program.
15. Repeat steps 10-13 for all channels in the group.
16. Turn radio off to store program changes.

Operation – Following are instructions for operating a KFH 985 radio that has been setup with the National Audio Support Cache recommended settings during initial setup.

1. **Starting Radios**
   Select MAIN ox AUX radio with toggle.

Turn both radios on. Adjust both squelches. Adjust volumes.
Set A/B toggles in A position.

2. **Selecting a Group**
   Select MAIN for groups 1-7, AUX for 8-15.
   Turn SCAN and PRI off – down.
   # once to display current group number.
   # twice to display label current group label.
   #, then key in number of group desired.

3. **Transmitting**
   Select appropriate radio, MAIN or AUX.
   Select appropriate group.
   Rotate knob to desired channel number.
   Select FM on the audio panel and press the PTT to transmit.
   Red light glows and TX is displayed.

4. **Receiving**
   MAIN and AUX receive one group each simultaneously.
   Channels selected are always received.
   PRI light glows when radios receive.
   If incorrect code is received, PRI light glows but message is not heard.
   Scan list channels in selected group are received when SCAN toggle is up.

5. **Scanning**
   If channels are not code guarded, adjust SQ to threshold.
   If channels are code guarded, adjust SQ to CG.
   Put the SCAN toggle up.
   All channels on the Scan List in the selected group are received.
   When display is in channel label mode, SCN flashes while scanning.
      If a channel is active, its label displays.
   When the display is in channel number mode, -- flashes while scanning.
      If a channel is active, its number displays right of current number.
   Scan delay time is 2 seconds at, end of scanned message.

6. **Changing the Scan List**
   Turn SCAN and PRI off - toggles down.
   Select a channel.
   Press ENT to add channel to list, SCN is displayed.
   Press CLR to delete channel from list, SCN disappears.

7. **Using Priority Scan**
   Turn SCAN and PRI on - toggles up.
   Channel selected is the priority channel.
   If priority channel is active, scanning function locks on it.

Technisonic TDFM-136 Radio

The TDFM-136 is programmed in layers (Levels), similar to a Windows based computer operating system. Think of the TDFM-136 as a computer that performs as a radio, not just a radio. **These TDFM-136 Programming instructions are intended only for radios having the same software version** (displayed when first turned on or see Level 3-Key 4).

There can be up to 200 Preset Main channels. TDFM-136 software allows disabling non-activated channels for quick wraparound channel changes. NIFC activates channels 1 to 15. Channels 16 to 200 can be user activated by programming a new channel (Level 2 - Key 1).

The TDFM-136 has 3 levels of user programmable functions. Level 1 has the most commonly used functions. Levels 2 and 3 are accessed using the "0/PROG" button. Some of Level 1 & 2's functions are disabled by NIFC.

Consult the TDFM-136 Command Matrix to see where to go ***and then*** use the individual Level instructions to see how to do it. Set MN/GD switch to MN before programming.

TDFM-136 Command Matrix (Software Version R1V40)			
KEY	**Level 1**	**Level 2**	**Level 3**
1 CHAN	Select Main Channel	Program New Channel **Guard**	Select Boot Channel
2 ↑	Display – Brighter	**Disabled**	Data Upload
3 MODE	Edit Mode (W/N/P25)	**Disabled**	Not Used
4 ←	Preset – Memory Down	Edit P25 NAC Code **Disabled for Guard**	Display Software Revision
5 SCAN	**Disabled**	**Disabled**	Not Used
6 →	Preset – Memory Up	Edit Channel Description – **Disabled for Guard**	Set PTT Timer
7 FREQ	Edit Frequency – **Disabled for Guard**	Not Used	Set Sidetone Level
8 ↓	Display Brightness – Dimmer	**Disabled**	Data Download from PC
9 SQL	Edit Squelch – **Disabled for Guard**	Set Noise Squelch Level	Display Squelch Value
0 PROG	Go to Next Level	Go to Next Level	Not Used
# ENTER	Save Changes – **Disabled for Guard**	Not Used	Not Used
* ESC	Abandon Changes	Go to Previous Level	Go to Previous Level

Matrix Notes:

Bolded 'Disabled for Guard' – Function disabled for Guard entries. Main radio editing functions normal.

Bolded Disabled – Function disabled.

LEVEL 1 - (Direct/Standard). Requires only the desired key to be pressed.

Key Function

1 **Select Main Channel** (Same as TFM-138B Recall). Selects any pre-programmed channel. Will select only valid channels having pre-programmed frequencies.
A. Press 1.
B. Press desired preset channel number (i.e. 034).
C. Press ENTER or ESC.

2 **Display Brightness Up.** Press 2 (hold down to rapidly increase brightness).

3 **Selects Mode.** Allows modification of mode using any pre-programmed channel's existing information.
A. Press 3/MODE.
B. Keep pressing MODE key to select "w", "n", or "D".
- "w" for 25 kHz analog wide-band, - "n" for 12.5 kHz analog narrow-band, - "D" for 12.5 kHz P25 Digital.
C. Press ENTER once to use change. Press ENTER a second time to store the change into the pre-programmed channel in use.

4 **Preset Memory Down.** Press 4 (hold down to rapidly decrease channels).

5 **SCAN ON/OFF – DISABLED.**
A. SCAN ON - Keep pressing SCAN for desired scan group and press ENTER.
B. SCAN OFF - Press SCAN or ESC.

6 **Preset Memory Up.** Press 6 (hold down to rapidly increase channels).

