National Interagency Leadplane Pilot Training Course

Interagency Leadplane Unit

Table of Contents:

Leadplane Training Course

Course Objectives

- Describe procedures for safe and effective leadplane operations over an incident
- Describe efficient procedures for the utilization of aircraft to meet incident objectives
- Describe procedures for effective coordination between aviation and ground forces

1

Leadplane Training Course

Course Objectives

- Fly a leadplane profile and exit maneuver while ensuring the safety of flight
- Communicate using clear and concise radio communications

2

Leadplane Training Course

Unit 0
Introduction

Unit Objectives

- Introduce course coordinator and instructors
- Review course logistics
- Introduce the students
- Present course overview
- Discuss course expectations
- Review pre-course test

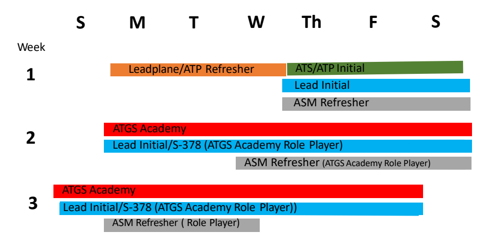
3

Leadplane Training Course

- Have an interest in becoming a leadplane pilot
- Exhibit mutual cooperation with the group
- Be open minded to accomplishments during the course presentations
- Participate actively in all of the training exercises presented in the course and be open to learning
- Return to class at the stated times
- Use what is presented in the course to effectively perform the duties of a leadplane pilot
- Be respectful of your instructor and the effort that is put into helping the student be successful

4

Leadplane Training Course



5

Leadplane Training Course

Unit 1
Safety

Objectives

- To familiarize the student with the importance of safety in the leadplane mission
- To develop the student's safety mindset in the leadplane mission

6

Leadplane Training Course

Unit 1 Handouts

NWCG SAS – Safety Chapter
NWCG – System Safety Assessment Appendix
12 Standard Aviation Questions that Shout Watch Out, 01-01-N9065-HO
Safety, 01-02-N9065-HO

7

Leadplane Training Course

Unit 2
Communications, Verbal Skills and Brevity

Objectives

- To familiarize the student with flight following procedures
- To familiarize the student with the initial briefing script
- To familiarize the student with the tactical briefing script
- To familiarize the student with the departure briefing script
- To familiarize the student with the transition briefing
- To familiarize the student with the FM radio setup
- To familiarize the student with target descriptions

8

Leadplane Training Course

Unit 2
Handouts

NWCG SAS – Scripts Appendix
Initial Briefing Script, 02-01-LPI-HO
Tactical Briefing Script, 02-02-LPI-HO
Departure Briefing Script, 02-03-LPI-HO
Verbal Skills, 02-04-N9065-HO

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Leadplane Training Course

Unit 2
Handouts

Target Descriptions, 02-05-LPI-HO
Target Descriptions, 02-01-LPI-PPT
Flight Following, 02-06-N9065-HO
FM Radio, 02-07-N9065-HO

10

Leadplane Training Course

Unit 3
Mountain Flying and Weather

Objectives

- Introduce the student to mountain flying techniques related to the leadplane mission
- Introduce the student to weather related to the leadplane mission
- Explain the importance of mountain flying techniques and weather

11

Leadplane Training Course

Unit 3
Handouts

Mountain Flying, 03-01-N9065-HO
Weather, 03-01-N9065-HO

12

Leadplane Training Course

Unit 4
Checklists and Single Pilot Resource Management

Unit Objectives

- To familiarize the student with the use of checklists
- To familiarize the student with single pilot resource management

13

Leadplane Training Course

Unit 4
Handouts

Checklists, 04-01-N9065-HO
Single Pilot Resource Management, 04-02-N9065-HO
Aircraft Preflight and Aircraft Set Up, 04-03-N9065-HO
GPS Set Up, 04-04-N9065-HO

14

Leadplane Training Course

Unit 5
In Route and Time Management

Unit Objectives

- Introduce the student with in route procedures related to the leadplane mission
- Explain the importance of time management and how it affects workload during the leadplane mission

15

Leadplane Training Course

Unit 5
Handouts

In Route, 05-01-N9065-HO
Time Management, 05-01-N9065-HO

16

Leadplane Training Course

Unit 6
FTA and High Low Recon

Objectives

- To review the FTA and FTA protocols
- To familiarize the student with the high and low recon

17

Leadplane Training Course

Unit 6
Handouts

Fire Traffic Area, 06-01-N9065-HO
High and Low Recon, 06-02-N9065-HO

18

Leadplane Training Course

Unit 7
Leadplane Profile Exit Maneuver and Exit Route

Objectives

- To familiarize the student with factors affecting altitude control during the leadplane profile
- To familiarize the student with factors affecting airspeed control during the leadplane profile
- To familiarize the student with factors affecting bank angle during the leadplane profile
- To familiarize the student with the leadplane profile and exit maneuver
- To familiarize the student with simulated emergency procedures

19

Leadplane Training Course

Unit 7 Hand Outs

Altitude Control, 07-01-N9065-HO
Airspeed Control, 07-02-N9065-HO
Bank Angle, 07-03-N9065-HO
Leadplane Flight Profile and Exit Maneuver, 07-04-N9065-HO
Leadplane Flight Profile and Exit Maneuver, 07-01-N9065-PPT
Emergency Procedures, 07-05-N9065-HO
Exit Routes, 07-06-N9065-HO

20

Leadplane Training Course

Unit 8
Situational Awareness and Judgment

Unit Objectives

- To familiarize the student with situational awareness
- To familiarize the student with the process that leads to safe judgement in the fire environment

21

Leadplane Training Course

Unit 8
Hand Outs

Situational Awareness, 08-01-N9065-HO
Judgement, 08-02-N9065-HO

22

Leadplane Training Course

Unit 9
Responsibility for Separation and Join Ups

Objectives

- To familiarize the student with the responsibility for separation procedures
- To familiarize the student with the join up procedure

23

Leadplane Training Course

Unit 9 Hand Outs

Responsibility for Separation, 09-01-N9065-HO
Join Up, 09-02-N9065-HO

24

Leadplane Training Course

Unit 10
Strategy and Tactics

Objectives

- To familiarize the student with operational firefighting and retardant strategy and tactics

25

Leadplane Training Course

Unit 10
Hand Out

Operational Tactics, 10-01-N9065-HO

26

Leadplane Training Course

Unit 11
Post Flight and Non-Mission Topics

Objectives

- To familiarize the student with the post-flight inspection in preparation for future fire suppression activities
- To familiarize the student with non-mission topics that assist in becoming a successful leadplane pilot

27

Leadplane Training Course

Unit 11
Hand Outs

Post Flight, 11-01-N9065-HO
Logistics, 11-02-N9065-HO

28

Leadplane Training Course

Unit 12
Phase 2 and 3 and Sign Offs

Objectives

- Review additional lesson plans
- Review sign offs and endorsements

29

Leadplane Training Course

Unit 12
Hand Outs

Incident Command System
TAWS
Fire Size Up
Flight Following

30

Leadplane Training Course

Unit 12
Hand Outs

Fire Order Information
Leadplane Transition
TCAS
Southern California Endorsement

31

Leadplane Training Course

Unit 12
Hand Outs

Aircraft Sequencing
LAT, VLAT, SEAT and Scooper Operations
MAFFS Operations
Initial Points (IP's)
Leadplane Triangle

32

Leadplane Training Course

Unit 13
Flight Training

Objectives

- Provide overall understanding of the environment a leadplane pilot operates within
- Provide overall understanding of the roles and responsibilities of a leadplane pilot
- Provide a safe learning environment while being introduced to the leadplane flight profiles
- Introduce and practice the different flight profiles needed for the delivery of retardant to the fire environment

33

Leadplane Training Course

Unit 13
Hand Outs

Flight 1, 13-01-N9065-HO
Flight 2, 13-02-N9065-HO
Flight 3, 13-03-N9065-HO
Flight 4, 13-04-N9065-HO

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Leadplane Training Course

Unit 14
Course Review

Objective

Review the ground and flight training as needed and clarify any student questions

35

Leadplane Training Course

Unit 14
Hand Out

Course Review, 14-01-N9065-HO

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 0 – Introduction.

Time 0.5 Hours.

Objectives

1. Introduce course coordinator and instructors.
2. Review course logistics.
3. Introduce the students.
4. Present course overview.
5. Discuss course expectations.
6. Review pre-course test.

Strategy

This unit is an introduction to the course. It involves student and cadre interaction through introductions and a group exercise.

Instructional Methods

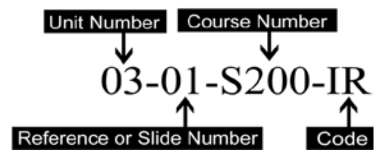
- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Computer with LCD projector and presentation software.
- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.

Outline

I. Instructor Introductions.
II. Course Logistics.
III. Student Introductions.
IV. Course Expectations.
V. Course Process.



Aids and Cues Codes:

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	SW – Student Workbook
IR – Instructor Reference	SR – Student Reference
HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 0 – Introduction.

OUTLINE	**AIDS & CUES**
Title Slide.	01-01-N9065-PPT

Welcome Students to the Course

Present the Course Goals

I. Instructor Introductions.

II. Course Logistics.
  a. Course Agenda.
  b. Breaks.
  c. Cell Phones.
  d. Facilities.

III. Student Introductions.

  a. Have each student present their:
    i. Name.
    ii. Agency.
    iii. Job Title.
    iv. Normal Duties.
    v. ICS experience.

IV. Course Expectations.

  a. Student Expectations.
    i. Have each student present their:
      1. Expectations of Leadplane Training.

2. Motivations to become a leadplane pilot.

b. Instructor Expectations.

i. Students will:

1. Have an interest in becoming a leadplane pilot.
2. Have completed their pre course work.
3. Exhibit mutual cooperation with the group.
4. Be open minded to accomplishments during the course presentation.
5. Participate actively in all of the training exercises presented in the course.
6. Return to class at stated times.
7. Use what is presented in the course to effectively perform the duties of a leadplane pilot.

V. Course Process.

a. This course is designed to meet the training needs of a Leadplane Pilot as outlined in the NWCG Standards for Aerial Supervision.

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 1 – Safety.

Time 0.5 Hours.

Objectives

1. To familiarize the student with the importance of safety in the leadplane mission.
2. To develop the student's safety mindset in the leadplane mission.

Strategy

The goal of this unit is to introduce the student to the safety processes used during the leadplane mission. The information will be used to build a foundation for the students safety mindset taught during the leadplane flight training.

Instructional Methods

- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Computer with LCD projector and presentation software.
- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.

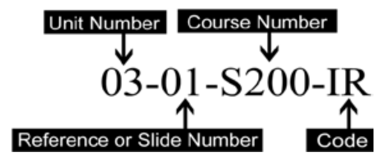
Outline

I. Safety Chapter from the NWCG SAS.

II. System Safety Assessment for Aerial Supervision from the NWCG SAS.

III. Twelve standard aviation questions that shout watch out.

IV. Safety.



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HO – Handout
SW – Student Workbook
SR – Student Reference
PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 1 – Safety.

OUTLINE	**AIDS & CUES**
Hand Outs	
Review Objectives	
I. Safety Chapter from the NWCG SAS.	NWCG SAS
a. Cover and explain the safety chapter in the NWCG SAS.	
II. System Safety Assessment for Aerial Supervision from the NWCG SAS.	NWCG SAS
a. Cover and explain the System Safety Assessment for Aerial Supervision table in the NWCG SAS.	
III. Twelve standard aviation questions that shout watch out.	01-01-N9065-HO
a. Cover and explain the twelve standard aviation questions that shout watch out.	
b. NFES 1129 card.	
IV. Safety.	01-02-N9065-HO
a. Cover and explain the safety mindset that a leadplane pilot must have.	

b. Describe the role a leadplane fills as the operational safety regulator for aviation operations.

A publication of the
National Wildfire Coordinating Group

NWCG Standards for Aerial Supervision

PMS 505

FEBRUARY 2020

NFES 002544

NWCG Standards for Aerial Supervision

February 2020
PMS 505
NFES 002544

The *NWCG Standards for Aerial Supervision* establishes standards for aerial supervision operations for national interagency wildland fire operations. These standards:

- Promote safe, cost-efficient, and effective aviation services in support of agency and interagency goals and objectives.
- Support standardization of Aerial Supervision operations, training, certification, and currency.
- Standardize Aerial Supervision mission procedures to enhance safety, effectiveness, efficiency, and professionalism.
- Provide guidance on aerial firefighting strategy, tactics, and risk management.
- Provide or reference other performance support materials for aerial supervisors.

Supplemental documents for the *NWCG Standards for Aerial Supervision*, PMS 505, are found at https://www.nwcg.gov/publications/505. These documents are separate to enable the use and editing of forms and logs as appropriate.

The National Wildfire Coordinating Group (NWCG) provides national leadership to enable interoperable wildland fire operations among federal, state, tribal, territorial, and local partners. NWCG operations standards are interagency by design; they are developed with the intent of universal adoption by the member agencies. However, the decision to adopt and utilize them is made independently by the individual member agencies and communicated through their respective directives systems.

Table of Contents

Chapter 1 – Aerial Supervision Administration, Roles and Responsibilities

Program Administration

Agencies are responsible for oversight and management of their agency's Aerial Supervision program. To achieve a cohesive and highly standardized interagency program, the following roles and responsibilities of interagency program management are provided.

National Regional, State, County, Cities, CAL FIRE, and Military Agency Program Managers

Program managers are delegated by their respective agencies and are responsible to administer the agency's Aerial Supervision program. Interagency scope of responsibilities should include:

- Coordinate with other agency program managers, the Interagency Aerial Supervision Subcommittee (IASS), Interagency Airtanker Board (IATB) and Interagency Geographic Area Coordination Center (GACC) Representatives to provide program coordination on an interagency basis.
- Coordinate with other agency program managers, the IASS, and interagency GACC Representatives to maintain and update a national resource qualifications list to include trainees, qualified personnel, Evaluators, and Final Evaluators.
- Ensure agency training and currency requirements are met. Annually review mission and qualification summaries.
- Participate in interagency working groups, committees, and subcommittees such as the Interagency Helicopter Operations Subcommittee, the Single-Engine Airtanker Board (SEATB), IATB, and the Interagency Airspace Subcommittee (IASC).
- Coordinate training at the national and/or geographic level.
- Manage Evaluators and Final Evaluator designations/qualifications to meet agency quality assurance, standardization, and training objectives.
- Coordinate with trainee's unit/agency to track training progression and on-the-job training (OJT) needs.
- Ensure coaches are assigned to trainees.
- Provide for quality assurance and oversight of operational and training performance standards.
- Distribute Aerial Supervision program-related information on an interagency basis.
- Coordinate with agencies that have a desire to develop or enhance an Aerial Supervision program.
- Coordinate operational standards with international cooperators.
- Provide input to the revision of the *NWCG Standards for Aerial Supervision* (*SAS*), PMS 505, https://www.nwcg.gov/publications/505, and interagency training management system.
- Additional roles and responsibilities may be assigned based on agency-specific needs.

GACC Aerial Supervision Representatives (GACC REPS)

Aerial Supervision Specialists, assigned by the Geographic Area Coordination Group, coordinate geographic Aerial Supervision needs and provide quality assurance oversight of:

GACC Representatives

Should be recommended on a rotational basis and delegated in writing.

Scope of Duties

- Serve as Geographic Area Interagency Aerial Supervision point of contact.
- Coordinate with agency program managers and Geographic Area Training Representatives (GATR) to coordinate suitability flights, quality assurance observation flights, final evaluation flights, and training of federal, state, and local agencies.
- Make recommendations concerning training priorities to agency program managers and GATRs.
- Should assist the GACC aircraft coordinators with tactical Aerial Supervision information and recommendations.
- Coordinate with agency program managers to ensure concurrent and cohesive training, training curriculum, and operations standards are met, nationally.
- Provide input to the revision of the SAS and interagency training management system.
- Participate during the IASS working group meeting(s).

Aerial Supervision Working Groups

There are three sub-groups of the IASS which provide subject matter expertise and technical assistance to meet IASS assigned tasking. Each group is managed under a charter from IASS.

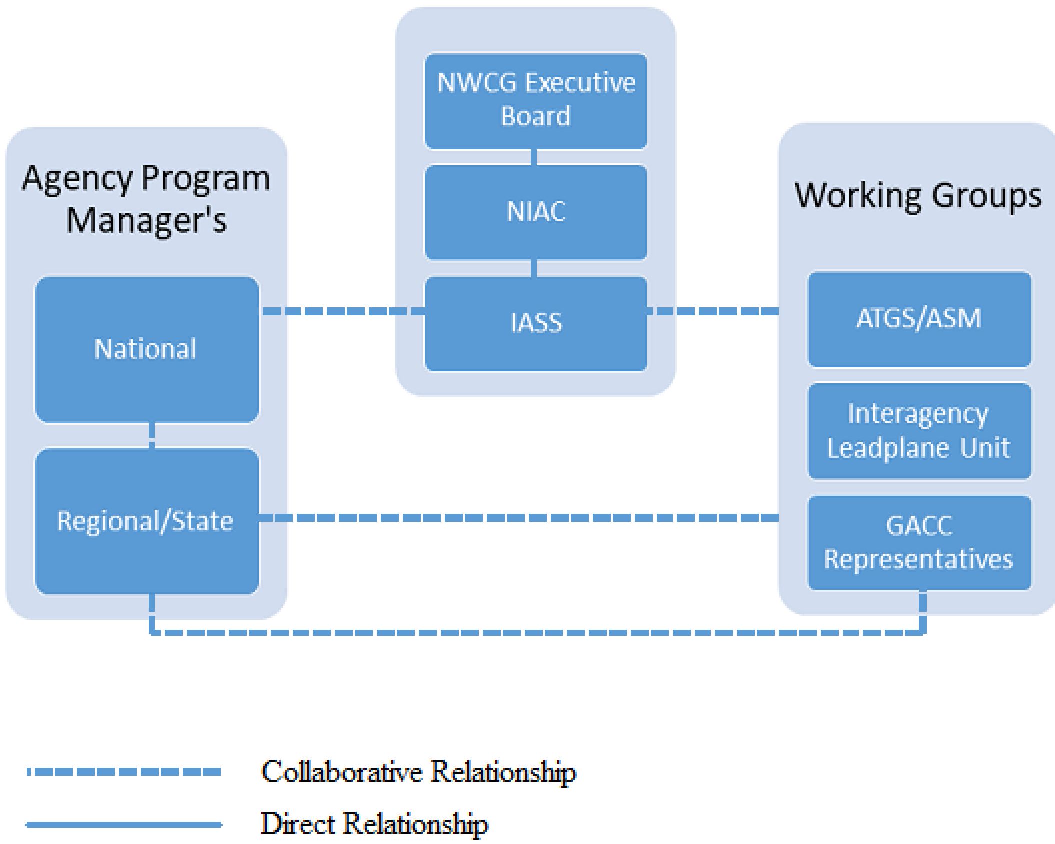
Chair/Co-chair:

- Serve as the point of contact to the IASS and manage the working group.
- Serve as the Subject Matter Expert (SME) during IASS meetings and deliberations.

Working Group Members:

- ATGS/ASM – National, Regional, State.
- Agency LPIL.
- GACC Representatives (Delegated) or Program Managers.

Figure 1. Interagency Aerial Supervision Relationship Diagram



Aerial Supervision Resources

There are four types of Aerial Supervision resources and four aerial supervisor Incident Command System (ICS) positions. Although these positions are unique, they share the common purpose of facilitating safe, effective, and efficient air operations in support of incident objectives.

Air Tactical Group Supervisor (ATGS)

The ATGS coordinates incident airspace and manages incident air traffic. The ATGS is an airborne firefighter who coordinates, assigns, and evaluates the use of aerial resources in support of incident objectives. The ATGS is the link between ground personnel and incident aircraft. The ATGS must collaborate with ground personnel to develop and implement tactical and logistical missions on an incident. The ATGS must be proactive in communicating current and expected fire and weather conditions. The ATGS must provide candid feedback regarding the effectiveness of aviation operations and overall progress toward meeting incident objectives. The ATGS must also work with dispatch staff to coordinate the ordering, assignment, and release of incident aircraft in accordance with the needs of fire management and incident command personnel.

On Initial Attack (IA) incidents (Type 4 and 5), the ATGS will sizeup, prioritize, and coordinate the response of aerial and ground resources until a qualified Incident Commander (IC) arrives. On complex incidents (Type 1, 2, or 3), the ATGS will coordinate and prioritize the use of aircraft between several divisions/groups while maintaining communications with operations personnel and aircraft bases (fixed/rotor).

In ICS, the ATGS works for the IC on IA and the Operations Section Chief (OSC), Air Operations Branch Director (AOBD), or operational designee on extended attack. The ATGS supervises the LPIL, ASM and the HLCO positions when activated. The ATGS may operate from an airplane or helicopter.

Aerial Supervision Module (ASM)

An ASM consists of an Air Tactical Pilot (ATP) and Air Tactical Supervisor (AITS). An ASM can be utilized as a LPIL, ATGS, or both, depending on the needs of incident management personnel.

ATP – The ATP is a qualified LPIL who has received specialized training and authorization to function as an ASM crew member.

AITS – The AITS is a qualified ATGS who has received specialized training and authorization to function as an ASM crew member.

LPIL – The LPIL coordinates, directs, and evaluates airtanker operations. When an ATGS is assigned the LPIL is a subordinate to the ATGS position. If no ATGS is present the LPIL works for the IC, OSC, AOBD, or designee.

A LPIL can increase the safety and effectiveness of an operation by assisting the ATGS through management of the airtankers assigned to an incident. The LPIL is authorized for low-level flight operations.

Helicopter Coordinator (HLCO)

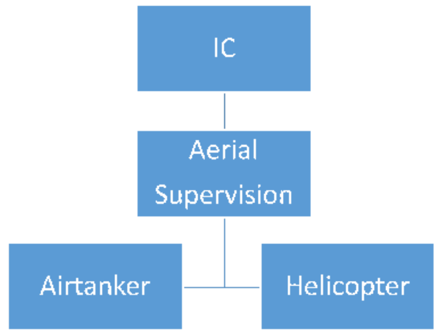
The HLCO coordinates, directs, and evaluates tactical/logistical helicopter operations. This position is responsible for establishing and managing the Fire Traffic Area and or Temporary Flight Restriction in the absence of the ATGS. The HLCO position **should** be activated whenever necessary or beneficial for the ATGS when only helicopters are assigned or in instances where visibility from smoke is a limiting factor for fixed-wing effectiveness. When an ATGS is assigned, the HLCO is a subordinate position to the ATGS. If no ATGS is present, the HLCO works for the IC, OSC, AOBD or designee.

The HLCO is an integral part of the helibase briefings and operational tempo regarding helicopter resources.

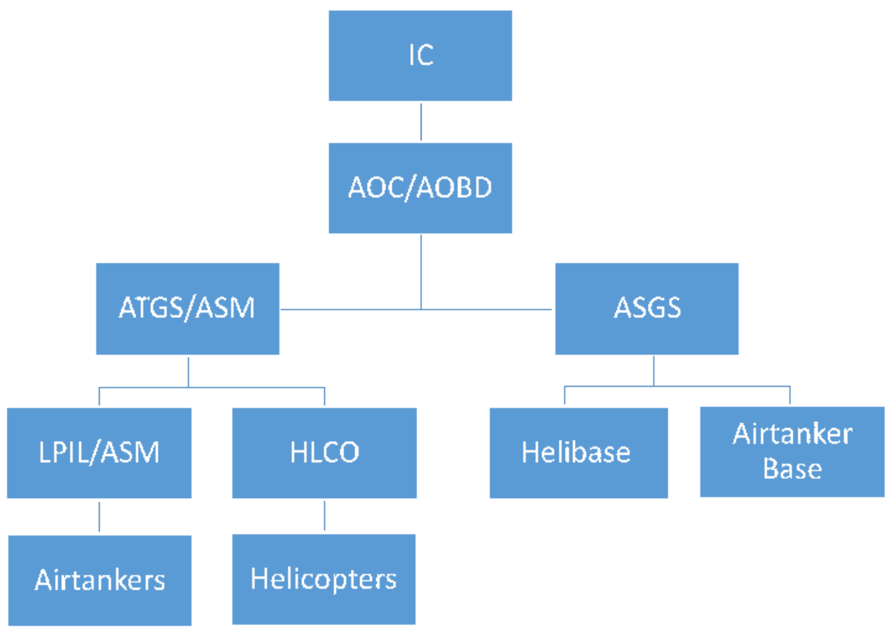
Note: Only aircraft with required radio configurations should be used for the HLCO mission. The following chart depicts the relation of Aerial Supervision to other resources in ICS.

Figure 2. Aerial Supervision organization during Initial Attack and Extended Attack

Initial Attack



Extended Attack



Chapter 2 – Training, Certification, and Currency

The policies governing training, certification, and currency shall comply with the employee's agency policy requirements. Additional requirements described within this guide shall be considered recommendations unless specifically adopted by the applicable agency as policy. The purpose of any additional requirement and/or standard is to achieve the highest level of safety and performance.

ATGS

Aerial supervision operations place a high demand on communication and management skills. Application of fire behavior knowledge combined with ground fire resource capability must be correlated with tactical aircraft mission planning.

ATGS Position Duties

- Coordinate and evaluate the safe and effective use of aircraft in support of incident objectives.
- Coordinate incident airspace and manages incident air traffic.
- Collaborate with ground personnel to develop and implement tactical and logistical missions on an incident.
- Communicate current and expected fire and weather conditions based upon continuous observations of the area.
- Provide candid feedback regarding the effectiveness of aviation operations and overall progress toward meeting incident objectives.
- Work with dispatch staff to coordinate the ordering, assignment, and release of incident aircraft in accordance with the needs of fire management and incident command personnel.

ATGS Initial Training, Certification, and Currency

- Candidates will meet prerequisite experience requirements and mandatory training requirements listed in the *NWCG Standards for Wildland Fire Position Qualifications*, PMS 310-1, https://www.nwcg.gov/publications/310-1. Forest Service employees will meet the prerequisite experience requirements and mandatory training requirements in the *Forest Service Fire and Aviation Qualification Guide*, FSM 5700 and FSH 5709.16.

ATGS Classroom Training

- Aerial Supervision (S-378), Air Tactical Group Supervisor (ATGS), State and Local Government) OR National Aerial Supervision Training Academy (S-378) OR California Aerial Supervision Academy (S-378).

Note: United States Forest Service (USFS) and Department of the Interior (DOI) employees must attend and pass the National Aerial Supervision Training Course or the California Aerial Supervision Course.

ATGS Agency Approved Crew Resource Management (CRM) Training

- Federal and federally sponsored Administratively Determined (AD) employees will complete Crew Resource Management 7 Skills (N-9059) facilitated by an authorized instructor.
- State employees will follow state CRM training requirements.

ATGS Mission Training Requirements

The flight-training program should include a variety of work experience and be of sufficient duration to ensure that the individual can independently function as an ATGS following certification.

- Observing an ATGS Evaluator during ongoing incident operations.
- All OJT will be under the direct supervision of an ATGS Evaluator in the same aircraft.
- Before final certification, candidates must undertake an OJT program under the supervision of an ATGS Evaluator that provides a variety of experience in initial and extended attack scenarios.
- Attend refresher RT-378/RTN9059 triennially after the initial attendance of S-378/N9059.

ATGS Candidate Evaluations

- After completing all missions, the candidate shall receive a written and signed evaluation from the ATGS Evaluator as an integral part of the mission de-briefing. Multiple missions during a single day may be combined on one form.
- The Aerial Supervision Mission Evaluation form is the standard performance assessment tool.
- The candidate will retain a copy of the Mission Evaluation to supplement information completed by the ATGS Evaluator in the candidate's Position Task Book (PTB).

ATGS Training Opportunities

Agency program managers can assist in the development of candidates by assigning a coach and providing a variety of training opportunities in different locales, fuel types, and incident complexities. Training opportunities include the following:

- Assignments to work with full-time, dedicated/exclusive use ATGS at an air attack base.
- Assignments to a national or geographic area Incident Management Team (IMT).
- Details or training assignments in other geographic areas to increase the depth of experience.
- Participate as a passenger on other tactical aircraft during missions [subject to approval from the National Program Manager, Regional Aviation Manager (RAO), Contracting Officer, Contractor and Pilot-in-Command (PIC)].

ATGS Certification Process

Upon completion of the PTB, the agency Final Evaluator will:

- Successfully perform a final Mission Evaluation.
- Return the completed PTB to the ATGS trainee along with recommendations.
- Notify the appropriate agency program manager.
- Trainee is responsible for submitting completed PTB, training documentation, and final recommendation to certifying official.

ATGS Supplemental Training

The following training opportunities should be considered before initial certification or as supplemental or refresher training for individuals currently certified as ATGS. The GACC representative, agency program manager, or training official can assist in the development of candidates by providing a variety of training opportunities in different locales, fuel types and incident complexities. Related aviation training opportunities should be made available to candidates to provide valuable knowledge, experience, and skills applicable to the ATGS. Training opportunities should include the following:

- Pinch Hitter pilot course.
- Private pilot ground school.
- National Aerial Fire Fighting Academy (NAFA and NAFA II).
- Participation in aerial reconnaissance or aerial detection missions.
- Observing or participating in large helibase operations.
- Orientation to airtanker base and retardant operations.
- Orientation to or observation of aircraft dispatch operations.
- Assignments working with full-time, exclusive use ATGS at an air attack base.
- Peer-to-peer observation and cross-training is recommended.
- Assignments to a national or geographic area IMT.

ATGS Currency Requirements

All ATGS will meet the requirements stated in the *NWCG Standards for Wildland Fire Position Qualifications*, PMS 310-1, and forward an annual mission summary[1] to the appropriate agency program manager/RAO.

In addition:

- Triennially perform, document, and report a minimum of 15 missions. (Failure to maintain ATGS mission currency requires a passing evaluation by a Final Evaluator on an actual or simulated mission).
- Each mission may be documented as a “shift” in the appropriate qualification management system.
- Attend a triennial RT-378. Attend a triennial CRM 7 Skills Refresher (RT9059F) or agency approved CRM refresher course.
- Recertification – See *NWCG Standards for Wildland Fire Position Qualifications*, PMS 310-1, or agency-specific policy.

Quality Assurance

Agency program managers may request a quality assurance (QA) assessment. QA evaluations may occur during RT-378 or over an incident. The request will be made from the program manager to the GACC Representative and a Final Evaluator will perform the QA assessment as an evaluation flight and

[1] Annual Mission Summaries, Individual Mission forms, and Mission Evaluation forms are components of the Aerial Supervision Logbook, PMS 509.

document using the Aerial Supervision Mission Evaluation form in the *Aerial Supervision Logbook*, PMS 509, https://www.nwcg.gov/publications/509.

Note: USFS qualified ATGSs must meet the *Forest Service Fire and Aviation Qualifications Guide* and the *NWCG Standards for Wildland Fire Position Qualifications*, PMS 310-1, for ATGS currency unless more restrictive requirements are established within operating plans approved by the Regional Forester/FAM Staff. California Department of Forestry and Fire Protection (CAL FIRE) supports the above currency requirements and manages them internally.

Air Tactical Group Supervisor Refresher Training (RT-378)

Required Elements

- Proficiency exercise.
- Review of applicable agency policies.
- Risk management/System Safety.
- Mission procedures.
- Fire Traffic Area (FTA) management.
- Fire and Aviation Weather.
- Lessons Learned/Case Studies.
- Agency approved CRM refresher.
    - Federal and federally sponsored AD employees will complete the 7 Skills CRM refresher (1.5 hours minimum) facilitated by a federally authorized instructor.
    - State employees will follow state CRM training requirements.

Optional Elements

- Radio programming.
- Map reading and navigation.
- Strategy and tactics.
- Aviation incidents/accidents from the preceding season.
- Payment documents.
- Contract and aircraft fleet updates.
- Issues and concerns from national and/or regional user groups (fire management, dispatch, hotshots, ICs, etc.).
- Communications brevity.
- Electronic flight bags.

Proficiency Exercise

All ATGS will demonstrate proficiency in the required refresher elements and complete a moderate complexity (a mix of at least four fixed and helicopter aircrafts) mission or flight/Sand Table Exercises (STEX). Students will be evaluated utilizing the Aerial Supervision Mission Evaluation form (PMS 509).

The exercise will represent a typical IA and will require the ATGS to demonstrate the minimum acceptable skill set of the position including FTA entry, determining FTA altitudes, initial aircraft briefings, aircraft separation, communication with air and ground resources, and situational awareness.

Performance will be documented on a Mission Evaluation, reviewed with the participant, and forward a copy to the appropriate agency program manager. Failure to demonstrate an acceptable level of proficiency, rating of (4), for the six required evaluation elements will require the ATGS agency-specific performance deficiency or decertification process to be implemented.

Documentation packet (or agency record of completion) will be issued to attendees who complete the refresher. Documentation will be forwarded to the appropriate agency program manager and the training official.

ATGS Mission Evaluation

The standard method for evaluating ATGS performance is an actual mission utilizing the Aerial Supervision Mission Evaluation form. ATGS (Evaluator/Final Evaluator) conducts mission evaluations for the following purposes:

- ATGS training.
- ATGS certification.
- ATGS currency.
- ATGS performance deficiencies.

ATGS Performance Deficiencies

If an ATGS is observed performing unsafely/deficiently:

- The written deficiencies will be provided to the ATGS GACC representative and supervisor
- The event and written deficiencies will be discussed with the individual and documented. Documentation should consist of recommendations on how to bring ATGS up to currency standards.

The recommendations will be forwarded to the appropriate RAO/agency program manager, and the individual's supervisor or sponsoring agency/official. The ATGS may be made unavailable for ATGS assignments in the appropriate dispatch status system until the certifying official reviews the recommendations.