7 **Edit Frequency** Allows modification of frequency using any pre-programmed channel's existing information.
A. Press 7/FREQ.
B. Keep pressing MODE key to select "S", "R" or "T" then press ENTER:
- "S" to set Simplex frequency - "R" to change Receive frequency - "T" to change Transmit frequency.
C. Push keys corresponding to desires frequency.
D. Press ENTER once to use change. Press ENTER a second time to store the change into the pre-programmed channel in use.

8 **Display Brightness Down.** Press 8 (hold down to rapidly decrease brightness).

LEVEL 1 - (Direct/Standard) – CONTINUED

Key Function

9 **Edit Squelch & Talkgroup.** Allows modification of squelch using any pre-programmed channel's existing information.

A. Press 9/SQL.

B. Keep pressing MODE key to select "S", "R" or "T" then press ENTER:
- "S" to set Simplex frequency Tones
- "R" to change Receive frequency Tones
- "T" to change Transmit frequency Tones.

C. Keep pressing SQL key to select "t", "c", "g", or "x" then press ENTER:
"t" to select CTCSS Tones (analog frequencies only) "c" to select DPL Tones (analog frequencies only)
"g" to select P25 Digital Talk Groups (Digital frequencies only) "x" to select Noise Squelch (no tones).

D1. ANALOG – Scroll to the desired "t" or "c" analog values using the 2 and 8 keys.

D2. DIGITAL – Scroll to the desired "g" talkgroup value using the 2 and 8 keys while moving the cursor left and right with the 4 and 6 keys.

E. Press ENTER once to use change. Press ENTER a second time to store the change into the pre-programmed channel in use.

0 **Change Programming Level.** Level indication between guard channel number and guard channel text.
- Level "1" for Direct Entries (no Level indicator).
- Level "2" for Programming Entries.
- Level "3" for Configuration Entries.
- Must enter second Level key within 5 seconds or display resets to Level 1.

**Enter.** Accepts entry and returns to standard display.

***** **Escape.** Abandons entry and returns to standard display.

LEVEL 2 - (Programming). Requires 0/PROG to be pressed before the second key is pressed (i.e. 0-1-etc).

Key Function

1 **Program New Channel** (Same idea as TFM-138B Programming). Dependent upon MN/GD and G1/G2 switches.

A. Press 0/PROG then 1/CHAN.
B. Enter channel number to Preset (i.e. "021") and press ENTER.
C. Scroll through SCAN List numbers (1-5) by continuing to press SCAN. Enable SCAN by pressing PROG to toggle between SCAN ON (large number-2) and SCAN OFF (small number-2) then press ENTER.
D. Enter Text using the 2 and 8 keys while moving the cursor left and right with the 4 and 6 keys and press ENTER.
   - Press MODE to select between upper case (A-Z), lower case (a-z), numbers (0-9), and special symbols (!-*) (see lower right corner of display).
E. Enter operating Mode using MODE key and press ENTER.
   - "w" for wide-band, - "n" for narrow-band, - "D" for P25 digital
F. Enter receive frequency (Rx) and press ENTER.
G. Enter transmit frequency (Tx) and press ENTER.

ANALOG OPERATION

H1. Enter receive squelch (Rx) using SQL key and press ENTER.
   - "t" for CTCSS, - "c" for DPL, - "x" for noise squelch
I1. Change squelch values using the 2 and 8 keys then press ENTER.
J1. Repeat H1 and I1 for transmit squelch (Tx).
K1. Done.

DIGITAL OPERATION

H2. Enter receive squelch (Rg) using SQL key and press ENTER. "g" for P25 digital squelch, or "x" for noise squelch
I2. Scroll to the desired “g” talkgroup values using the 2 and 8 keys while moving the cursor left and right with the 4 and 6 keys then press ENTER.
J2. Repeat H2 and I2 for transmit squelch (Tg).
K2. Select receive P25 digital NAC values using the 2 and 8 keys while moving the cursor left and right with the 4 and 6 keys then press ENTER.
L2. Repeat K2 for transmit NAC value.
M2. Done

2 **Copy GUARD to MAIN – DISABLED.** Press 0 then 2.

3 **Lock Keypad – DISABLED.** Lock’s out keypad.

A. Press 0/PROG then 3/MODE to lock keypad.
B. Hold */ESC to unlock keypad.

LEVEL 2 - (Programming) – CONTINUED

Key Function

4 **Change P25 digital Network Access Code (NAC).** Allows modification of three character NAC code (i.e. F7F) using any pre-programmed channel's existing information.

A. Press 0/PROG then 4.
B. Keep pressing MODE key to select S, R, or T then press ENTER:
   - "S" to set Simplex frequency NAC code.
   - "R" to change Receive frequency. NAC code
   - "T" to change Transmit frequency NAC code.
C. Press the 2 and 8 keys while moving the cursor left and right with the 4 and 6 keys.
D. Press ENTER once to use change. Press ENTER a second time to store the change into the pre-programmed channel in use.

5. **EDIT SCAN List - DISABLED**. You must be on the pre-programmed channel requiring editing.

A. Press 0/PROG then 5/SCAN.
B. Toggle between SCAN ON (large number-2) and SCAN OFF (small number-2) by pressing PROG.
C. Scroll through SCAN lists (1-5) by pressing SCAN. SCAN number "0" is no SCAN list on channel.
D. Press ENTER once to use change. Press ENTER a second time to store the change into the pre-programmed channel in use.

6 **Edit Channel Text**. Allows modification of text using any pre-programmed channel's existing information.

A. Press 0/PROG then 6.
B. Keep pressing MODE key to select A, a, 0 or <space> then press ENTER (see lower right corner of display).
   - "A" to set Upper Case letters (A-Z).
   - "a" to set lower case letters (a-z).
   - "0" to set numbers (0-9).
   - <space> to set blank space and special symbols (!-*).
C. Enter Text using the 2 and 8 keys while moving the cursor left and right with the 4 and 6 keys.
D. Press ENTER once to use change. Press ENTER a second time to store the change into the pre-programmed channel in use.