ATGS Coach

ATGS Coaches serve as a point of contact and SME for the trainee throughout the training process.

Position Requirements

Qualified ATGS.

Responsibilities

- Help develop a training plan for the candidate.
- Coordinate with the agency program manager and employee supervisor.
- Assure training is on track and that all requirements are being scheduled so as not to delay progress.
- Assist with any problems regarding agency and training requirements.
- Coaches should be an independent, nonpartisan person outside the employee's standard chain of command.

ATGS Evaluator

ATGS Evaluators should provide consistent ATGS instruction, evaluation, and feedback on ATGS missions.

Position Requirements

- One year following ATGS qualification while maintaining currency.
- Attend a regionally sponsored ATGS Evaluator workshop. Documentation shall be forwarded to the appropriate GACC representative or agency official.
- ADs are authorized for this position providing they meet the position requirements.
- Maintain ATGS currency as defined by agency training policy.
- The agency program manager/appropriate Regional Aviation Officer (RAO) will track ATGS Evaluator. State agency aviation program managers can designate state-employed ATGS Evaluators.

Responsibilities

- Utilize applicable methods to promote ATGS trainee progress and ultimate certification.
- Utilize training aids, best practices, forms, and policy documents to maximize the training experience.
- Conduct ground training exercises.
- Review and complete applicable PTB elements.
- Document strengths and focus on improvement areas utilizing the Aerial Supervision Mission Evaluation form, PMS 505-11.
- Provide feedback to the trainee's supervisor/coach.
- Share progress reports with ATGS trainee's GACC representative.
- Coordinate with the trainee's supervisor to recommend and schedule the final evaluation flight.

ATGS Evaluator Workshop

Workshops should prepare ATGS Evaluators to apply current and consistent training procedures. The Evaluator workshop should be integrated with RT-378.

Target Group

Qualified ATGS.

Workshop Instructor Requirement

ATGS Evaluator.

Course Prerequisite

None.

Course Level

Regional, state, or area.

Course Content:

- Utilization of the Mission Evaluation form, PMS 505k, https://www.nwcg.gov/publications/505.
- Mission flights.
- Lecture.
- STEX.
- After Action Review (AAR).
- Interagency/regional consistency.
- CRM/Human Factors – How to provide constructive criticism.
- Training aids.

ATGS Final Evaluator

This section describes the qualifications, training, certification, and currency requirements necessary to perform as an ATGS Final Evaluator.

ATGS Final Evaluator Duties

Provide final ATGS trainee evaluation and complete the Final Evaluator verification page in the ATGS PTB.

Position Requirements

- One year of experience as an ATGS Evaluator.
- Attend a nationally sponsored ATGS Final Evaluator Workshop. Individuals meeting the requirements of a Final Evaluator will be designated in writing by their agency. Annual letters will be maintained by the appropriate GACC representative or agency official and disseminated to agency training committees.
- AD employees are NOT authorized to perform this function.
- Maintain ATGS currency as defined by agency training policy.
- The appropriate RAO /agency program manager will provide a letter of authorization to the ATGS Final Evaluator upon completion of the requisite training.

Note: State agency aviation program managers can designate state-employed ATGS Final Evaluators.

Responsibilities

- Coordinate with ATGS Instructor and trainee's supervisor to schedule and implement a final evaluation.
- Perform final evaluation and complete Aerial Supervision Mission Evaluation form, PMS 509, https://www.nwcg.gov/products/509/aerial-supervision-logbook-forms.
- Complete the PTB.
- Complete Final Evaluator Verification, or complete an Evaluation Record (experience block) to document further training recommendations.
- Review evaluation with ATGS trainee.
- Contact trainee's supervisor and review the final evaluation.

ATGS Final Evaluator Workshop

Objective

Prepare ATGS Final Evaluators to perform ATGS trainee final evaluations. The Final Evaluator Workshop should be integrated with the Aerial Supervision Academy or equivalent.

Target Group

ATGS Evaluators.

Instructor Requirement

ATGS Final Evaluator.

Course Prerequisite

None.

Course Level

National.

Course Content

- Policy.
- Documentation.
- ATGS PTB.
- Aerial Supervision Mission Evaluation form, PMS 509, https://www.nwcg.gov/products/509/aerial-supervision-logbook-forms.
- CRM/Human Factors – How to provide constructive criticism.
- Agency-specific qualification/certification processes.

Leadplane Pilot (LPIL)

The primary mission of the LPIL is to ensure the safe, efficient and effective use of airtankers in the management of wildland fire.

LPIL operations place a high demand on not only pilot skills, but on a person's ability to manage and coordinate airspace.

A LPIL is an aerial firefighter. As such, National Wildfire Coordinating Group (NWCG) firefighter training titles are used instead of standard Federal Aviation Administration (FAA) pilot terminology. For purposes of LPIL training:

- An “Instructor” is herein referred to as an “Evaluator.”
- A “Pilot Examiner or Check Airman” is herein referred to as a “Final Evaluator.”
- An interagency LPIL call sign/qualification list is maintained by the National Branch Chief, Pilot Standardization (USFS) and published annually in the National Interagency Mobilization Guide.

LPIL Qualifications

Candidates for LPIL designation must be federal or state (or state contract) employees who have the appropriate FAA pilot and medical certifications. Forest Service candidates shall possess, as a minimum, the flight experience listed in the *Forest Service Handbook* (FSH) 5709.16. DOI pilots shall meet, as a minimum, the requirements of 351 Departmental Manual (DM) 3. State contract employees shall possess, at a minimum, the flight experience listed in FSH 5709.16 Trainees shall complete the mission training and certification requirements of this section. It is desirable that LPIL candidates have line firefighting experience.

<u>Deviations or Exceptions</u>

The National Branch Chief, Pilot Standardization in coordination with the appropriate RAO (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official may authorize deviations or exceptions from the training requirements. Approved deviations or exceptions will be in writing. Documentation will be maintained by the appropriate agency official and a copy will be carried in the trainee’s training folder.

LPIL Training

See NWCG LPIL position description.

Note: The courses listed in the NWCG LPIL position description shall be completed prior to entering Phase 3 Operational Flight Training.

Operational Flight Instruction

Training is divided into three phases. Each phase is to be completed before progressing to the next phase. Identified deficiencies shall be documented and corrected before the candidate’s progress to the next phase.

Documentation of Training

The pilot is responsible for maintaining their training folder. The folder shall include the following:

- Course completion certificates.
- Record of ground and flight training including documentation of corrected deficiencies.
- Signoffs for each phase of flight training.

Flight Training Records

LPIL Evaluators will provide the trainee with written documentation of each training flight. The original copy will be retained by the trainee in their training folder. A copy of the phase training completion form will be sent to the appropriate RAO and a copy forwarded to the National Branch Chief, Pilot Standardization (USFS), the National Flight Operations Manager (BLM), or the appropriate State Aviation Officer. The LPIL Evaluator will retain a copy for their records.

LPIL Training and Check Rides

The LPIL/Mission Evaluation form is to be used to record all LPIL training and check rides.

Initial LPIL Training Process

Every effort shall be made to limit the number of LPIL Evaluators assigned to provide training for each candidate during Phases 1 and 2.

The LPIL training course (N-9065) should be taken before entering Phase 1 but shall be accomplished before completing Phase 2.

Note: The LPIL Evaluator may alternate between the left and right (front and back) seats during Phases 2 and 3.

<u>Phase 1</u>

- Minimum of two missions of LPIL tactical flight training comprised of low-level flight, mountainous terrain flight, proximity flight, and airtanker simulation.

Note: Flight time obtained in the Initial LPIL Training Course can be used to meet this requirement.

- Phase Check –This check will evaluate the following in a non-fire environment.
    - Oral – The trainee shall pass an oral review covering all activities under Phase 1. The oral will consist of questions involving (1) specific safety-of-flight and key operational issues, (2) discussion questions designed to determine if the trainee has the base knowledge that should be gained from Phase 1 activities, and (3) general questions to establish that the trainee has an understanding of the operational issues that are necessary to progress to Phase 2.
    - Flight Check – The flight check shall include low-level mountain flying, airspeed control, tactical low-level patterns and join ups.

<u>Phase 2</u>

- Minimum of three missions in the right seat observing fire operations with a LPIL Evaluator.
- Minimum of two operational periods of observing an ATGS/AITS on missions with a minimum of moderate complexity.

- Ride as an observer on a variety of airtankers during fire missions.
- Minimum of 15 LPIL missions on fires of various sizes and complexity as the flying pilot in the left seat under the supervision of a LPIL Evaluator.
- Phase Check – A LPIL Final Evaluator will administer the Phase Check.
  - Oral – The trainee shall pass an oral review covering all activities under Phase 2. The oral will consist of questions involving (1) specific safety-of-flight and key operational issues, (2) discussion questions designed to determine if the trainee has the base knowledge that should be gained from Phase 2 activities, and (3) questions designed to determine that the trainee has the knowledge to address situations that can arise when performing the LPIL mission.
  - Flight Check – The flight check to determine that the trainee (1) can safely perform the LPIL mission, (2) operate within the designated mission profiles, and (3) has been exposed to varying fire size and complexities. Any identified problem areas will be satisfactorily resolved.

Phase 3

All required ground training shall be completed prior to initiating Phase 3.

- Multiple LPIL missions on fires of varying size and complexity as the flying pilot without reliance on the LPIL Evaluator.
- The number of missions should provide the trainee an opportunity to demonstrate the skills needed to safely, effectively, and efficiently manage resources as a LPIL.
- A portion of the LPIL missions shall be flown in other geographic areas if not accomplished in Phase 2.
- Additional flights in airtankers as necessary.
- Final LPIL Progress Check – A LPIL Evaluator will make a final progress check upon completion of Phase 3. This will consist of an oral review covering all aspects of LPIL operations.
- Complete Records Review – Complete records review of the training folder by the candidate's coach to determine that all requirements have been met and signed off. The coach will then schedule a final check ride.

Final Evaluation and Qualification

To be designated as a LPIL, candidates shall have:

- Satisfactorily completed all operational flight training and acquire the necessary operational flight experience.
- Undergone a complete oral and operational evaluation. The evaluation consists of:
  - A Phase 3 sign-off by a LPIL Evaluator who has instructed the candidate during Phase 3, attesting to the candidate's mission competence.
  - A final flight check (which may require multiple missions to allow the LPIL Final Evaluator to observe adequate performance in complex environments) by a LPIL Final Evaluator certifying that the candidate has completed the required training and recommends they be approved to perform as a LPIL.

- The National Branch Chief, Pilot Standardization (USFS) in coordination with the appropriate RAO (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official will issue a letter of designation upon successful completion of LPIL training.

LPIL Currency

<u>Experience</u>

LPILs shall complete any combination of 30 LPIL or ATP missions in a three-year period. Pilots not meeting the 30-mission requirement shall pass a flight check on a LPIL fire mission. A mission consists of a flight on an actual fire where retardant is delivered. Each fire flown during a single flight counts as a mission.

Annual LPIL Refresher

Attend RT-9065 annually.

Optional Ground School Refresher Elements

- Target Description Exercise.
- Safety.
- Communications.
- Tactics.
- Airtanker Operations.
- ICS.
- Pre-season Update: (airtanker crew assignments, Expected fire behavior, Long-term weather prognosis).
- Fire sizeup.
- Additional elements may be added based on national trends and needs.

Required Flight Training Refresher Elements

Flight Training shall be a minimum of three flight hours and include:

- Target Description.
- LPIL tactical flight profile.
- Communications.
- Escape Routes.
- Emergency Procedures.
- Pass an annual LPIL mission competency check from a LPIL Evaluator.

Standardization Evaluation

LPIL mission checks may be conducted at any time for all qualified LPILs without prior notice. The results will be forwarded to the appropriate RAO and National Branch Chief, Pilot Standardization (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official and the LPIL briefed on the evaluation.

ATP/ASM Training

See the ASM section.

Modular Airborne Fire Fighting System (MAFFS)

MAFFS qualification is an additional required endorsement. LPILs are required to attend the first available MAFFS training session after the initial LPIL qualification.

- Be a qualified LPIL.
- Shall have completed MAFFS LPIL training.
- Interim certification may be granted upon initial LPIL qualification based on actual MAFFS operational experience obtained during initial LPIL training. LPILs who obtain interim MAFFS certification shall attend the next MAFFS training session.
- LPILs shall attend the MAFFS training session every four years.

California Familiarization

LPILs shall receive instruction by a LPIL Evaluator in California before operating alone in that area. The National Branch Chief, Pilot Standardization (USFS) in coordination with the appropriate RAO (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official may waive this requirement if the LPIL received instruction in this area on fire missions during Phase 2 or Phase 3 LPIL training.

Supplemental (AD/Contract) LPILs

AD/Contract pilots shall maintain the same currency and training requirements stipulated for agency pilots. The USFS WO will publish a list of supplemental LPILs on an annual basis.

LPIL Coach

This section describes the qualifications, training, and currency requirements necessary to perform as a LPIL Coach. LPIL Coach: Serves as a point of contact and SME for the trainee throughout the training process.

Position Requirements

Qualified LPIL.

Responsibilities

- Help develop a training plan for the candidate.
- Coordinate with the appropriate RAO/agency program manager and employee supervisor.
- Assure training is on track and that all requirements are being scheduled to not delay progress.
- Assist with any problems regarding agency and training requirements.
- Coaches should be an independent, nonpartisan person outside the employee’s standard chain of command.

LPIL Evaluator

LPIL Evaluator provides consistent LPIL instruction, evaluation, and feedback on LPIL missions.

Qualification Requirements

- Current LPIL with a minimum of two seasons of experience after initial qualification.
- Multi-region experience as a qualified LPIL.
- MAFFS Qualified.
- Possess the appropriate FAA flight instructor certificate.
- California Experience.
- Attend the LPIL Evaluator workshop every two years.

Responsibilities

- Utilize applicable methods to promote LPIL trainee progress and ultimate certification.
- Utilize training aids, best practices, forms, and policy documents to maximize the training experience.
- Review and complete applicable phase training documentation.
- Document strengths, area for improvement, and focus areas utilizing the LPIL Training/ Check Form.
- Provide feedback to the trainee’s supervisor/coach.
- Share progress reports with the LPIL Evaluator community.
- Coordinate with the trainee’s supervisor to recommend and schedule the final evaluation flight.

Certification Process

- Pass a LPIL Evaluator oral and flight check.
- The National Branch Chief, Pilot Standardization (USFS) in coordination with the appropriate RAO (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official will issue a LPIL Evaluator designation letter.

Currency

- Maintain LPIL currency.
- Maintain MAFFS currency.
- Attend Evaluator Workshop every two years.

LPIL Evaluator Workshop

Objective

- Prepare LPIL Evaluators to apply current and consistent training procedures.
- Target Group: Qualified LPILs with 2 years of experience.
- Workshop Instructor Requirement –LPIL Evaluators and Final Evaluators.

Nomination Process

The LPIL working group, in conjunction with the National Branch Chief, Pilot Standardization (USFS) and the appropriate RAO (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official will nominate pilots who meet the qualifications and whom they consider to have the experience, aptitude, dedication, and ability to perform the duties of a LPIL Evaluator.

Course Prerequisite

- Multi-region experience as a qualified LPIL.
- MAFFS Qualified.
- Possess the appropriate FAA flight instructor certificate.
- California Experience.

Course Level

National Interagency.

Course Content

- Instructional methods.
- Utilization of the LPIL Training/ Check Form.
- Mission flights.
- Lecture.
- STEX.
- AAR.
- Standardization of instruction.
- CRM/Human Factors – How to provide constructive criticism.
- Training Aids.
- Policy.

LPIL Final Evaluator

LPIL Final Evaluator provides final LPIL trainee evaluations. The LPIL Final Evaluator makes the recommendation for certification to the appropriate agency program manager.

Qualification Requirements

- Current LPIL with a minimum of three seasons as a LPIL Evaluator.
- MAFFS Qualified.
- Possess the appropriate FAA flight instructor certificates.
- Attend the LPIL Final Evaluator workshop biennially.

Responsibilities

- Coordinate with LPIL Evaluator and trainee's supervisor to schedule and implement a final evaluation/check ride.
- Perform final evaluation/check ride and complete LPIL Training/ Check Form.
- Contact trainee's supervisor and review the final evaluation.

Certification

- Pass the LPIL Final Evaluator oral and flight check.
- The National Branch Chief, Pilot Standardization (USFS) in coordination with the appropriate RAO (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official will issue the LPIL Final Evaluator designation letter.

Currency

- Maintain LPIL currency.
- Maintain MAFFS currency.
- Attend Evaluator Workshop every two years.

LPIL Final Evaluator Workshop

Objective

Prepare LPIL Final Evaluators to apply current and consistent training procedures.

Target Group

Qualified LPIL Evaluator Pilots with 3 years of experience.

Workshop Instructor Requirement

LPIL Evaluator.

Nomination Process

The LPIL working group, in conjunction with the National Branch Chief, Pilot Standardization (USFS) and the appropriate RAO (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official will nominate pilots who meet the qualifications and whom they consider to have the experience, aptitude, dedication, and ability to perform the duties of a LPIL Final Evaluator.

Course Prerequisite

- Multi-region experience as a qualified LPIL Evaluator.
- MAFFS Qualified.
- Possess the appropriate FAA flight instructor certificate.

Course Level

National Interagency.

Course Content

- Final evaluation methods.
- Mission flights.
- Standardization of final evaluation.
- CRM/Human Factors – How to provide constructive criticism.
- Policy.

LPIL/Trainee Performance Deficiencies

If a LPIL/Trainee is observed performing unsafely/deficiently:

- The event will be discussed with the individual and documented as appropriate.
- Depending on the agency, the documentation will be forwarded National Branch Chief, Pilot Standardization (USFS) and the appropriate RAO (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official. The individual may be made unavailable for LPIL/Trainee assignments in the appropriate dispatch/status system.

ASM

An ASM is a crew of two specially trained individuals who retain their individual LPIL and ATGS qualifications. Each crew member has specific duties and responsibilities that fall within their area of expertise. These vary in scope based on the mission and task loads of each crew member.

The ATP serves as the PIC and is primarily responsible for fixed-wing aircraft coordination over the incident. Following LPIL qualification, it is recommended that LPILs acquire one year of LPIL experience in multiple geographic regions before operating as an ATP. This does not preclude the LPIL from attending ASM training or flying with an AITS to gain additional firefighting and retardant use experience.

The AITS serves as the mission commander who develops/implements strategy/tactics in conjunction with the IC and Operations personnel or ATGS. When no IC is present, the AITS assumes those responsibilities until qualified ground personnel arrives. AITS initial candidates must be qualified as an ATGS Evaluator. This does not preclude the AITS candidate from attending ASM training.

ASM Utilization

The ASM is a shared national resource and can be utilized in the following capacities:

- ASM, LPIL, ATGS, detection/recon, all hazard, etc.

ASM Resource Status, Ordering, and Identification

ASM resource identification and status are reported using the following procedures:

<u>Tactical Aircraft Report</u>

The National Interagency Coordination Center (NICC) and GACC report the status of the ASM crews as a national resource. The ATP’s LPIL designator is used in conjunction with the agency ASM designator to identify the ASM. The State of Alaska ASM designator is A (Alpha). The Forest Service and BLM ASM designator is B (Bravo). The CAL FIRE ASM designator is C (Charlie).

Resource Ordering

Federal ASMs are a national resource and will be ordered in the same manner as LPILs or other national resources. The AITS and LPIL should be rostered as subordinates to the aircraft on the resource order.

Flight and Duty Day Limitations

The AITS, when assigned to an ASM, will have the same flight and duty limitation as the ATP and are considered a crew member. The AITS will match the ATP tour of duty for consistency and resource availability.

Authorized Passengers

The following positions are authorized to be on board the aircraft during ASM operations:

- ATP/ATP Trainee.
- LPIL Evaluator/LPIL Final Evaluator.
- AITS/AITS Trainee.
- AITS Evaluator/AITS Final Evaluator.

Other passengers must be authorized in writing by the appropriate National Branch Chief, Pilot Standardization or National Branch Chief, Aviation Operations (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official and approved by the flight crew. This is generally limited to three total personnel on board the aircraft during low-level ASM mission operations.

Initial ASM Training (ATP/AITS)

Objective

To establish the qualification and training requirements necessary to perform as an ASM.

Nomination

RAO's/agency program managers will nominate candidates to attend ASM initial training.

Documentation of Training

It is the responsibility of the AITS/ATP candidate to maintain and update a training and experience folder which will include:

- Course completion certificates.
- A copy of the signed ATGS certification page.
- Annual update of experience to agency-specific Incident Qualification and Certification System (IQCS).
- AITS/ATP Letter of Authorization.

Deviations or Exceptions

The National Branch Chief, Pilot Standardization in coordination with the appropriate RAO and the National Aerial Supervision Program Manager (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official may authorize deviations or exceptions from the training requirements. Approved deviations or exceptions will be in writing. Documentation will be maintained by the appropriate agency official and a copy will be carried in the trainee's training folder.

ASM Initial/Refresher Course of Instruction

Classroom Training

ASM initial is a national level course.

Required Classroom Elements

- Safety.
- Tactical Mission CRM.
- Communications (Tactical).
- Aircraft Familiarization/Differences.
- Tactics.
- Airtanker/ Helicopter Sequencing.

Optional Classroom Elements

- Crew interaction and CRM utilization.
- ICS.
- Pre-season Update: Program Updates/Changes, Expected fire behavior, Long-term weather prognosis.
- Additional elements may be added based on national trends and needs.
- Global Positioning System (GPS)/Radio/Technology Review.

Operational Mission Instruction

ASM candidates should have a variety of OJT. The following flight-training requirements provide guidance for evaluating ASM candidates. Individualized training and evaluation programs should be developed to refine the skills and abilities of each trainee prior to certification.

AITS Initial Observation Flights

Two observation flights must be completed prior to front seat flight training. One of these flights must occur on a fire mission:

- Two simulated missions to occur during ASM Initial.
- Initial OJT must occur under the direct supervision of an AITS Evaluator in the same aircraft.
- After initial OJT and when mutually agreed upon by the ATP Evaluator and AITS Evaluator an AITS trainee may be authorized to continue training with an ATP Evaluator without an AITS Evaluator onboard the aircraft. Approval will be made on a case by case basis. A final evaluation must be conducted by an AITS Final Evaluator on board the aircraft.

ASM Evaluation

The standard method for evaluating AITS performance is an actual or simulated mission utilizing the ASM Mission Evaluation form.

Recommended minimum incident complexity for final evaluation:
Crew members' (ATP and AITS) workload will be balanced and at a tempo that limits verbal communication and requires nonverbal communications be utilized for a portion of the mission.

Low-level operations while coordinating a minimum of two airtankers and two helicopters in collaboration with ground resources shall occur. The ASM crew shall have operational control of the four aircraft, working low-level on the incident. Demonstrate CRM on a moderate complexity incident.

AITS Certification

Upon completion of the PTB the AITS Final Evaluator will:

- Administer a final ASM Mission Evaluation, documenting a rating of (4), for the 14 required evaluation elements.
- Return the completed PTB to the AITS trainee along with recommendations.
- Notify the appropriate agency program manager.
- The AITS trainee is responsible for submitting completed PTB, training documentation, and final recommendation to certifying official.
- The National Branch Chief, Pilot Standardization in coordination with the appropriate RAO (USFS), BLM National Flight Operations Manager, or State Aviation Official issues a Letter of Authorization to the employee and supervisor.

ATP Certification

The ATP Final Evaluator will:

- Administer a final ASM Mission Evaluation, documenting a rating of (4), for the 14 required evaluation elements.
- Notify the appropriate agency program manager.
- The ATP trainee is responsible for submitting training documentation, and final recommendation to certifying official.
- The National Branch Chief, Pilot Standardization in coordination with the appropriate RAO (USFS), BLM National Flight Operations Manager, or State Aviation Official issues a Letter of Authorization to the employee and supervisor.

AITS Supplemental Training

- Attend professional simulator training as a crew.
- Agency provided Pinch Hitter Course (Aircraft Specific).
- Private Pilot Ground School/Private Pilot Rating.

ASM Currency

- 5 ASM missions per year.
- ATP: ASM missions can be considered LPIL missions. LPIL missions do not count toward ATP currency.
- The annual mission summary will be forwarded to the agency program manager.
- If currency lapses a final evaluation must be performed on an actual/simulated mission.
- Attend an ASM refresher triennially.

<u>One Year Lost Currency</u>

If the AITS has not met the five-mission requirement in the previous 12 months, a passing "final evaluation" must be documented by an AITS FE during ASM initial/refresher ***or*** on an actual wildfire assignment.

<u>Two Consecutive Years of Lost Currency</u>

If the AITS has not met the five-mission requirement for the second consecutive year, a passing "final evaluation" must be documented by an AITS FE during ASM initial/refresher ***and*** on an actual wildfire assignment.

Quality Assurance

Agency program managers may request a QA assessment. QA evaluations may occur during ASM refresher, ASM initial, or over an incident. The request will be made from the program manager to the National Aerial Supervision Training Academy (NASTA) course coordinator to describe intent and needs if it needs to occur during NASTA. The course coordinator will facilitate flights to ensure the QA request needs are met on a case-by-case basis.

ASM Deficiencies

If an ASM is performing deficiently:

- The event will be discussed with the individuals and documented. Documentation should consist of recommendations on how to bring ASM up to current standards; additional academics, coaching, mentoring, observations, etc.
    - The recommendations will be forwarded to the National Branch Chief, Pilot Standardization and appropriate RAO (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official. The crew may be made unavailable for ASM assignments in the appropriate dispatch/status system. This may not make them individually unavailable for LPIL or ATGS assignments.

AITS Coach

An AITS Coach serves as a point of contact and SME for the trainee throughout the training process.

Position Requirements

Qualified AITS Evaluator.

Responsibilities

- Help develop a training plan for the candidate.
- Coordinate with the agency program manager and Employee Supervisor.
- Assure training is on track and that all requirements are being scheduled so as to not delay progress.
- Assist with any problems regarding agency and training requirements.
- Coaches should be an independent, nonpartisan person outside the employee's standard chain of command.

AITS Evaluator

AITS Evaluator provides consistent AITS instruction, evaluation, and feedback on AITS missions.

Position Requirements

- Qualified AITS.
- ADs are authorized for this position providing they meet the position requirements.
- Maintain AITS currency.
- Attend ASM Evaluator Workshop.
- The RAO/agency program manager will track AITS Evaluator.

Responsibilities

- Utilize applicable methods to promote AITS trainee progress and certification.
- Utilize training aids, best practices, forms, and policy documents to maximize the training experience.
- Review and complete applicable PTB elements.
- Document strengths, area for improvement, and focus areas utilizing the ASM Mission.

Evaluation Form

- Provide feedback to the trainee's supervisor/coach.
- Share progress reports with the AITS Evaluator community.
- Coordinate with the trainee's supervisor to recommend and schedule the final evaluation flight.

ASM Evaluator Workshop

Objective

Prepare AITS/ATP Evaluators to apply current and consistent training procedures.

- Target Group – Qualified AITS/ATP.
- Workshop Instructor Requirement –AITS/ATP Evaluators and Final Evaluators.

Nomination Process

The AITS working group, in conjunction with the National Branch Chief, Pilot Standardization, appropriate RAO, and the National Aerial Supervision Program Manager (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official will nominate AITS/ATP's who meet the qualifications and whom they consider to have the experience, aptitude, dedication, and ability to perform the duties of an AITS/ATP Evaluator.

Course Prerequisite

Multi-Region experience as a qualified AITS/ATP.

Course Level

National Interagency.

Course Content

- Instructional methods.
- Utilization of the ASM Mission Evaluation Form.
- Mission flights.
- Lecture.
- STEX.
- AAR.
- Standardization of instruction.
- CRM/Human Factors – How to provide constructive criticism.
- Training Aids.
- Policy.

AITS Final Evaluator

AITS Final Evaluators provide final AITS trainee evaluation and complete the Final Evaluator verification page in the AITS PTB.

Position Requirements

- One year of experience as an AITS Evaluator.
- AD employees are not authorized to perform this function.
- Maintain AITS currency.
- Attend ASM Final Evaluator Workshop.
- The National Branch Chief, Pilot Standardization in coordination with the appropriate RAO (USFS), and the National Aerial Supervision Program Manager (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official will provide a letter of authorization to the AITS Final Evaluator upon completion of the requisite training.

Responsibilities

- Coordinate with AITS Evaluator and trainee's supervisor to schedule and implement a final evaluation.
- Perform final evaluation and complete the ASM Mission Evaluation form.
- Complete the PTB.
- Review evaluation with AITS trainee.
- Contact trainee's supervisor and review the final evaluation.

ASM Final Evaluator Workshop

Objective

Prepare AITS/ATP Final Evaluators to apply current and consistent training procedures.

- Target Group: Qualified AITS/ATP Evaluator.
- Workshop Instructor Requirement –AITS/ATP Evaluators and Final Evaluators.

Nomination Process

The AITS working group, in conjunction with the National Branch Chief, Pilot Standardization, appropriate RAO, and the National Aerial Supervision Program Manager (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official will nominate AITS/ATP's who meet the qualifications and whom they consider to have the experience, aptitude, dedication, and ability to perform the duties of an AITS/ATP Final Evaluator.

Course Prerequisite

Multi-region experience as a qualified AITS/ATP Evaluator.

Course Level

National Interagency.

Course Content

- Instructional methods.
- Utilization of the ASM Mission Evaluation Form.
- Mission flights.
- Lecture.
- STEX.
- AAR.
- Standardization of instruction.
- CRM/Human Factors – How to provide constructive criticism.
- Training Aids.
- Policy.

ATP Evaluator

ATP Evaluator provides consistent ATP instruction, evaluation, and feedback on ASM missions.

Position Requirements

- 1 Year following ATP qualification while maintaining currency.
- Attend ASM Evaluator Workshop.
- Pass an oral evaluation from an ATP Final Evaluator.
- Pass a flight evaluation from an ATP Final Evaluator.
- Maintain ATP currency.
- The National Branch Chief, Pilot Standardization in coordination with the appropriate RAO (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official will provide a letter of authorization to the ATP Evaluator upon completion of the requisite training.

Responsibilities

- Utilize applicable methods to promote ATP trainee progress and ultimate certification.
- Utilize training aids, best practices, forms, and policy documents to maximize the training experience.
- Review and complete applicable PTB elements.
- Review document strengths, areas for improvement, and focus areas utilizing the ASM Mission.

Evaluation Form

- Provide feedback to the trainee's supervisor/coach.
- Share progress reports with the ATP Evaluator community.
- Coordinate with the trainee's supervisor to recommend and schedule final evaluation flight).

ATP Final Evaluator

ATP Final Evaluators provide final ATP trainee evaluation.

Position Requirements

- One year of experience as an ATP.
- Attend ASM Final Evaluator Workshop.
- Pass an oral evaluation from an ATP Final Evaluator.
- Pass a flight evaluation from an ATP Final Evaluator.
- Maintain ATP currency.
- The National Branch Chief, Pilot Standardization in coordination with the RAO (USFS), the National Flight Operations Manager (BLM), or appropriate State Aviation Official will provide a letter of authorization to the ATP Final Evaluator upon completion of the requisite training.

Responsibilities

- Coordinate with ATP's supervisor to schedule and implement a final evaluation.
- Perform final evaluation and complete the ASM Mission Evaluation form.
- Review evaluation with the ATP trainee.
- Contact trainee's supervisor and review the final evaluation.

Helicopter Coordinator (HLCO)

HLCO is used in conjunction with ATGS/ASM or as stand-alone aerial supervisors of helicopters. Large incidents may have more than one HLCO operating at the same time.

HLCO Position Duties

- Coordinates, directs, and evaluates tactical/logistical helicopter operations.
- Provide sole Aerial Supervision on an incident where only helicopters are assigned, otherwise ATGS is required.
- Collaborate with ground personnel to develop and implement tactical and logistical missions on an incident.
- Communicate current and expected fire and weather conditions.
- Provide candid feedback regarding the effectiveness of aviation operations and overall progress toward meeting incident objectives.
- When possible, fly to fixed-wing bases and interact with ATGS/ASM/LPIL.
- Work with dispatch/AOBD/IC/OPS staff to coordinate the ordering, assignment, and release of incident aircraft in accordance with the needs of fire management and incident command personnel.
- Attend operational briefing (when possible) at ICP.
- Make recommendations for additional orders to cover mission requirements.
- Establish routes, patterns, checkpoints, dip sites, etc. and identify hazards. Ensure all are added to the flight hazard maps daily.
- Ensure communications are adequate and make recommendations to incident personnel as needed.
- When working from a helibase conduct helicopter pilot briefings covering objectives, assignments, established incident protocols and identified hazards.
- Establish an ordering process with helibase/dispatch for additional aircraft.
- Establish trigger points for smoke/visibility impacts regarding safe operations.

HLCO Initial Training

- Candidates will meet prerequisite experience requirements and mandatory training requirements listed in the PMS 310-1 or *Forest Service Fire and Aviation Qualification Guide*.
- Attend and pass Aerial Supervision (S-378), or equivalent.

Note: USFS and DOI employees must attend and pass the National Aerial Supervision Training Course or the California Aerial Supervision Course. Completion of PTB and recommendation for certification by a qualified/ current HLCO.

HLCO Agency Approved CRM Training

- Federal and federally sponsored AD employees will complete Crew Resource Management 7 Skills (N-9059) facilitated by an authorized instructor.
- State employees will follow state CRM training requirements.

HLCO Mission Training Requirements

The flight-training program should include a variety of work experience and be of sufficient duration to ensure that the individual can independently function as an HLCO following certification.