7 **Not Functional**.

8 **Copy MAIN to GUARD – DISABLED** (Same as TFM-138B Func-7).

LEVEL 2 - (Programming) – CONTINUED

Key Function

9 **Set Noise Squelch Level – AVOID USE**. Adjusts radio squelch level.
A. Press 0/PROG then 9/SQL.
B. Press 2 and 8 to adjust value. "00" is lowest and "10" is highest.

0 **Change Programming Level.**
- Level indication between guard channel number and guard channel text.
- Level "1" for Direct Entries (no Level indicator).
- Level "2" for Programming Entries.
- Level "3" for Configuration Entries.
- Must enter second Level 2 key (2-1) within 5 seconds or display resets to Level 1.

**Enter.** Accepts entry and returns to standard display.

- **Escape.** Abandons entry and returns to standard display.

LEVEL 3 - (Configuration). Requires 0/PROG to be pressed twice before the second key is pressed (i.e. 0-0-4-).

Key Function

1 **Select Boot Channel.** Selects which Preset channel will be displayed when radio first turned on.
A. Press 0/PROG twice then press 1/CHAN.
B. Continue to press 1 to switch between "last used" and "last programmed".

2 **Data Upload to PC.**
A. Connect PCDL-136 Programming cable. TFM-138 & TFM-500 cables will not work.
B. Start TDP-136 software program and configure for proper COM port.
C. Select "Upload (from radio)" on the computer within 20 seconds of pressing 2 (below).
D. Press 0/PROG twice then press 2.
E. Select "OK" after upload complete.

4 **Display Radio Software Version.** Press 0/PROG twice then press 4 & hold.

6 **PTT Timer.** Selects PTT timer for off, 30, 60, or 90 seconds.
A. Press 0/PROG twice then press 6.
B. Press 2 and 8 to change number.
C. Press ENTER or ESC.

7 **Sidetone Adjust – AVOID USING.** Adjusts radio sidetone level.
A. Press 0/PROG twice then press 7/FREQ.
B. Adjust Guard volume knob for desired sidetone level.
C. Press FREQ to save setting.
D. Press ESC twice to return to normal operation.

8. **Data Download from PC**.
A. Connect PCDL-136 Programming cable. TFM-138 & TFM-500 cables will not work.
B. Start TDP-136 software program and configure for proper COM port.
C. If desired, erase all radio channel information (reset to default) prior to loading new information by:
   a. Selecting "Purge" on computer.
   b. Follow steps E through G below.
   c. Select "Unpurge" on computer.

LEVEL 3 - (Configuration) – CONTINUED

either

D1. Edit information displayed on screen.

or

D1. Open existing file on computer by selecting "Open File".

D2. Locate existing ".136" file then select "Open".

then

E. Press 0/PROG twice then press 8.

F. Select "Download (to radio)" on the computer within 20 seconds of pressing 8 (above).

G. Select "OK" after download complete.

H. Turn radio OFF then back ON once programming is complete (reboots using new information).

9 **Display Channel Squelch Information.** Displays squelch information for channel currently active.

A. Press 0/PROG twice then press 9/SQL & hold.

- Upper window for Receive data. Bottom window for Transmit data.

- "t" for CTCSS tone - "c" for DPL - "G" for Talkgroup - "N" for NAC code

NOTE: Displayed values present on every channel but active only when enabled.

Additional Information – TDFM 136

1. **Programming Level**. Level 1 (Direct/Standard) programming functions do not require a level number being used prior to performing Level 1 fuctions. Level 2 (Programming) functions WILL require the level number for Level 2 functions (i.e. for Programming Channels press 0/PROG – 1/FREQ - etc.).

2. **P25 Digital**. Normally, P25 Digital channels will also receive standard analog wide-band and analog narrow-band communications. **This radio will not receive both P25 digital and analog simultaneously**. The transmitter will transmit whatever mode the channel is currently programmed for (digital, wide-band or narrow-band). P25 cannot transmit CTCSS or DPL tones. P25 must use NAC codes and talkgroups.

3. **NAC codes**. Think of NAC codes as the digital equivalent of CTCSS tones. To operate any P25 radio you MUST have the same NAC code (and talkgroup) as the people you are trying to talk with. Open NAC code is **F7F**.

4. **Talkgroups**. A talkgroup is a sub-group of a NAC code. You will not hear anyone unless you are on the same talkgroup. Open talkgroup is **FFFF**. There can be thousands of talkgroups and hundreds of NAC codes all operating on the same frequency. Obviously you will need to have standard NAC and talkgroups or effective communications will be impossible.

5. **Switches**
   A. MN/GD switch. Selects transmitter to main (upper window) or guard (lower window) use.
   B. G1/G2 switch. Selects guard 1 or guard 2 preset channel.
   C. HI/LOW switch. Selects HI (10 watts – normal) or LOW (1 watt) power output.
   D. Scratchpad channel. Channels with small numbers (00_1) indicate that channel has been modified (scratchpad). Any channel can be a scratchpad channel. Press ENTER once to use changes made to preset channel (00_1). Press ENTER a second time to accept change for loading into the pre-programmed channel (001) or ESC to abandon changes.

Northern Airborne Technology NPX Programming Guide

Display

1. **Upper Row** – Selected channel information.
2. **Lower Row** – Functions information. Normally shows power level settings and tones. Other settings may be displayed by entering the status edit mode.