- Observing a HLCO Evaluator during ongoing incident operations.
- All OJT will be under the direct supervision of an HLCO Evaluator in the same aircraft.
- Prior to final certification, candidates must undertake an OJT program under the supervision of an HLCO Evaluator that provides a variety of experience in initial and extended attack scenarios.

HLCO Candidate Evaluations

- The candidate shall receive a written evaluation at the completion of all missions from the HLCO Evaluator as an integral part of the mission de-briefing. Multiple missions in a single day may be combined on one evaluation form.
- The Aerial Supervision Mission Evaluation form is the standard performance assessment tool.
- The candidate will retain a copy of the Mission Evaluation to supplement information completed by the HLCO Evaluator in the candidate's PTB.

HLCO Training Opportunities

Agency program managers can assist in the development of candidates by assigning a coach and providing a variety of training opportunities in different geographical areas, fuel types and incident complexities. Training opportunities may include the following:

- Assignments to work with full-time, dedicated/exclusive use ATGS at an air attack base.
- Assignments to a national or geographic area IMT.
- Details or training assignments in other geographic areas to increase the depth of experience.

HLCO Certification Process

Upon completion of the PTB, the agency Final Evaluator will:

- Perform a final Mission Evaluation.
- Return the completed PTB to the HLCO trainee along with recommendations.
- Notify the appropriate agency program manager.
- Trainee is responsible for submitting completed PTB, training documentation, and final recommendation to certifying official.

HLCO Supplemental Training

- Load Calculation Overview.
- Attend RT-378, Air Tactical Group Supervisor Refresher, triennially.
- 7 Skills CRM training.
- S-271, Helicopter Crew Member.
- S-372, Helicopter Manager.
- S-371, Helibase Manager.

HLCO Currency

All HLCO will meet the requirements stated in the PMS 310-1 and forward an annual mission summary[2] to the appropriate agency program manager/RAO.

Additionally:

- Triennially perform, document, and report a minimum of 15 missions. (By 2023, failure to maintain HLCO mission currency requires a passing evaluation by a Final Evaluator on an actual or simulated mission.)
- Each mission may be documented as a "Shift" in the appropriate qualification management system.
- Attend a triennial Air Tactical Group Supervisor Refresher (RT-378). Attend a triennial CRM 7 Skills Refresher (RT9059F) or agency approved CRM refresher course.
- Recertification – See PMS 310-1 or agency-specific policy.

<u>Quality Assurance</u>

Agency program managers may request a QAs assessment. QAs may occur during RT-378 or on an incident. The request will be made from the program manager to the GACC Representative and a Final Evaluator will perform the QA assessment as an evaluation flight and document using the Aerial Supervision Mission Evaluation form (PMS 509).

Note: USFS qualified HLCOs must meet the *Forest Service Fire and Aviation Qualifications* Guide and the PMS 310-1 for ATGS currency. California Department of Forestry (CAL FIRE) supports the above currency requirements and manages them internally.

[2] Annual Mission Summaries, Individual Mission forms, and Mission Evaluation forms are components of the *Aerial Supervision Log Book*, PMS 509.

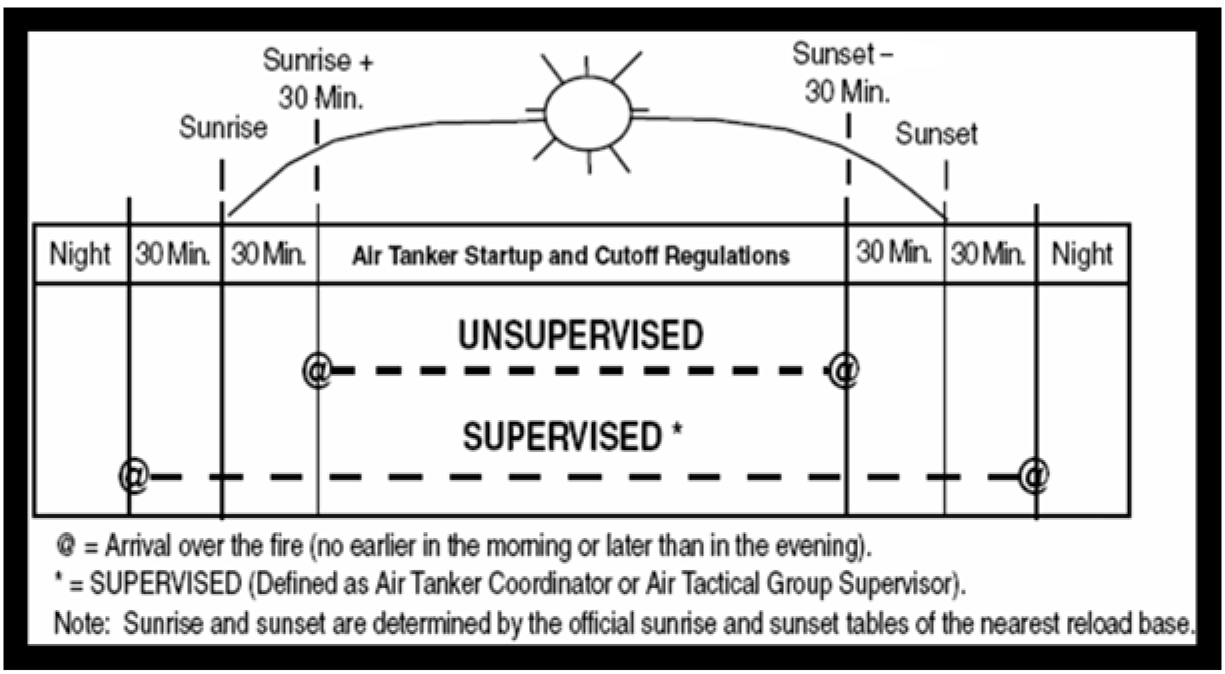
Chapter 3 – Policies, Regulations, and Guidelines

Incident aviation operations are often conducted under adverse flight conditions. Congested airspace, reduced visibility, number of aircraft on scene, poor weather, and mountainous terrain all add risk and complexity to incident Aerial Supervision operations. Complexity dictates the level of supervision required to safely and effectively conduct aerial operations. Aerial supervision may be provided by a LPIL, ASM, ATGS, or HLCO as individual resources or in any combination based on ICS models.

Low Light Conditions (Sunrise/Sunset)

Daylight hours are defined as 30 minutes prior to sunrise until 30 minutes after sunset as noted in the table below. Low-level fixed-wing operations are permitted 30 minutes before and after sunrise, as well as 30 minutes before and after sunset, but must have concurrence by the involved flight crews and Aerial Supervision (Lead, ATCO, ASM, or ATGS) must be on scene. Multi-engine aircraft empty of retardant may fly to assigned bases after daylight hours. Daylight hours may be further limited at the discretion of the pilot, aviation manager, ATGS, ASM, or leadplane because of low visibility conditions caused by smoke, shadows, or other environmental factors.

Figure 3. Aerial Supervision organization during Initial Attack and Extended Attack



Note: In Alaska, fixed-wing dropping operations shall not be authorized during periods outside of civil twilight.

Note: For paracargo operations see the *Interagency Smokejumper Operations Guide,* https://gacc.nifc.gov/swcc/dc/nmsdc/documents/Dispatch/Reference/Interagency%20ISMOG_02_03_2017.pdf, and the PMS 310-1 for ATGS currency.

Note: Single-Engine Airtankers (SEATs) and helicopters are limited to flight during official daylight hours.

Note: Sunrise and sunset are determined by the official sunrise and sunset tables of the nearest reload base.

Aerial Supervision Requirements

When aerial supervisors are co-located with retardant aircraft, they will be launched together on the initial order to maximize safety, effectiveness, and efficiency of incident operations. Federal policy dictates additional requirements as listed below.

Table 1. Incident Aerial Supervision Requirements

Incident Aerial Supervision Requirements

**ASM can perform all LEAD missions.

Note: Deviations from this table can be authorized by the agencies through local mitigations.

SITUATION	HLCO	LPIL	ATGS / ASM**
Three or more aircraft assigned to incident.	If no ATGS AND only helicopter	If no ATGS AND only fixed-wing	ORDERED
Fixed-Wing Low-Level Operations in Low Light conditions.	N/A	REQUIRED IF NO ATGS	REQUIRED IF NO LPIL
MAFFS/VLAT.	N/A	REQUIRED	N/A
Airtanker not IA carded.	N/A	REQUIRED	N/A
Level 2 SEAT operating on an incident with more than one other tactical aircraft on scene.	N/A	REQUIRED IF NO ATGS	REQUIRED IF NO LPIL
Foreign Government Aircraft.	N/A	REQUIRED IF NO ATGS	REQUIRED IF NO LPIL
Congested Area Flight Operations.	ORDERED	ORDERED	REQUIRED
Periods of marginal weather, poor visibility or turbulence.	REQUIRED IF NO ATGS/ASM	REQUIRED IF NO ATGS	REQUIRED
Active Duty (Non-National Guard) Military Helicopter Operations.	ORDERED	N/A	REQUIRED IF NO HLCO
Night Helicopter water-dropping operations with two or more helicopters.	ORDERED if no ATGS*	N/A	ORDERED unless HLCO is on scene and does not require additional supervision.*
When requested by airtanker, helicopters, ATGS, LPIL, or ASM.	REQUIRED	REQUIRED	REQUIRED

Required

Aerial supervisory resource(s) shall be over the incident when specified air tactical operations are being conducted.

Ordered

Aerial supervisors shall be ordered by the unit maintaining operational control (operations may be continued while the aerial supervisor is en route to the incident. Operations can be continued if the resource is not available and assigned resource are notified).

Assigned

Tactical resource allocated to an incident. The resource may be flying en route to and from, or on hold at assigned airport/helibase.

N/A

Not authorized or applicable to the level of supervision required for the mission/resource.

Note: Aerial Supervision personnel and equipment may be used during night flying operations when approved by the agency having operational control. Incidents on Forest Service lands or using Forest Service resources will follow the USFS National Night Air Operations Plan, https://www.fs.fed.us/sites/default/files/media_wysiwyg/2017_national_night_air_operations_plan_508.pdf.

Aerial Supervision personnel must carefully evaluate flight hazards, conditions (visibility, wind, thunder cells, turbulence, and terrain) to ensure that operations can be conducted in a safely and effectively.

The following policies and guidelines are designed to do this:

Visibility

Visibility must meet the FAA Visual Flight Rules (VFR) minimum requirement for the airspace that operations are within. When poor visibility precludes safe operations, flights will be suspended. It is highly recommended that all incident aircraft fly with lights on, appropriate to the aircraft and conditions, at all times. Regular position reporting is critical in marginal visibility conditions.

Night Air Operations

Reference FIRESCOPE and USFS Night Air Operations Plan.

Hazardous Conditions

Moderate to high winds and turbulent conditions affect flight safety and water/retardant drop effectiveness. Several factors including terrain, fuel type, target location, resources at risk, crosswinds, etc., must be considered. Aerial operations should cease when safety-of-flight is or may be compromised, water/retardant drops become ineffective, or at the pilot's recommendation. Refer to the *Incident Response Pocket Guide* (*IRPG*), PMS 461, https://www.nwcg.gov/publications/461, refusal of risk process.

Evaluate thunderstorms and other hazardous weather activities for flight safety. Erratic winds, lightning, hail, and diminished visibility adversely affect aviation operations. Consider delaying operations or reassigning resources to safe operation areas. Suspend flight operations when lightning or other adverse weather conditions are present. Further reading: Interagency Aviation Accident Prevention Bulletin 13-04, MAFFS operations plan, Federal Aviation Regulations (FAR)/Aeronautical Information Manual.

Note: Any aerial supervisor, pilot, or ground resource can halt operations to mitigate risk or hazardous situations.

Foreign Government Aircraft on United States Incidents

Under international cooperative agreements the U.S. Department of Agriculture (USDA)-USFS, DOI-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 LPIL will normally be assigned with Canadian airtankers. The State of Alaska also employs a Bird Dog program and manages it internally for the State of Alaska airtankers which are federally approved. The Canadian airtanker communications system is compatible with USDA-USFS and DOI Systems. Aerial supervisors assigned to these incidents will adhere to the following policies and guidelines:

Incidents on Federal Lands

- Aerial Supervision shall be assigned to the incident as outlined in the Incident Aerial Supervision Requirements table in this chapter.
- A Federal ATGS, ASM, or LPIL shall supervise Canadian airtankers. In the absence of a LPIL or ASM, the Canadian Air Attack Officer/Bird Dog is authorized to coordinate airtanker drops and function as ATGS (after completing an orientation).

Deviations from this policy must be specifically approved by the appropriate agency.

- Airtanker Reloads – The reload base for Canadian airtankers shall be determined by the originating dispatch.
- Canadian airtanker pilots shall be briefed on standard drop height minimums as they normally drop from lower heights.
- Canadian airtankers and helicopters operating on federal lands will be managed in the same manner as United States resources.

Incidents on Cooperator Lands

When an ATGS, ASM or LPIL are assigned to a cooperator incident employing Canadian air resources; the incident will be managed as outlined in this chapter.

Authorization to lead United States Airtankers

Canadian Air Attack Officers/Bird Dogs or Alaskan Bird Dogs are not authorized to “lead” U.S. airtankers.

Air Attack Pilot Standards

Pilots flying air tactical missions must be agency approved. Airplane Pilot Qualification Cards must be checked prior to air tactical missions.

Air Attack Pilot Approval

Aerial supervision pilots (for ATGS or HLCO) shall be inspected and approved annually by a qualified Forest Service or Office of Aviation Services (OAS) Pilot Inspector. Qualification for air tactical missions shall be indicated on the Airplane Pilot Qualification Card.

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. As a minimum, the following shall be covered:

- General scope of the mission.
- Incident air organization – emphasis on ATGS, ASM and HLCO roles.
- Specific responsibilities of the ATGS.
- Fire Anatomy.
- Specific responsibilities and expectations of the ATGS pilot.
- Air resources commonly assigned to, or present on, the type of incident.
- Communications hardware, procedures, protocol and frequency management.
- Air space management, FTA, Temporary Flight Restrictions (TFRs), flight patterns, etc.
- Operations safety.
- Standard Operating Procedures.
- Fuel management.
- Dispatch readiness, availability for duty.
- Records.

Personal Protective Equipment (PPE) Policy

The following PPE is required for all interagency ATGS operations (ATGS and Pilot):

- Leather or Nomex® shoes.
- Full-length cotton or Nomex® pants or a flight suit.
- Cotton or Nomex® shirt.

The following PPE is required for all interagency HLCO operations (HLCO and Pilot):

- Leather or Nomex® shoes.
- Pants and long sleeve shirt made of Nomex® or a flight suit.
- Leather or Nomex® gloves.
- Agency approved flight helmet.

LPIL and ASM

Policy

The use of PPE by personnel engaged in LPIL/ASM operations is required as per agency policy. This requirement is stated in various publications, including the *USDA Safety and Health Handbook*, FSH 6709.11, Chapter 3, the *DOI Safety and Health Handbook*, 485 DM, Chapter 20, and both departments *Aircraft Accident Prevention Plans*. Specific requirements for PPE differ slightly among organizations. A complete text of requirements can be found in the DOI Departmental Manual (351 DM 1).

Requirements

Flight Suit

One-piece fire-resistant polyamide or aramid material or equal. The use of wildland firefighter Nomex® shirts and trousers (two-piece) is authorized.

Protective Footgear

Leather boots shall extend above the ankle. Such boots may not have synthetic insert panels (such as jungle boots).

Gloves

Gloves made of polyamide or aramid material or all leather gloves, without synthetic liners. Leather gloves must cover the wrist and allow required finger dexterity.

Flight Helmets

Aerial Supervision from helicopters requires a flight helmet.

Oxygen Requirements

Flights must comply with the FAA Part 135, 14 or Part 91.211 of Code of Federal Regulations (CFR) part 135.89 or more restrictive contractual regulations.

Note: Refer to aircraft contract for specific direction on applicable FARs.

Day/Night Flight Policy

Twin-Engine Fixed-Wing

These aircraft are not limited to daylight operations. The aircraft can travel to/from or work over the incident before sunrise and after sunset as long as the aircraft and pilot are equipped/authorized for Instrument Flight Rules (IFR) operations and in compliance with fixed-wing low-level operations in low light conditions in this guide. Consult agency policy for further clarification.

Single-Engine Fixed-Wing

Flight time is limited to 30 minutes prior to sunrise and 30 minutes after sunset unless IFR equipped and the pilot is qualified.

USFS: Use only multi-engine or turbine-powered single-engine aircraft (fixed-wing or helicopter) for night flights that meet the applicable requirements in FAR Part 91 and Part 61 as referenced in FSH 5709.16 or applicable contract requirements.

Helicopters

Flight time is limited to 30 minutes prior to sunrise and 30 minutes after sunset. Multi-engine helicopters are not limited to daylight operations under certain stipulations such as emergencies or lighted airports, or specific programs/contracts.

USFS: Low-level helicopter night flight operations will primarily be conducted using Night Vision Goggles (NVG), a temporary unaided flight is allowed when excessive illumination exists and becomes hazardous to NVG aided flight. Helicopters will be approved for NVG operations. Refer to agency policy and/or aircraft contract.