Normal Operation

1. **EDIT Switch** – Must be in center position for **NORMAL** operations. Functions of edit control switches (connected by lines on panel) are those labeled above them.
2. **MN Knob** – Sets Main Rx volume. Turns Main radio off.
3. **Main LED** – Lights green if Main is keyed. Lights amber if a signal is received.
4. **SCAN-NORM-GD Tx Switch**
    a. **NORM** – Main radio transmitter is selected and scanning is disabled.
    b. **SCAN** – Main radio transmitter is selected and scanning is enabled.
    c. **GD TX** – Guard (G1 or G2) radio transmitter is selected.
5. **GD Knob** – Guard Rx volume. Cannot be turned off – preset minimum level.
6. **Guard LED** – Lights amber when Guard radio is active.
7. **GD1/GD2 Switch** – Selects active guard channel. GD1 is preset to 168.625, GD2 is preset to 167.950. Transmit frequencies of Guard channels are programmable.
8. **DISP Switch** – Each channel has three data lines (ID, RX and TX).
    a. **ID** – Channel number, label, scan flag, and priority scan flag.
    b. **RX** – Channel number, Rx frequency and tone. "r" is for receive frequency.
    c. **TX** – Channel number, Tx frequency and tone. "t" is transmit frequency.
    In SIMPLEX mode, radio's Tx data is changed to match Rx data. Tx data remains in radio, but is unused until radio is switched back to duplex mode. "s" indicates radio is in simplex mode.
9. **CHAN Switch** – Press left or right (- or +) to increment by one channel. Press and hold left or right (- or +) to scroll through channels.
10. **BRIGHT Switch** – Press left or right (- or +) to change display brightness.
11. **SQ Button** – Press to monitor activity on radio when tones prevent squelch from opening, or to verify settings or radio function.

Channel Editing

1. **EDIT Switch** – Must be in **CH** position for channel editing. Functions of edit control switches (connected by lines on panel) are those labeled **below** them.
2. **DISP Switch** – Select information to be edited (ID, RX, or TX).
3. **SELECT Switch** – Cycles up or down (+/-) through list of available numbers/characters that can be entered at position of blinking edit cursor.
4. **NEXT Switch** – Moves the edit cursor one position to the right (+) or left (-).
5. **HELP Switch** – Press to access help during initial power-up. If help is required after the radio is already on, cycle the radio off and then back on again.

Tones

1. **Tone Display** – On far right side of RX and TX lines.
2. **Tone Selection** – Use Channel Edit mode to select tones for each channel. Different tones can be set for Rx and Tx. If no tone is needed it can be set to "-".

Status Editing

1. **EDIT Switch** – Must be in **ST** position for status editing. Functions of edit control switches (connected by lines on panel) are those labeled **below** them.
2. **SELECT Switch** – Step to previous/next available setting for the current function.
3. **NEXT Switch** – Press left or fight to move to the previous/next function.
4. **TX MODE-DUPLEX** means both RX and TX frequencies programmed in selected channel will be used. **SIMPLEX** means RX frequency programmed in selected channel will be used for both RX and TX. TX data is stored and will become effective when mode is changed back to duplex.
5. **POWER** – Radio can transmit at HI (10 watt) or LO (1 watt) power setting. Many radio station licenses have power restrictions at altitude, and must be set to low TX power above 5,000 feet for legal operation. This may also be required to prevent repeater interference at altitude, or to permit secure operations.
6. **TONES** – Radio tones can be set globally to **ON**, **OFF**, or **TX ONLY**.
7. **Tone DISP** – Tone presentation: **FREQ** = tone frequency (most common – decimals are truncated e.g., 103.5 Hz becomes 103, **1-38** = sequential numbers for EIA tones, **MCODES** = Motorola codes, and **WCODES** = Wulfsberg codes.
8. **SCAN** – At present, there is only one scan mode available (**LIST**).
9. **PWR-UP SCAN** – Channel on power up. Can be set to PDC (Power-Down Channel) the channel that was selected when the radio was turned off.

Scanning

1. **General** – Radio stops on flagged channels. There may be no audible signal if tones do not match. Tones should be set to **OFF** during scanning.
2. **Activation** – Move **SCAN/NORM/GUARD Tx Switch** to **SCAN** position. The "home" channel is the channel the radio was on before scanning was activated.
3. **Message** – **SCANNING** appears on the upper row of the display. When radio finds an active channel, display shows channel data (**ID**, **RX**, or **TX**).
4. **Keyed Mic** – If radio is scanning, radio will go to "home" channel. If radio is locked on a channel, transmission will occur on that channel.
5. **Scan List** – A dash (-) in second to last space on channel ID line means the channel is not in the list. If the scan flag (~c) is displayed, the channel is in the list.
6. **Scanning Activated** – Radio moves through flagged channels until a carrier is detected. It remains on that channel until traffic stops, then waits 2-3 seconds for operator to reply. If no further activity, radio continues scanning.
7. **Scan Turned Off** – Radio resumes normal operation on the home channel.
8. **Deleting Nuisance Channels** – When radio locks on a channel not wat

NOTE: RADIO PROGAMMING INSTRUCTIONS CAN BE FOUND AT:

www.fs.fed.us/fire/niicd/avionics

Mission Checklists

Pre-Mission Checklist

1. Pilot Card & Aircraft Data Card
2. Flight & Duty Time Available
3. Aircraft Maintenance Scheduled
4. Pilot Responsibilities

Weight & Balance Calculation
Fueling
Route Planning
Aircraft Pre-Flight
Flight Plan if Needed
PPE as Required
Obtain Weather Briefing

5. ATGS Responsibilities
    - Radio System Familiarization
    - Program VHF-FM Frequencies
    - Load ATGS Equipment
    - Assist Pilot as Requested
    - Review Procurement Agreement

Dispatch Checklist

1. Incident Name/Number
2. Agency jurisdiction
3. Location (latitude/longitude, legal location, VOR)
4. Frequencies & Tones
    - Flight following
    - Air-to-Ground
    - Air-to-Air
5. Contacts (Air & Ground)
6. Aircraft assigned to incident (type & identifier)
7. Ground resources dispatched to incident (type and quantity)
8. Aviation resources available for dispatch
9. Approximate size of incident and fire behavior
10. Status of TFR, MOA, MTR (if applicable)
11. Location of airtanker reload bases – turnaround times
12. Resource considerations: watershed, wilderness, wildland urban interface
13. Incident Action Plan – If Available

Pre-Takeoff Checklist

1. Brief pilot
2. Confirm fuel supply adequate for mission
3. Set GPS
4. Record altimeter setting

Enroute Checklist

1. Record takeoff time
2. Observe sterile cockpit procedures (as agreed to with pilot)
3. Provide ETA to dispatch
4. Program VHF-AM Radio(s) when approved by pilot
5. Assist pilot as requested
6. Obtain updated information from dispatch (aviation and/or ground resource status)
7. Obtain updated status of TFR, MTR and MOA (as applicable)
8. Contact responding aviation resources
9. Flight follow at 15 minute intervals or as applicable to local agency policy

12 Nautical Mile Out - Checklist

1. Give position report to dispatch
2. Switch over to incident frequencies
3. If aviation resources are over the incident:
   - Contact controlling aircraft – provide location and altitude
   - Obtain briefing on other aircraft and incident status
   - Request approval to enter incident airspace
   - Enter airspace at agreed upon location, altitude and altimeter setting
4. If no aircraft observed or overheard over the incident:
   - Request aircraft status from ground contact
   - Announce position and status 'in the blind'
5. Advise dispatch of arrival over the incident

Arrival Checklist

1. Determine flight hazards
2. Contact other incident aircraft
   - Determine identifiers, altitudes, flight patterns, and missions
   - Assign new altitudes, flight patterns and routes as needed
   - Confirm radio frequencies
3. Make contact with incident commander (ground contact)
   - Announce location and identifier
   - Request incident strategy, tactics and priorities
   - Request status of resources assigned/enroute

4. Determine ground elevations
5. Establish air traffic control
6. Size up fire
7. Get oriented
   - Cardinal directions
   - Landmarks
   - Fire anatomy
   - Location of existing/proposed control lines
   - Record GPS reference coordinates
   - Review incident action plan (IAP) map
8. Assign aviation resources (as per strategy, tactics and incident priorities)
9. Determine TFR requirements
10. Check for airspace conflicts (MOA, MTR, etc.)

Incoming Aircraft Checklist

1. Assign altitude and altimeter setting
2. Give location and altitude of other incident aircraft
3. Provide information on flight hazards
4. Assign holding pattern/location or give clearance to enter incident airspace

Coordination with Air Ops & Dispatch Checklist

1. TFR needs for the incident
2. Airspace conflicts
3. Airtanker status (load and return or hold)
4. Aviation incidents or accidents
5. Projected needs for the following operational period (following day)
6. ATGS flight and duty hours used
7. Airtanker RON (remain overnight) location
8. Aircraft maintenance needs
9. Airtanker in-flight emergencies
10. Need for ATGS (aerial supervision) relief

Airtanker Mission Checklist

1. ATGS and Operations (or Incident Commander) determine incident objectives
2. ATGS briefs leadplane or ASM (if resource hadn't overheard operational briefing):
   - Incident priorities
   - Coverage level
   - Location of ground resources
3. ATGS briefs incoming airtanker:
   - Assigned altitude
   - Altimeter setting
   - Holding pattern or location
   - Other incident aircraft
4. ATGS clears airtanker to enter incident airspace and to contact leadplane or ASM
5. Lead plane or ASM briefs airtanker (if airtanker hadn't overheard ATGS briefing):
6. ATGS clears airspace around target
7. ATGS ensures ground resources are clear of target area
8. ATGS maintains silence on air-to-air radio frequency
   - When leadplane (ASM) and airtanker are on final or exiting the drop
9. ATGS determine whether leadplane (ASM) will fly low-level recon or dry run
10. Leadplane (ASM) briefs airtanker (route, flight hazards, retardant drift potential)
11. ATGS confirms ground resources are clear of the target area
12. Airtanker completes drop (with or without leadplane or ASM)
13. ATGS evaluates retardant drop:
    - Based on personal observation
    - From feedback from ground resources
    - From input from leadplane or ASM
14. ATGS provides feedback to leadplane (ASM) and airtanker on needed adjustments
15. Leadplane (ASM) and airtanker make adjustments on subsequent drops
16. ATGS informs airtanker to load-and-return or hold at designated reload base
17. ATGS informs ground resources they are cleared to return to the target area
18. Airtanker informs dispatch of airtanker status (load and return or hold)

Departing Incident Checklist

1. Coordinate with leadplane or relief ATGS for continuity of aerial supervision
2. Notify Operations and assigned aircraft who will provide aerial
3. Notify Operations and leadplane (or relief ATGS) when departing the incident
4. Notify dispatch of status and ETA to operating base (airport)
5. At end of shift (or operational period):
   - Plan return to operating base within daylight (single-engine aircraft only)
   - Update Operations or Incident Commander on incident status
   - Remind remaining incident aircraft of daylight operating restrictions
   - Determine RON (remain overnight) base(s) for assigned aviation resources