Flight Crew Duty Day and Flight Hour Policy

Refer to the *Interagency Standards for Fire and Fire Aviation Operations* (Red Book), Chapter 16, for current Interagency Interim Flight and Duty Limitations https://www.nifc.gov/policies/pol_ref_redbook.html.

Communications Guidelines

Flight Following

A frequency is assigned by the dispatch center for check-ins and incident related information. National Flight Following (NFF) frequency (168.650 Tx/Rx. Tone 110.9 Tx/Rx) is the primary flight follow frequency. Local units may assign an additional (VHF-AM or VHF-FM) based on unit policy. Dispatch centers may require a 15-minute check-in or a confirmation that an aircraft is showing “positive” on the automated flight following (AFF) system. See National/GACC Mobilization Guide for specific flight following responsibilities.

Note: Consult hosting dispatch center for local procedures.

Air-to-Ground Communications

It is essential to have a dedicated air-to-ground frequency that is continuously monitored by Aerial Supervision resources.

- IA – Many agencies have pre-assigned FM air-to-ground frequencies assigned to geographic areas. Other agencies use standard work channel frequencies.
- Extended Attack Incidents – Specific frequencies should be ordered to avoid radio conflicts with other incidents. Some incidents require two air-to-ground frequencies to separate command and tactical air-to-ground communications. These frequencies must be ordered through the dispatch system. Once assigned, incident frequencies and their specified use will be listed in the ICS 220 Air Operations Summary and the ICS 205 Incident Radio Communications Plan.

Air-to-Air Communications

Communication between all airborne incident aircraft is critical to safety and effectiveness. Air-to-air communications are usually accomplished using a VHF-AM frequency. California uses a VHF-FM for air-to-air communications, which requires three FM radios.

- Primary air-to-air frequencies are assigned on an aircraft dispatch form. Agencies may have pre-assigned air-to-air frequencies for IA specific to geographic areas. Specific frequencies should be ordered for extended attack incidents to avoid conflict with other incidents through the local dispatch center. Extended attack incidents have discrete air-to-air frequencies assigned by the incident's Communication Unit Leader and are listed in the Air Operations Summary (ICS-220), and Incident Radio Communication Plan, (ICS-205).

- Secondary air-to-air frequencies are assigned on an aircraft dispatch form. 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 en route to the incident can check-in. A discrete air-to-air frequency may be required for LPIL operations.

Air-to-Air Continuity

The ATGS must monitor all assigned air-to-air frequencies and maintain communications with incident aircraft. Air resources under the direct supervision of the ATGS must monitor their assigned air-to-air frequency.

Air Guard

VHF-FM 168.625 (TX Tone 110.9) has been established as the USDA/DOI 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:

- In-flight aircraft emergencies.
- Emergency aircraft-to-aircraft communications.
- Emergency communications between air and ground resources.
- Dispatch contact (when use of the designated flight following frequency does not result in positive communications).
- Initial call, recall, and redirection (divert) of aircraft when assigned frequencies fail to work.

Air-to-Air Enroute Position Reporting

During periods of poor visibility, a VHF-AM or FM frequency may be established for assigned aircraft position and altitude reporting (calls in the blind).

In-flight Communications Failure

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:

- Total System Failure – No ability to monitor or transmit – seek a safe altitude and route and return to base in accordance with FARs.
- VHF-FM System Failure – Report the problem to other aircraft and dispatch (if able) on VHF-AM system and return to base.
- VHF-AM System Failure – Report the problem to other aircraft, IC and Dispatch on VHF-FM system and return to base in accordance with FARs.

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.
- VHF-AM is allocated by the 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 GACCs.

Backcountry Airstrips / Uncontrolled Airstrips

When there is a potential conflict between agency aircraft and public users of back country airstrips announce intention relating to fire activity on the appropriate backcountry frequency. The Air Attack Pilot should monitor Unicom/Multicom/Common Traffic Advisory Frequency and brief the ATGS regarding traffic.

Conflicting Radio Frequencies

When multiple incidents in relative proximity are sharing the same tactical frequencies, interference can seriously impair operations. The ATGS must recognize this and request different frequencies through dispatch or the IMT Communications Unit Leader. ATGS may select a “LOW” transmit power setting, if available, to attempt to mitigate interference issues. A local (geographic area) frequency coordinator and the National Incident Radio Support Cache should be involved when assigning frequencies where several incidents are in close proximity.

Tone Guards

Tones have been established to allow the use of assigned frequencies selectively. The tone can be programmed, or selected, on VHF-FM radios for both receive and transmit frequencies positions when tones are assigned incident aircraft shall use them as directed. When frequencies are protected in the “receive” position only radios that have specified tone in their “transmit” position will be heard.

Air Resource Identifiers

- ATGS/HLCO identifier en route to and from incidents will use their unit identifier (Air Attack or HLCO) or Tail Number (last 3) until they assume incident duties
- The federal ASM identifier is Bravo, State of Alaska units use Alpha, and CALFIRE uses Charlie (example: “Bravo-5”)
- LPIL identifier is “Lead”
  - LPIL – Pilots are assigned a one or two-digit identifier (ex: Lead 1 is pronounced “Lead one” and Lead 0-1 is “Lead zero one”).
- Airtanker: Tanker plus identification number (ex: Tanker 21 is “Tanker two one”).
- Scooper: Scooper plus identification number (ex: Scooper 260 is “Scooper two six zero”).
- MAFFS: MAFFS plus identification number (ex: MAFFS 6 is “MAFFS six”).

- Helicopter: Helicopter plus last three characters of N-number (ex. helicopter 72D is “Helicopter seven two delta”) or a locally assigned agency identifier (ex. Helicopter 534 is “Helicopter five three four”).
- Smokejumper Aircraft: Jumper plus last two characters of N-number (ex. Jumper 41) or an agency assigned identification number.
- Other Fixed-Wing: Other fixed-wing are identified by “make or model prefix” plus the last three characters of N-number (ex. Cessna 426).
- Other Identifiers:
  - Air Ops: Air Operations Director
  - Air Support: Air Support Group Supervisor
  - Operations or Ops: OSC

Message Sequence

Protocol requires the resource you are calling be stated first, followed by your identification. “Tanker two three, Trinity Air Attack.” Make messages as short and concise as possible.

Frequency Identification

Monitoring several frequencies when all are actively receiving makes it difficult to determine which frequency is being heard. When making initial contact, state the frequency you are transmitting on: “Lead six-eight, Bear Air Attack on Victor one-one-eight-two-five-zero.”

Airspace Policy

The *NWCG Standards for Airspace Coordination, PMS 520,* https://www.nwcg.gov/publications/520, covers all aspects of wildland agency airspace management. Aerial supervision personnel must be familiar with information in the guide and FAA designated airspace. Dispatch centers and airtanker base managers should have a copy of both available for reference. Clearance from dispatch is **not** a clearance from the FAA or Air Traffic Control (ATC) and the pilot must obtain clearance appropriate to the airspace.

Federally Designated Special Use Airspace (SUA)

Incidents may be located in, or flight routes to incidents may pass through, areas designated by the FAA as Special Use Areas. Operations through, or within these areas, may require specific procedures to be followed.

SUA “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 (MOAs), Restricted Areas (RAs), Prohibited Areas (PAs) Alert Areas (AAs) Warning Areas (WAs) and Controlled Firing Areas (CFAs).

SUA Locations

All areas except CFA are identified on National Oceanic and Atmospheric Administration (NOAA) Aeronautical Sectional Charts. Many of these are located in wildland areas throughout the United States.

Procedures

The Interagency Airspace Coordination Guide and the FAA Handbook 7400.2L (Procedures for Handling Airspace Matters) discuss procedures to be used when wildland aerial fire operations are requested in or through these areas. Often, 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. Dispatch is not a controlling agency regarding airspace.

- RA – These areas denote the existence of unusual and often invisible hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Aircraft must obtain authorization from the controlling agency prior to entry. Many dispatch centers have a deconfliction plan for this type of airspace.
- MOA – Many MOAs in the Western United States are located in airspace over agency lands. Current information regarding MOA scheduling is published in the Area Planning (AP/1B) Handbook and Charts. When wildfires occur in these areas the local unit should contact the controlling agency and notify them that incident aircraft will be in the area. Do not assume there will be no military activity within the SUA. Authorization is not required to enter a MOA, however, the controlling agency may alter operations in the vicinity of the incident.
- Military Training Route (MTR) – MTRs are located over many agency lands in the United States. Centers should have daily schedule information (hot routes) and may notify the FAA and Military.
- Scheduling Activity when incident aircraft may conflict with military aircraft on or near a MTR. Do not assume an MTR has been de-conflicted.
- Other Military Training Routes and Areas – While the MOAs and MTRs are charted on sectional maps and the AP/IB charts, Slow Speed Low-Altitude Training Routes (SRs) and Low-Altitude Tactical Navigation Areas (LATNs) 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 en route to, near or within the operations area.

Incident Airspace; the FTA

The airspace surrounding an incident is managed by the aerial supervisor who must implement FTA procedures. All wildland incidents, regardless of aircraft on scene, have an FTA (if an incident has an active TFR in place, clearance from the controlling aircraft is required prior to TFR entry, see next section for TFR). If Aerial Supervision is not on scene, the first aircraft on scene will establish the FTA protocol.

The FTA is a communication protocol for firefighting agencies. It does not pertain to nonparticipating aircraft.

Key components and procedures of the FTA include:

- Initial Communication Ring – A ring 12 nm from the center point of the incident. At or prior to 12 nm, inbound aircraft contact the ATGS or appropriate aerial resource for permission to proceed to the incident. Briefing information is provided to the inbound aircraft by the aerial supervisor over the incident.

- No Communication (NOCOM) Ring – A ring 7 nm from the center point of the incident that should not be crossed by inbound aircraft without first receiving clearance from the appropriate on-scene incident aircraft.
- Three (3) Cs of initial contact – Communication requirements and related actions to be undertaken by the pilot of the inbound aircraft:
  - Communication – Establish communications with the controlling aerial supervisor or an on-scene aircraft if there is no Aerial Supervision.
  - Clearance – Receive clearance from aerial supervisor (or on-scene aircraft if there is no Aerial Supervision) to proceed to the incident past the NOCOM ring. The inbound pilot will acknowledge receipt of clearance or (hold) outside the NOCOM ring until the clearance is received and understood.
  - Comply – Inbound aircraft will comply with clearance. If compliance cannot be accomplished, the inbound aircraft will remain outside the NOCOM ring until an amended clearance is received and understood.
- Departing Aircraft – Aircraft departing incident airspace must follow assigned departure route and altitude. Aerial supervisors must deconflict routes for departing aircraft within the airspace.

Initial Points (IP)

The IP is a location that airtankers initially fly to when coming to the fire. It can be identified by latitude and longitude, a geographic location, or even a distance and direction from the fire.

TFR

Under the conditions listed below the responsible agency should request a TFR under FAR Part 91.137 (a)(2). A TFR may be initiated by the dispatch center, IC, AOBD, LPIL, ASM, or ATGS.

For more information, refer to the NWCG Standards for Airspace Coordination or FAR Part 91.137 (a)(2).

Aerial Supervision Responsibilities Regarding TFRs

During the IA phase of an incident, the aerial supervisor may initiate a request for a TFR. The aerial supervisor should provide information required on the Interagency Request for TFRs form and radio this information to the responsible dispatch coordination center. On Type 1 or 2 incidents, the ATGS in consultation with the ASM, HLCO, and/or LPIL will advise the AOBD when the dimensions of the TFR should be changed. These changes must be forwarded immediately to the dispatch center that will initiate a new order to the FAA. The aerial supervisor should coordinate with the incident AOBD or local dispatch office as appropriate to recommend termination of an existing TFR.

Ordering a TFR

Three pieces of information are required:

- Center point in Degree Minutes Seconds (DMS) format.
- Vertical dimension in feet Mean Sea Level (MSL).
- Horizontal radius in Nautical Miles (NM) from center point.
  - Non-standard/non-circular TFR dimensions require points in DMS format at each corner of the polygon listed clockwise around the perimeter.

Note: The Interagency Airspace Coordination Guide covers this subject in detail.

TFR Additional Factors to Consider

- Length of operation: Extended operations (>3 hours) are anticipated. Local agency policy for the anticipated length of incident operations may apply.
- Congested airspace involved: Operations are in the vicinity of high-density civil aircraft operation (airports).
- Incident size and complexity.
- Potential conflict with non-operational aircraft.
- Extended operations on MTRs.
- Extended Operations within SUA.
- The type and number of aircraft operations occurring within the incident airspace and their aeronautical requirements.
- The operating altitudes to provide all incident aircraft including the ATGS and ATGS relief aircraft a safe operating orbit.
- Entry and exit points and routes to bases.
- Other aviation operations in the geographic area.
- Size, shape, and rate of increase of the incident.
- Location of the incident helibases, water sources, etc.
- Location of airports.

TFR Lateral Dimensions

The suggested radius for a TFR is 7 NM from the center point. Any incident helicopter operating bases within “reasonable distance” should be included (helibase, heli-dip site) within the TFR. The lateral dimensions/shape may be irregular to conform to incident airspace requirements. TFRs reaching 20 NM will require a special frequency from the FAA.

TFR Vertical Dimensions

The suggested guideline for an incident TFR is 2,000 feet above the highest flying incident aircraft. Generally, this will be, 4,500 feet above terrain.

Note: 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.

TFRs for Multiple Incidents in Close Proximity

Multiple incidents in close proximity may result in overlapping restrictions. To avoid confusion the respective dispatchers and AOBDs should consolidate multiple TFRs into one manageable TFR. This will need to be negotiated between agencies and IMT’s. Frequency management will also need to be considered. As long as the TFRs do not overlap, they may share boundaries.

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).

- Volcanic eruption, toxic gas leaks, spills.
- Forest and range fires, earthquakes, tornado activity, etc. Disaster/hazard incidents of limited duration that would attract an unsafe congestion of sightseeing aircraft, such as aircraft accident sites.
- Incidents/events generating high public interest such as sporting events.

Note: ATGS, ASM, and HLCO do not have the legal authority to waive 14 CFR 91.137 and allow nonparticipating aviation to pass through the TFR area. They have only two options: (1) Release the TFR (through normal ordering channels) to accommodate the requests, or (2) advise the requestor that they will have to continue to fly around the TFR for their safety.

Protocol for Airspace Conflicts and Intrusions Inside a TFR

- When incident airspace conflicts and intrusions occur, the aerial supervisor must:
- Immediately ensure the safety of incident aircraft.
- Notify incident aircraft in the immediate area of the position of the intruder.
- Attempt radio contact with intruder aircraft by use of VHF-AM (known Victor, local Unicom) and VHF-FM (assigned, local, or Air Guard) frequencies.
- 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. Determine if the intruder has legitimate authority to be within the TFR.
- Request intruder departs TFR area (assign an altitude and heading if necessary). Request the intruder to stay in radio contact until clear of the TFR.
- If the aircraft is a legitimate "nonparticipating" aircraft and has the authority (law enforcement) to be within the area, communicate with the aircraft and advise incident aircraft of its presence. If possible, coordinate altitudes and locations.
- For drone conflicts and intrusions please reference: Unmanned Aircraft Systems: https://www.faa.gov/uas/.
- *NWCG Standards for Airspace Coordination*, PMS 520, https://www.nwcg.gov/publications/520.

If radio contact is not established:

- Do not attempt to drive, guide or force the intruder from the area. The aerial supervisor must monitor intruder's position, altitude, and heading.
- The aerial supervisor must ensure that incident aircraft are informed and kept clear of intruder. This may require removing incident aircraft and suspending operations for as long as intruder is considered a potential hazard.

- 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.
- If there is a conflict or intrusion, report it to the appropriate dispatch center. Ask dispatch to report the intrusion to the local ARTCC.
- Submit a Mishap or Aviation Safety Communiqué (SAFECOM) Report as per agency policy and procedures.

Air Operations in Congested Areas

Fires in the urban interface are considered to be in "congested areas." Airtankers can drop retardant in congested areas under DOI authority given in FAR Part 137. USFS authority is granted in exemption 392, FAR 91.119 as referenced in the Forest Service Manual 5700 and 5709.16. When such operations are necessary, they may be authorized and are subject to these limitations:

- Airtanker operations in congested areas may be conducted at the request of the city, rural fire department, county, state, or federal fire suppression agency.
- An ASM or LPIL is ordered to coordinate aerial operations.
- The ATC facility responsible for the airspace is notified before or as soon as possible after the beginning of the operation.
- A positive communication link must be established between the LPIL or the ASM, airtanker pilots, and the responsible fire suppression agency official.
- The IC or designee for the responsible agency will advise Aerial Supervision personnel or airtanker that the line is clear before retardant drops.

Use of Firefighting Aircraft Transponder Code 1255

All incident aircraft will utilize a transponder code of 1255 unless another code is assigned by ATC.