Post Mission Checklist

1. Determine aerial supervision (ATGS) needs for the next operational period
2. Advise pilot of plans for the next operational period
3. Debrief with ATGS pilot
4. Debrief with airtanker pilots or other tactical aviation resources at base
5. Debrief with Air Operations Branch Director (or designee) and dispatch
6. Attend or provide input to incident planning meeting
7. Request incident action plan (IAP) for the following operational period
8. Complete daily reports (as needed):
    - Flight invoices
    - SAFECOM
    - Incident specific forms or forms required by dispatch

Emergency Checklists

Flight Emergencies Checklist

1. A flight emergency is the highest priority
2. Determine the pilot's intentions for managing the situation
3. Clear airspace for the pilot as needed
4. Dedicate a radio frequency for the emergency situation
5. Direct incident aircraft to climb to a safe altitude
6. Jettison load away from ground personnel, structures or critical resources
7. If problem persists; have aircraft return to operating base or landing site
8. Alert incident medivac resources
9. Consider the need to suppress a post-crash fire
10. Notify dispatch and incident to initiate applicable crash, fire rescue protocol(s)

Missing Aircraft & Crash Checklist

1. Assign incident aircraft to conduct search
2. Determine location of crash
3. Monitor VHF-AM (ELT Frequency 121.5) if crash location is unknown
4. Assign incident aircraft to holding areas or operating bases
5. Activate incident medivac plan in coordination with Medical Unit (or Operations)
6. Assign resources to respond to the crash:
   - Initiate actions to assist survivors and/or suppress post-crash fire
7. Advise Operations or Incident Commander of accident status
8. Direct support aviation operations as required

Medivac Checklist

1. Relay information between the accident site, helibase and Medical Unit
2. Determine coordinates for accident location
3. Obtain medivac helicopter radio frequency from incident medical plan
4. Assist responding resources in locating nearest helispot
5. Provide dust abatement at emergency helispot if required
6. Guide medivac helicopter to emergency helispot

ATGS Fire Orders

The following ATGS Fire Orders highlight the most critical responsibilities and concerns of the Air Tactical Group Supervisor. Strictly adhere to these time tested orders. They will guarantee an effective and safe air operation.

A Assign air resources based on fire size-up, hazard assessment, resource capability and tactical plans.

T Terminate aviation operations that are unsafe or ineffective.

G Guarantee flight safety by practicing good radio frequency management and air space management.

S Strictly adhere to and enforce agency policies, FARs and standard operating procedures.

F Fight fire aggressively but provide for safe ground and air operations.

I Inform Operations when tactics are completed, ineffective or unsafe – recommend other options.

R Recognize and alert ground personnel of fire conditions and air operations that may jeopardize firefighter safety. ("You are their eyes in the sky! ")

E Ensure instructions are clear, accurate and expressed in standard terms.

O Organize air tactical operations to provide continuous supervised air tactical support.

R Require continuous communications with ground personnel and assigned air resources.

D Determine and assign safe flight routes and patterns with adequate vertical and horizontal separation.

E Establish communications procedures to ensure good coordination, positive aircraft separation and flight safety.

R Remain in control of all air resources at all times.

S Stay alert, keep calm, think clearly and act decisively.

ATGS Watch Out Situations

When one or more of the following situations exists, air operations safety and effectiveness are in jeopardy. Address the situation(s) before continuing operations.

1. Fire is not thoroughly scouted for aviation safety hazards.
2. Fire has not been thoroughly sized up and a strategic/tactical plan has not been developed.
3. Air resources do not clearly understand location of the target area and their tactical objectives.
4. Air resources are not aware of all flight hazards.
5. Flight routes and altitude assignments have not been established, identified and communicated.
6. Visibility is poor and air resources are having difficulty seeing ground hazards and maintaining visual contact with other aviation resources.
7. Poor or intermittent communications with ground resources and other air resources.
8. Ground resources are not continuously monitoring and communicating on the tactical air-to-ground frequency.
9. Wind, turbulence and/or visibility make missions ineffective or unsafe.
10. Simultaneous arrival of air resources working in the same airspace without establishing mission priorities and coordination.
11. Radio frequency overload or inattention makes communication difficult or ineffective.
12. Aircraft are in the incident airspace with inoperable radio(s).
13. There is an airspace intrusion by a non-incident aircraft.
14. MOA's or MTR's have not been de-conflicted.
15. A TFR has not been established or its dimensions do not include all incident operating areas.
16. Aviation operations are occurring in a congested area without a leadplane (ATCO).
17. The incident is located on or near a flight route to an airport.
18. Aircraft are making altitude changes without prior clearance.
19. Aircraft enter the incident airspace without proper clearance.
20. Aerial supervision is interrupted by the need for fuel, relief ATGS or an emergency.
21. Unnecessary leads or join-ups when a "show-me" will do.

ATGS Do's & Don'ts

1. Check for air space restrictions and request a TFR if this has not been done.
2. The VHF-FM radio has two volume switches. Turn both of them on. Things just won't work unless you do.
3. Be "positive" in your communications. Hesitant or tentative messages lead to doubt and eventual mistrust.
4. Stay calm. "Excited" voices from the sky lead to excited people on the ground and can contribute to panic where there isn't any need.
5. Don't use "scare" terms such as "blowup" when the fire is making a "run." Relates to #3 above.
6. Establish and maintain control of the air operations and radio communications. If everyone starts talking, no one hears anything.
7. Keep an action log. Make notes pertaining to ETA's, "turn-around" times, flying times left, drop placement and effectiveness, airtanker performance, etc.
8. Note and record: fuel types, natural barriers, ground/flight hazards and access routes even if they don't affect suppression activities now. These items may become important as the day goes on.
9. Be alert for the development of dangerous situations and intense fire behavior that may threaten ground resources. Advise or alert the Incident Commander or Operations Section Chief as appropriate. If you are unable to contact these individuals and the situation is becoming critical, contact affected line personnel directly.
10. Spot fires – be alert – don't forget the flanks and heel (toe) of the fire. Wind direction changes and so does the convection column. Look for spot fires downwind and under the "trail" of the convection column. If the column shifts, look where it 'was'. There can be "sleepers" lying around out there.
11. Be specific when describing locations on the ground. "Next to the big tree" or "right by those red rocks" doesn't mean much to anyone on the ground or in the air when they're looking at acres and acres of trees and rocks.
12. Don't use compass references when describing locations on the fire. The 'northeast corner' may be the 'southwest corner' to the guy on the ground. Use fire anatomy terminology such as 'head', 'right flank', 'left shoulder', etc.
13. Observe retardant and helicopter bucket drops. Check with Operations on placement and effectiveness. Make corrections as needed.
14. Be in position to observe drops. You can't correct the location of the next drop if you didn't see where the previous one hit.