SUA Reminders

- Check with dispatch when receiving the Resource Order.
- Is the incident within SUA?
- Is the Restricted Area/MOA/MTR "hot" or about to be?
- Confirm the military has been notified and what action will be taken.
- The pilot must obtain clearance/routing from ATC through or around RAs en route to the incident.
- Always be alert for military aircraft even when SUA/MTRs are "cold."

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.

- This group may include two airtankers or scoopers and a Bird Dog.
- On board, the Bird Dog is an Air Attack Officer, very similar to an ATGS.

- Typically, on a ‘quick strike’ across the border, the Bird Dog would assume control of the airspace and work the fire until a U.S. ATGS is present.
- 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 a LPIL under the supervision of the ATGS. The ATGS is responsible for the direction of all U.S. resources and the Bird Dog.
- Refer to policies of the local agency or your home agency about the utilization of Canadian air resources.
- The local unit Dispatch should coordinate flights with Air and Marine Interdiction Coordination Center at 1-866-AIRBUST.

Chapter 4 – Incident Aircraft

Aerial supervisors should have knowledge of the types of aircraft they supervise, how to communicate with them, and the logistics required to support them.

Tactical and logistical aircraft supervised and coordinated by aerial supervisors may be procured from the USDA Forest Service, DOI OAS, U.S. 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 the Aircraft Identification Library on the DOI/USFS Interagency Aviation Training site at: https://www.iat.gov/aircraft_library/index.asp.

Note: See the USFS *Standards for Airtanker Operations* for specific information related to federal airtankers.

Very Large Airtankers (VLAT)

VLATs may be used on fires to augment Type 1, Type 2 and Type 3 airtankers, but not as a replacement.

- VLAT airtanker base operations will not limit or restrict the capacity of an airtanker base to load large airtankers (LAT).
- Establish flight paths holding areas/altitudes, to avoid creating hazards to other aerial resources within the FTA.
- To avoid wake turbulence, it is required to wait a minimum of 3 minutes after the VLAT has dropped to resume aerial operations near the pattern from the drop.
- Aerial supervision (the PMS 310-1 for ATGS currency or ASM) is required by contract and interagency policy for VLATs while dropping retardant.
- The leadplane or ASM must be on scene prior to dispatching the VLAT.
- VLATs are less maneuverable than large airtankers and should be used in less challenging terrain that affords better maneuverability and effectiveness for dispensing.
- The VLATs minimum drop height is 250 feet above the ground or canopy cover whichever is higher. Generally, drop heights should increase when using higher coverage levels.

Note: See the USFS *Standards for Airtanker Operations* for specific information related to federal airtankers: FS Standards for Airtanker Operations.

Airtanker Typing

Table 2. Airtanker Typing

Ordered as	Type	Capacity (gallons)
VLAT	VLAT	8,000+
LAT	1	3000-7999
	2	1800-2999
SEAT or Multi-Engine	3	800-1799
	4	Up to 799

Airtankers Capabilities

Table 3. Airtanker Classification (Does not account for retardant download requirements.)

Type	Aircraft Make and Model	Maximum Gallons	Cruise Speed (Knots)	Tank/Door System
VLAT	DC-10	9,400	380	3 Constant Flow Tanks
VLAT	747	18,000	500	1 Pressurized System
Type 1	C-130H/Q	4,000	300	1 Constant Flow
Type 1	B-737	4,000	450	1 Constant Flow
Type 1	C-130 (MAFFS)	3,000	300	1 Pressurized System
Type 1	DC-7	3,000	235	8 Doors
Type 1	BAE-146	3,000	330	5 Valves-Constant Flow
Type 1	RJ-85	3,000	340	1-Constant Flow
Type 1	MD-87	3,000	320	1-Constant Flow
Type 2	Q-400	2,600	320	1-Constant Flow
Type 2	P3	2,250	328	1-Constant Flow
Type 3	CL-215, Scooper	1,400	160	2 (foam capable)
Type 3	CL-415, Scooper	1,600	180	4 (foam capable)
Type 3	S2 Turbine Tracker	1,200	230	1-Constant Flow
Type 3	Air Tractor AT-802 F	800	170	1-Constant Flow
Type 3	Air Tractor AT-802 F (Amphibious)	800	150	1-Constant Flow
Type 4	Air Tractor AT-802/602	600-799	140	1 (in-line or horizontal)
Type 4	Turbine Thrush	400-770	122	1 (in-line or horizontal)
Type 4	Turbine Dromader	500	122	1 (in-line or horizontal)

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 evaluated and approved by the IATB and or contracting agency, to ensure that the systems meet desired coverage level and drop characteristics. The four basic systems used today include the following:

- Variable Tank Door System – Multiple tanks or compartments controlled by an electronic intervalometer control mechanism to open doors singly, simultaneously or in an interval sequence. The pilot may select a low flow rate or a high flow rate.
- Constant 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 gallons per 100 square feet (GPC) to +8 GPC.
- Pressurized Tank System – MAFFS C-130s are equipped with a pressurized system to discharge their 3,000 gallons of retardant through one (18") dispensing nozzle. The system is capable of coverage level (CL) 1, 2, 3, 4, 5, 6, and, 8. The line width is about 70% of other (LAT) systems but is more continuous throughout the drop. The MAFFS pattern is the same as an S2T, constant flow, and setting/coverage level 8. Standard Tank System – This system is common on SEATs. 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.

Use of Non-Federally Approved Airtankers

A non-federally approved airtanker is an aircraft that is on contract with a cooperator and may not meet Forest Service or DOI contract standards or policy and may not meet the National Association of State Foresters Cooperator Aviation Standards.

For further information refer to the *Interagency Standards for Fire and Aviation Management* (Red Book), Ch. 16: https://www.nifc.gov/policies/pol_ref_redbook.html.

Non-federally approved airtankers are permitted to reload out of federal airtanker bases, following the standards established in the *NWCG Standards for Airtanker Base Operations,* PMS 508, https://www.nwcg.gov/publications/508.

Helicopters

ICS categorizes three types of helicopters based on minimum gallons of water/retardant, lift capability, number of passenger seats, and weight capacity. Operations personnel refer to helicopters by type. Density altitude will greatly affect lift capability.

Loads under high-density altitude conditions are displayed in the helicopter classification table.

- Helicopter Type 1
- Helicopter Type 2
- Helicopter Type 3

Table 4. Helicopter Classification

Helicopter Type	Aircraft	Typical Payload at 8,000 feet Density Altitude (lbs)	Typical Payload at 11,000 feet Density Altitude (lbs)
Type 1	Sikorsky S-64E (Aircrane)	12,700	9,117
Type 1	Sikorsky S-64F (Aircrane)	15,640	10,288
Type 1	Boeing 234/CH-47 (Chinook)	19,063	15,363
Type 1	Boeing 107/CH-46 (Vertol)	4,656	3,424
Type 1	Sikorsky S-61	4,038	2,221
Type 1	Airbus 332L (Super Puma)	4,328	2,729
Type 1	Airbus SA 330 (Puma)	4,525	3,325
Type 1	Kaman 1200 (Kmax)	5,288	4,588
Type 1	Sikorsky CH-54 (Skycrane)	11,098	7,978
Type 1	Sikorsky UH-60/S-70	6,569	5,669
Type 2	Bell B-214	3,754	2,665
Type 2	Bell B-212	1,973	1,010
Type 2	Bell B-205A-1	1,294	642
Type 2	Bell B-205A-1+	1,596	896
Type 2	Bell B-205A-1++ (Super 205)	2,806	2,120
Type 2	Bell B-412	1,742	884
Type 2	Sikorsky S-58T	1,635	597
Type 3	Bell B-206 B3 (Jet Ranger)	715	380
Type 3	Bell B-206 L3 (Long Ranger)	950	830
Type 3	Bell B-206 L4 (Long Ranger)	1,196	767
Type 3	Bell B-407	1,315	880
Type 3	Airbus 350-B2 (Astar)	1,083	700
Type 3	Airbus 350-B3/H125 (Astar)	1,972	1,911
Type 3	MD Helicopters MD500 D/E/F	515	295

Helicopter Retardant/Suppressant Delivery Systems

There are two basic delivery systems: bucket and tank systems.

- Buckets – Two types of helicopter buckets are used and may or may not have "power fill capabilities." These include:
  - Rigid Shell (100 to 3,000 gallons).
  - Collapsible (94-2000 gallons).
- Tanks – Internal and external tank systems have been developed for various Type 1-3 helicopters. These include:
  - Computerized metered or constant flow tank system.
  - Conventional tank/door system.

Aerial Supervision Aircraft Considerations

All aircraft must be carded by the appropriate agency official for the mission.

In selecting an aircraft for a particular mission, the following should be considered:

Visibility

Fixed-Wing

- High or low-wing aircraft designed with the cockpit forward of the wings typically provide the best visibility.
- Low-wing aircraft designed with the cockpit over the wings; provide for limited visibility.
- Helicopters open cockpit designs facilitate excellent visibility. Consider potential issues derived from doors off in-flight. They can fly under smoke layers which fixed-wing may not be able to. Helicopters are advantageous if the incident is not near any airport and if the aerial supervisor must meet with the OSC. Helicopters are generally utilized for HLCO however, they may also be desirable for ATGS missions when visibility is limited or helicopters are meeting incident objectives.

Speed

For large, IA, and multiple incident scenarios, aircraft speed is important. On IA incidents in particular, it is key that the aerial supervisor arrives before other aerial resources to determine incident objectives and set up the airspace. Twin-engine fixed-wing aircraft are usually the best choice in these situations (150+ knots cruise speed with 200+ knots desirable).

- Twin-Engine Fixed-Wing – Fast (generally greater than 150 kts)
- Single-Engine Fixed-Wing – Slower (generally less than 150 kts)
- Helicopters – Slowest (generally less than 130 kts)

Pressurization

When performing missions above 10,000 ft msl, consider a pressurized aircraft.

Endurance

Consider length of the mission, distance of dispatch, and area of availability.

Aircraft Performance

Consider operating environment, payload, endurance, runway length requirements, weather, and training needs.

Noise Level

Excessive noise can interfere with the ability to communicate for prolonged periods and can contribute to fatigue. Consider using an active noise-canceling headset to help mitigate noise-related fatigue.

<u>Aircraft Approvals</u>

Aircraft must have interagency approval to be used for an air tactical mission. The approval card must be carried onboard the aircraft.

<u>Avionics Equipment</u>

In addition to the above avionics' requirements, the following are required:

- Headset(s) with boom microphones for each person.
- Voice Activated Intercom.

- Separate Audio Panels for the pilot and ATGS/AITS.
- Separate volume and squelch controls for the pilot and ATGS/AITS.
- A separate audio panel and voice activated intercom station in a rear seat may be required in aircraft to accommodate an ATGS/AITS trainee (observer) of ATGS Evaluator or ATGS Final Evaluator.

Traffic Collision Avoidance System (TCAS/TCAD)

The threat of midair collision is ever-present in the fire environment. TCAS/TCAD is now part of the standard equipment in leadplane and ASM aircraft. The systems are enhanced with special features designed to improve safety and operational effectiveness on incidents. USFS Smokejumper airplanes are equipped with TCAS.

Helicopter Emergency Services: Short-Haul/Hoist Extraction

The interagency community produces a hoist/extraction guide annually. Please refer to the following document: Interagency Emergency Helicopter Extraction Source List, PMS 512, https://www.nwcg.gov/publications/512.

Smokejumper Aircraft

Smokejumper aircraft are turbine-powered aircraft carrying 8 to 12 smokejumpers plus spotters and flight crew. Smokejumpers are primarily used for IA but are also used to reinforce large fires, build helispots, etc.

MAFFS

See more information at: https://www.fs.fed.us/managing-land/fire/planes/maffs.

Policy

The NICC mobilizes MAFFS as surge capability when 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, Nevada, 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 of the Forest Service Assistant Director, Fire Operations is responsible for initiating a MAFFS mission. Refer to the *National Mobilization Guide*, Chapter 20 for additional MAFFS mobilization information.

Through the Memorandum of Understanding the USDA, Forest Service will provide the following resources:

- MAFFS unit “slip-in tank” systems.
- Qualified MAFFS LPIL.
- MAFFS Liaison Officer (MLO).
- MAFFS Airtanker Base Manager (MABM).
- VHF-FM radios.

MAFFS Home Base (Wing) Locations

Air National Guard and Air Force Reserve units utilizing C-130 are based at the following locations:

- Reno, Nevada (152nd AW) – Air National Guard
- Port Hueneme, California (146th AW) – Air National Guard
- Cheyenne, Wyoming (153rd AW) – Air National Guard
- Colorado Springs, Colorado (302nd AW) – Air Force Reserve

Training and Proficiency

Training will be conducted by the Forest Service, National MAFFS Training Coordinator annually for military and agency personnel. Specific training dates will be negotiated with the military airlift wings.

MAFFS Flight Crews

Training of MAFFS crews will be in accordance with military qualifications and continuation training requirements. To become qualified to fly MAFFS operations, MAFFS flight crews must attend initial and recurrent training as appropriate at the annual MAFFS training session. The Air Force Mission Commander (AFMC) will certify to the Forest Service National MAFFS Training Coordinator. The status of flight crewmembers after the annual training currency requirements are as follows:

- MAFFS airdrop currency is required annually. If more than 120 days have elapsed since the last airdrop, the crew's first airdrop will be restricted to a target judged by the MAFFS LPIL to offer the fewest hazards.
- If more than eight months have elapsed since the last MAFFS airdrop, an airborne MAFFS LPIL supervised waterdrop will be required before entering the incident area.

Currency training will be conducted annually.

MAFFS Operations Policies

<u>MAFFS Aircraft Identification</u>

Each MAFFS aircraft will be identified by a large, high visibility number on the aircraft tail, side of the fuselage aft of the cockpit area, and on top of the fuselage cabin. The MAFFS call sign will be this number (i.e., MAFFS 2).

<u>Supervision of a MAFFS Mission</u>

- No MAFFS mission will be flown unless under the supervision of a qualified MAFFS LPIL. The LPIL will communicate with the MLO/AFMC daily on flight needs of military crews.
    - International MAFFS missions will utilize a qualified MAFFS LPIL in the MAFFS aircraft to assist the aircraft commander with tactical requirements. Headquarters (HQ) Military Airlift Command approval must be obtained prior to flying civilian personnel aboard MAFFS aircraft.
    - LPIL operations will be provided on each run and the runs are restricted to one MAFFS aircraft at a time with no daisy-chain operations of multiple aircraft in trail.

MAFFS

Agencies must participate every 4 years to be re-qualified for operations with MAFFS. Qualified MAFFS will be listed in the National Interagency Mobilization Guide.

Military Flight Duty Limitations

Flight time will not exceed a total of 8 hours per day.

- A normal duty day may be limited to 12 hours.
- Within any 24-hour period, pilots shall have a minimum of 12 consecutive hours off duty immediately prior to the beginning of any duty day.
- Duty includes flight time, ground duty of any kind, and standby or alert status at any location.

Standard Operation Procedures (SOPs)

Procedures for working MAFFS on an incident are the same as for contract airtankers. MAFFS flight crews are rotated regularly. The AFMC will verify the status of the flight crews with the MLO. LPILs should be aware that newly rotated flight crews may have restrictions on their initial airdrops to accomplish currency requirements.

Operational Considerations

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

- Volume – C-130s configured with MAFFS 2 (M2) normally carry 3,000 gallons unless takeoff performance requires a download.
- Load Portions – Capable of Start/Stop drops.
- Coverage Levels – M2 is capable of Coverage Levels 1, 2, 3, 4, 6, and 8.
- Retardant Line Width – M2 has a narrower but more uniform line pattern than commercial airtankers. This is a characteristic of the nozzle on the pressurized system. Density (coverage level) at the center meets IATB criteria and remains consistent along the path of delivery.
- Reload – M2 can be sent to reload at pre-approved bases identified in the *NWCG Airtanker Base Directory,* PMS 507, https://www.nwcg.gov/publications/507. Normally, following the final airdrop MAFFS aircraft will recover to the activation base for servicing by military personnel.

Communications Considerations

Aircraft Identifier

The number displayed on the aircraft fuselage will identify MAFFS aircraft.

Radio Hardware

MAFFS aircraft are equipped with one Forest Service supplied P-25 compliant VHF-FM radio operating over the frequency band of 138–174 MHz. Communications may also be conducted using a VHF-AM frequency in the 118-136.975 MHz bandwidth in the same manner as other contract air tactical resources.

Check-in Procedure

The aerial supervisor 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’ en route to the incident.

Dispatch Communications

The ATGS or LPIL will notify dispatch whether additional loads of retardant will be required to meet operational objectives on the incident.

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,* https://www.nifc.gov/nicc/logistics/references.htm. Key portions of the parent text are included below.

Policy

Regular military helicopter assets may be provided by the Department of Defense – Support of Civilian Authority as requested by appropriate ordering entities when civilian aviation resources are depleted.