15. Watch the helicopter bucket drops closely. It's hard to see water/foam once its released and even harder to see it once its on the ground.

16. As the day (and the fire) heats up, short term retardant begins to lose its effectiveness much faster than long term retardant.

17. Keep feeding information to Operations or the Incident Commander. You are the best pair of 'eyes' they have.

18. Establish standard fire traffic area check-in procedures for all incoming aircraft (12 nautical miles out).

19. Set up a staggered 'turn-around' for airtankers. Don't 'stack' airtankers for long periods of time. This results in wasted money and flight time you may wish you had later on in the day.

20. Maintain separation of aircraft and aviation operations. Large airtankers and helicopters don't share the same air space at the same time without shedding parts.

21. Don't waste time between arriving airtankers. Establish priorities, take another 'look' at the last trouble spot and anticipate the next trouble spot. Be ready for the inbound airtanker; don't waste its time. Line up the drop with the leadplane. The longer an airtanker orbits, the longer it takes to return with the next load. Retardant doesn't do anybody any good orbiting in a tank.

22. Don't get 'bent-out-of-shape' if Operations or the Incident Commander changes your priorities. It's their fire and you work for them. Make your recommendations and then 'get on with it'.

23. Airtanker pilots will do almost anything to put the retardant where it's needed. Don't let a sense of urgency influence you and/or them into doing something that might get someone killed.

24. Don't get 'up-tight' if a pilot refuses a mission. He/she knows what they and the aircraft can do safely.

25. Get to know the aircraft and pilots on the incident. Assign the "tough jobs" to those who can accomplish it.

26. Visit with lead plane and airtanker pilots. Questions and/or problems are easier to work out on the ground than in the air.

27. If it's clear that one of your airtankers/helicopters is going to run out of flight time before the end of the shift, get another resource ordered. Don't wait until it becomes a 'crisis' to order additional resources.

28. When the need for or the effectiveness of air operations is questionable, recommend shutting down operations to the Operations Section Chief or Incident Commander.

29. It is your responsibility to monitor the effectiveness of incident air operations. Part of that is the effectiveness of the retardant itself. If the drops are placed correctly and it still isn't doing any good, advise Operations or the Incident Commander. Shift targets or shut down all or part of the air operation.

30. When you do shut down air operations, make sure everyone 'gets the word' including Operations, the Incident Commander, dispatch and assigned aviation resources. Airtankers have been known to make 'one more trip'.

31. On large incidents or during extended attack, you and/or the relief should attempt to attend the evening planning meeting to provide input on today's operations and to better understand tomorrow's incidents needs and objectives.

32. Provide for adequate rest for yourself and your pilot. During periods of prolonged activity, cumulative fatigue will catch up with you.

33. Advise Operations or the Incident Commander of your remaining flight time. He/she needs to know how long they can count on you.

34. Don't go home until released by Operations or the Incident Commander. You work for them and it's reasonable to expect they want their money's worth.

35. News media aircraft (particularly helicopters) may appear out of nowhere. They can, and should be accommodated, but you are responsible to manage incident airspace. Control them and let them in when it is safe. If there are airtanker operations in progress, contact the media on the assigned air-to-air frequency and instruct them to orbit at an assigned altitude and/or location. Permit media aircraft to move in closer 'to the action' when it is safe to do so.

36. Follow up and recommend lifting the temporary flight restriction (TFR) when the scope of air operations makes it prudent to do so.

37. Air operations are expensive. Manage aviation resources effectively and efficiently. Shut down air operations when they are ineffective.

38. Watch out for hazards in flight patterns and drop runs. Watch out for tall trees (snags), towers and turbulence in saddles, canyons and the lee-side of ridges.

39. Coordinate the use of reconnaissance aircraft from the local jurisdiction and/or recon flights with agency managers.

40. Don't throw up on the upholstery in the aircraft. Pilot's don't have that much of a sense of humor.

These will do for a 'starter'. You will add some of your own as you go along**.**

ATGS Mission Record

Date_____ **Altimeter_____** **Take Off_____ On_____**

Time_____ **Fire Elevation _____** **Take Off_____ On_____**

T_____R_____Sec_____1/4_____ **VOR-From_____On_____Nm_____**

Lat_____ Long_____ **VOR-From_____On_____Nm_____**

Flight Hazards _____ **TFR: Y or N or Ordered**

In MOA____ On MTR____ **Mil/FAA Notified: Y or N** **Contacts**

Dispatch_____ **Air-Ground _____** **_____**

Air-Air Tanker_____ **Command _____** **_____**

Air-Air Heli_____ **Other _____** **_____**

Miscellaneous Aircraft					Helicopters			
Type	Number	Mk/Mod	ETA		Type	Number	Mk/Mod	ETA

Airtankers

Number	Mk/Mod	Gallons	Reload	T/A	RON	Remarks

Retardant Drop Record

Tanker	ETA	Drop	Assess	Ret		Tanker	ETA	Drop	Assess	Ret
1						11				
2						12				
3						13				
4						14				
5						15				
6						16				
7						17				
8						18				
9						19				
10						20				

Fire Size-Up Form

Incident _____ **T_____ R_____ S_____ ¼ _____**

Date _____ Time _____ **Lat_____ Long _____**

Agency _____ Unit _____ **Priority_____of _____**

As needed - circle choice or fill in the blank.

Character of Fire	**Smoldering Creeping Running Torching Crowning Spotting**
Size (acres)	
Position on Slope	**Top Upper 1/3 Middle Lower 1/3 Bottom**
Percent Slope	**Flat 10 20 30 40 50 50+**
Exposure	**N NE E SE S SW W NW**
Elevation (feet)	
Wind Speed (mph)	
Wind Direction	**N NE E SE S SW W NW**
Wind & Terrain	**Down Canyon Up Canyon Down Slope Up Slope Variable**
Weather	**Clear Scattered Clouds Overcast T-Storms Rain**
Fuel Type	**Grass Brush Re-prod Hardwood Timber Slash Snag Log**
Fuel Model	
Fuel Pattern	**Continuous Broken Patchy Isolated**
Adjacent Fuel	**Grass Brush Re-prod Hardwood Timber Slash**
Spread Rate (ch/hr, ft/min)	
Spread Potential	**Low Moderate High Extreme**
Recommended Resources	**Engine Dozer Ground Crew Smokejumper Helitack Rappel**
Number Personnel Needed	
Ground Travel Time	**0-1 hours 1-3 hours 3 hours +**
Special Needs	**Retardant Bucket Pump Chainsaw**
Priority Category	**1. Life & Property 2. Commodity 3. Wilderness**
Remarks	

ATGS MISSION EVALUATION

Name:	**Date:**	**# Evaluation Fires _____ (Taskbook)**
Trainee: Y N	**Check Ride: Y N**	**# Missions this Fire _____**
Incident Name:		**# Missions Active ATGS Role:**
Incident Location:		**Fuel Model(s):**

Type of Incident:
____ Prescribed Fire ____ Initial Attack (A, B, C) ____ Initial/Extended Attack (D+)
____ Large Fire (pre-containment) ____ Large Fire (controlled) ____ Other:

Complexity Elements: ____ TFR ____ Urban Interface ____ MOA/MTR ____ International

Complexity Level: ____ Low ____ Medium ____ High

Aviation Resources This Mission (number):

____ Type 1 Helicopters	**____ Type 1 Airtankers**	**____ Lead/ASM/HLCO**
____ Type 2 Helicopters	**____ Type 2 Airtankers**	**____ Media Aircraft**
____ Type 3 Helicopters	**____ Type 3 Airtankers**	**____ Recon/Beaver Ops.**
____ Rappel Helicopters	**____ Type 4 Airtankers (SEATS)**	**____ CL-215/415**
____ Miltary (ANG) Heli	**____ MAFFS/AFFS**	**____ Smokejumpers**

Evaluation Criteria:	**1**	**2**	**3**	**Remarks**
1. Pre-mission preparation/tasks				
2. Enroute procedures				
3. Air space entry				
4. Establish ATGS control				
5. Implementing strategy/tactics				
6. Resource tracking				
7. Communications Management				
8. Multi-task management				
9. Air space management				
10. Air/ground safety hazards				
11. Situational awareness				
12. Intelligence gathering/reporting				
13. Directing water/retardant drops				
14. Interfacing with Lead/ASM				
15. Responding to emergencies				
16. Relief ATGS/Ops briefing				
17. Other				

Focus Areas – Next Mission:
A.
B.
C.

Remarks:

Evaluator/Check Airman Name:

Evaluation Criteria: 1 = Deficient; 2= Minimally Acceptable Performance; 3 = Proficient

ATGS AIRCRAFT DAILY COST SUMMARY

Date_____ Aircraft N#_____ Contractor_____

Contract#_____ Flight Invoice#_____

Incident Name _____ Incident Number _____

ATGS'S Name _____ Home Unit_____

	HRS		RATE	
Flight Time		**X**		**= _____**
	HRS		**RATE**	
Guaranteed		**X**		**= _____**
	HRS		**RATE**	
Standby		**X**		**= _____**
	No. of Crewmen		**RATE**	
RON Cost		**X**		**= _____**
Misc Cost				**= _____**
		TOTAL COST		**= _____**

COMMENTS

ATGS Mission History Log

Incident Name and Number	Incident Type	Dates Assigned	Incident Commander or Unit Name	Aviation Resources Assigned		Flight Time (Hours)
				Number/Type Helicopter	Number/Type Fixed Wing	

For use in tracking experience and currency requirements

Acreage Estimation Tools

Known Acreage References

Football Field	1.1 Acres
Baseball Diamond	0.2 Acres
Baseball Field	2.1 Acres

Section Acreage (1 square mile – 640 acres)

Large Acreage Estimates

1. Maintain a constant airspeed of 105 knots (120 mph)
2. Measure the average length and width of the incident in seconds
3. Measure in both directions to compensate for wind
4. Multiply the length by the width in seconds
5. Multiply the result by 0.711 to estimate acreage

GPS Acreage Estimates

1. Determine the dimensions of the fire in statute miles
2. Determine the area of the fire in statute miles (squared)
   Rectangle = Length X Width Triangle = ½ Base X Height
   Circle = 3.14 X Radius (squared)
3. Divide the result by 640 to estimate acres