Mission Profiles

Mission profiles for regular military helicopter units are normally limited to:

- Reconnaissance or Command and Control activities.
- Medevac.
- Crew transportation.
- Cargo transportation (internal and external loads).
- Crew and cargo staging from airports to base camps for incident support.

Bucket Operations

An ATGS/ASM/HLCO shall be utilized whenever military helicopters are sequenced with contracted helicopter resources.

Communications

- Military Radio Hardware – Regular military aircraft are equipped with VHF-AM aeronautical radios that operate in the 118 to 136.975 MHz bandwidth.
- 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 communications capability using civilian bandwidths for air-to-air and air-to-ground communications.

National Guard Helicopter Operations

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 aerial supervisor should coordinate with local agency officials, agency aviation management specialists or the AOBD to ensure planned use of National Guard assets complies with applicable policy and procedures specific to the local area and/or participating jurisdictions.

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.

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.

Communications and HLCO

Lack of VHF-FM communications capability may be a problem and will need to be addressed prior to use of National Guard aviation resources on federal or multi-jurisdictional incidents. A Helicopter Coordinator (HLCO) should be ordered to mitigate communications issues with ground and aviation resources on an incident.

Training and 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.

Water Scooping Aircraft

Canadair CL-215, 415, and AT-802 Fire Boss.

Policy and Availability

- United States – Water scooping aircraft are located or utilized throughout the U.S. and operate on a basis where water sources are conducive to operations. These aircraft are contracted by DOI, FS, and state agencies.

USFS: Forest Service contracted water scoopers shall not be loaded with chemical retardant, water enhancers or foam per the contract.

- Canada – Water scooping aircraft 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. Aerial supervisors should obtain a briefing on these agreements or procedures when assigned, if applicable.

Night Aerial Supervision

A technology-enhanced exclusive use fixed-wing Aerial Supervision Platform may be available and stationed in R5 USFS Southern California Operations Center (SOPS). The standard hours of the aircraft availability will be 1800-0600 however, it can vary throughout the fire season to maximize coverage. The night aerial supervisory platform is ordered through the South Operations GACC.

Considerations:

- ATGS will be trained to the standards within the USFS National Night Air Operations Plan ATGS will be familiar with FIRESCOPE Night Flying Guidelines.
- IA Resource may be used on large fires with concurrence from SOPS GACC.
- 14-hour duty day, 8 hour flight time within the previous 24 hours.
- 10 hours of rest between shifts.
- If planned to be used on extended attack or emerging incident an effort should be made to allow the ATGS to observe operations during daylight hours.
- Only Aerial supervisors that are trained and designated can supervise incident aircraft during night operations.

Firewatch Aerial Supervision Platforms

The USFS Firewatch Helicopter is a Bell 209 converted for use as an Aerial Supervision and intelligence-gathering platform. There are two platforms in use H-507 and H-509. The platforms are Technology Enhanced Initial/Extended Attack HLCO/ATGS platforms based in Redding, California and repositioned as needed.

Call Signs

For mission clarification:

- When in the ATGS profile the call sign is Air Attack 507/509.
- For intelligence gathering, mapping or suppression resource support profile, the call sign is Firewatch 507/509.
- Mission Profiles – The USFS Firewatch Helicopter will request entry into the FTA in one of the following mission profiles:
    - Tactical
        - ATGS.
        - HLCO.
    - Intelligence
        - Tactical intelligence.
        - Live video downlink.
        - Infrared imagery/video.
        - Mapping.

Considerations

Clearance for the Firewatch Platform (AA 507 or 509) into the FTA as an ATGS or HLCO should be the same as any relief or IA ATGS or HLCO, one thousand feet either above or below the on-scene Aerial Supervision or controlling platform for initial briefing and transition of control.

When performing live down link operations, aircraft may request 3,000 to 5,000 Above Ground Level (AGL) altitudes for better big picture video feed.

Unmanned Aircraft Systems

See *NWCG Standards for Fire Unmanned Aircraft Systems Operations*, PMS 515, https://www.nwcg.gov/publications/515.

Unmanned aircraft systems pilots are held to the same pilot operating procedures found in the *SAS*, PMS 505, https://www.faa.gov/uas/.

Chapter 5 – Suppression Chemicals

Wildland fire suppressants and retardants are chemical agents applied to burning and adjacent fuels. Only chemicals that are on the Qualified Products List (QPL) shall be used, and only for the delivery method approved. See the Forest Service's Wildland Fire Chemicals website for details: https://www.fs.fed.us/rm/fire/wfcs/index.htm.

Refer to the *Interagency Standards for Fire and Fire Aviation Operations,* https://www.nifc.gov/PUBLICATIONS/redbook/2019/RedBookAll.pdf, or the website noted above for the most current information on fire chemicals and their use.

Definitions

Suppressants (Direct Attack)

A fire suppression chemical applied directly to the flame base to extinguish the flame (water, foam, gel/water enhancer).

Note: Federal Land Management agencies are not approving the use of fire chemicals (water enhancers) mixed with onboard fire chemical injections systems on federal lands or federally contracted aircraft.

Foam Fire Suppressants

Foam fire suppressants contain foaming and/or wetting agents. The foaming agents and percentage of concentrate added to affect the accuracy of an aerial drop, how fast the water drains from the foam, and how well the product clings to the fuel surfaces. The wetting agents increase the ability of the drained water to penetrate fuels. These products are dependent on the water they contain to suppress the fire. Once the water they contain has evaporated, they are no longer effective. Engines, portable pumps, helicopters, and SEATs may apply foam. Some agencies also allow the application of foam from fixed-wing water scoopers.

Water Enhancers

Water enhancers contain ingredients designed to alter the physical characteristics of water to increase viscosity, accuracy of the drop, or adhesion to fuels. They improve the ability of water to cling to vertical and smooth surfaces. The consistency of these products can change depending on the quality of the water used for mixing. Once the water they contain has evaporated, they are no longer effective. Approved products are available for use in helicopter buckets, with some approved at specific mixing ratios for use in SEATs and fixed-tank helicopters.

- Retardants contain fertilizer salts that change the way fuels burn. They are effective even after the water has evaporated. Large airtankers, SEATs, helicopter buckets, and ground engines may apply retardant. Some retardant products are approved for fixed-tank helicopters. See the QPL for specific uses for each product.
- Recommended coverage levels and guidelines for use can be found in the *IRPG*, under Principles for Airtanker and Water Scooper Use.
- Retardant mixing, blending, testing, and sampling requirements can be found at the Forest Service (FS) Wildland Fire Chemical Systems website, Lot Acceptance and Quality Assurance page: https://www.fs.fed.us/rm/fire/wfcs/laqa.htm.

- In general, one can expect chemicals to remain effective for the following amounts of time:
  - Long-Term Retardants – Days to weeks (or until removed by environmental elements such as rain or wind).
  - Foams – Minutes.
  - Water Enhancers/Gels – Minutes up to possibly an hour or more (direct sunlight breaks down gels faster). Time will vary according to weather conditions (heat, humidity, wind, etc.).

Note: "Refreshing" dried water enhancers with waterdrops do not provide any additional effectiveness than the water being dropped.

Approved Fire Chemicals

Many different retardants, foams, and water enhancers are approved for use. Prior to approval, these agents must meet rigid criteria to ensure that they are environmentally safe, effective as a retardant or suppressant, and that the chemicals do not harm aircraft surfaces. Chemical concentrates may be dry powder or liquid. All USDA/DOI bases must use chemicals that are either fully approved or "conditionally approved" during field evaluations for full approval.

Retardant Mixing Facilities

Retardant may be available from a variety of facilities including fire incident locations. Temporary mixing facilities may be ordered through the incident management system.

Airtanker Base Information

Information regarding the operation and management of airtanker bases can be found in the following documents:

NWCG Standards for Airtanker Base Operations, PMS 508: This guide defines and standardizes interagency operating procedures at all airtanker bases for contractor and government employees.

NWCG Airtanker Base Directory, PMS 507: The directory is intended to aid wildland fire managers, pilots, and contractors who operate at airtanker bases.

Wildland Fire Chemicals website: https://www.fs.fed.us/rm/fire/wfcs/index.htm.

Waterway and Avoidance Area Policy

This policy has been adapted from the 2016 *Implementation Guide for Aerial Application of Fire Retardant*. It has been expanded to include additional avoidance areas for aerial delivery of fire chemicals, as designated by individual agencies, and includes additional USFS reporting requirements.

Note: This policy does not require the helicopter or airtanker PIC to fly in such a way as to endanger their aircraft, other aircraft, or structures or compromise ground personnel safety.

Table 5. Aerial and Ground Delivery Policy

Aerial Delivery Policy	Ground Delivery Policy
• Avoid aerial application of all wildland fire chemicals within 300 feet (ft.) of waterways. • Additional mapped avoidance areas may be designated by the individual agency. • For USFS, whenever practical, as determined by the fire IC, use water or other less toxic wildland fire chemical suppressants for direct attack or less toxic approved fire retardants in areas occupied by threatened, endangered, proposed, candidate or sensitive species (TEPCS) or their designated critical habitats.	• Avoid application of all wildland fire chemicals into waterways or mapped avoidance areas.

Definition of Waterway

Any body of water (including lakes, rivers, streams, and ponds) whether or not it contains aquatic life.

Definition of Waterway Buffer

300 ft. distance on either side of a waterway.

Definition of Additional Mapped Avoidance Areas

Other areas requiring additional protection outside of the 300 ft. waterway buffer. For USFS, this may include certain dry intermittent or ephemeral streams for resource protection.

Guidance for Pilots

Pilots will avoid all waterways and additional mapped avoidance areas designated by individual agencies. To meet the 300 ft. waterway buffer zone or additional mapped avoidance areas guideline, implement the following:

- When approaching a waterway or riparian vegetation visible to the pilot (to assist in identification if waterways) or other avoidance areas, the pilot shall terminate application of wildland fire chemical approximately 300 ft. before reaching the area. When flying over a waterway, the pilot shall not begin application of wildland fire chemical until 300 ft. after crossing the far bank or shore. The pilot shall make adjustments for airspeed and ambient conditions such as wind to avoid the application of wildland fire chemicals within the 300 ft. buffer zone.
- Additional guidance to pilots for any aircraft supporting a fire on USFS lands:
    - USFS may have additional mapped avoidance areas for TEPCS species, waterway buffers exceeding 300 ft. or certain intermittent or ephemeral waterways identified as avoidance areas for resource protection. Any Aerial Supervision resource should inquire if these avoidance areas exist on any USFS fire they are providing support to.

- Prior to fire retardant application, aerial supervisors should be briefed by dispatch on the locations of all TEPCS or other avoidance areas in the vicinity.
- If operationally feasible, pilots should make a 'dry run' over the intended application area to identify avoidance areas and waterways in the vicinity of the wildland fire.

Exceptions for USDA Forest Service

Deviations from the policy are allowed only for the protection of life or safety (public and firefighter).

Exceptions for All Other Agencies

- When alternative line construction tactics are not available due to terrain constraints, congested area, life and property concerns or lack of ground personnel, it is acceptable to anchor the wildland fire chemical application to the waterway. When anchoring a wildland fire chemical line to a waterway, use the most accurate method of delivery to minimize placement of wildland fire chemicals in the waterway (e.g., a helicopter rather than a heavy airtanker).
- Deviations from the policy are acceptable when life or property is threatened and the use of wildland fire chemicals can be reasonably expected to alleviate the threat.
- When potential damage to natural resources outweighs possible loss of aquatic life, the unit administrator may approve a deviation from these guidelines.
- During training or briefings, inform field personnel of:
  - Environmental guidelines for fire chemical application requirements for avoiding contact with waterways;
  - Additional mapped avoidance areas as designated by individual agency; and
  - Their responsibility for upward reporting in the event of application, for whatever reason, into avoidance areas.

Reporting Requirements of Aerially Delivered Wildland Fire Chemicals into Waterways, Waterway Buffer Areas and Mapped Avoidance Areas

If application of wildland fire chemicals occurs or anyone believes it may have been introduced within a waterway, waterway buffered areas, or other mapped avoidance areas, the following is required as appropriate:

- Inform supervisor;
- The information will be forwarded to incident management and the Agency Administrator, usually through the Resource Advisor;
- The incident or host authorities must immediately contact specialists within the local jurisdiction; and
- Notifications and reporting will be completed as soon as possible.

Procedures have been implemented for the required reporting. All information, including reporting tools and instructions are posted on the USFS Wildland Fire Chemicals website at: https://www.fs.fed.us/rm/fire/wfcs/index.htm and Interagency Wildland Fire Chemicals Policy and Guidance website on fire retardant at: https://www.fs.fed.us/managing-land/fire.

The USFS has additional reporting requirements for threatened, endangered, proposed, candidate and USFS listed sensitive species for aerially delivered fire retardant only. This requirement resulted from the Forest Service's acceptance of Biological Opinions received from the National Marine Fisheries Service (NMFS) and the Fish and Wildlife Service (FWS) and the 2011 Record of Decision for Nationwide Aerial Application of Fire Retardant on National Forest System lands. The procedures, reporting tools and instructions can be found on the same website listed above.

Endangered Species Act (ESA) Emergency Consultation

The USFS has completed consultation with regulatory agencies (FWS and NOAA) for aerial delivery of fire retardant (only) on National Forest System lands; please refer to the USFS fire retardant site at https://www.fs.fed.us/managing-land/fire for additional information and re-initiation of consultation requirements.

The following provisions are guidance for complying with the emergency section 7 consultation procedures of the ESA for wildland fire chemicals. These provisions do not alter or diminish an action agency's responsibilities under the ESA.

Where Threatened and Endangered (T&E) species or their habitats are potentially affected by application of wildland fire chemicals, the following additional procedures apply and shall be documented in initial or subsequent fire reports.

As soon as practicable after application of wildland fire chemicals near waterways or other avoidance area as designated by agency, determine whether the application has caused any adverse effects to a T&E species or their habitat. This can be accomplished by the following:

- Ground application of wildland fire chemical outside a waterway is presumed to avoid adverse effects to aquatic species and no further consultation for aquatic species is necessary.
- Aerial application of wildland fire chemical outside 300 ft. of a waterway is presumed to avoid adverse effects to aquatic species and no further consultation for aquatic species is necessary.
- Aerial application of wildland fire chemical within 300 ft. of a waterway requires that the unit administrator determine whether there have been any adverse effects to T&E species within the waterway. If no adverse effects to aquatic T&E species or their habitats, no additional requirement to consult on aquatic species with FWS or NMFS is required.
- Application of wildland fire chemical within other avoidance areas as designated by agency requires the agency administrator to determine whether there have been any adverse effects to T&E species. If there are no adverse effects to species or their habitats there is no additional requirement to consult with FWS or NMFS.

If the action agency determines that there were adverse effects on T&E species or their habitats then the action agency must consult with FWS and NMFS, as required by 50 CFR 402.05 (Emergencies). Procedures for emergency consultation are described in the *Interagency Consultation Handbook*, Chapter 8 (March 1998). In the case of a long duration incident, emergency consultation should be initiated as soon as practical during the event. Otherwise, post-event consultation is appropriate. The initiation of the consultation is the responsibility of the unit administrator.

Chapter 6 – Aerial Supervision Mission Procedures

Aerial Supervision operations are conducted in demanding flight conditions in a high workload and multi-tasking environment. Because of this, standardization of procedures is important to enhance safety, effectiveness, efficiency, and professionalism. This chapter addresses common procedures to be observed by all aerial supervisors as well as specific guidance for LPIL ASM, ATGS, and HLCO personnel.

The actions listed below pertain to all positions of Aerial Supervision. Methods for performing these actions differ and are often refined as CRM is enhanced.

Pre-Mission Procedures

Pilot Qualification Card and Aircraft Data Card

Review these cards and verify the pilot and aircraft are authorized for air tactical missions.

Flight and Duty Limitations

Determine when a pilot's duty day began and if sufficient flight/duty time is remaining. Order a relief pilot as appropriate regarding, flight, or duty limitations.

Aircraft Maintenance

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

Aircraft Preparation

<u>Pilot Preflight Responsibilities</u>

Include but not limited to:

- Aircraft preflight inspection.
- Calculate weight and balance of passengers and equipment.
- Calculate aircraft performance specific to the aircraft configuration and field conditions.
- Fueling: Discuss fuel requirements and limitations for mission with ATGS. Ensure proper fueling.
- PPE per contract.
- File a flight plan as needed.
- Obtain an adequate weather briefing.
- Cover aircraft checklist expectations with aerial supervisor.

<u>ATGS/AITS Preflight Responsibilities</u>

- Inspect communications system. Install auxiliary radio if required.
- Program VHF-FM tactical frequencies in radio (coordinate with pilot).
- Perform a radio check with dispatch and airbase before flying.

- Load Aerial Supervision kit/gear into aircraft.
- Assist pilot as requested with duties.
- Communicate destination and other applicable intended route of flight with PIC.
- Understand aircraft performance (takeoff distance, landing distance, single-engine performance, max gross weight, fuel endurance) and document.

Procurement Agreements

The aerial supervisor should be familiar with the basic terms of the procurement agreement/contract.

Obtain a Mission Briefing

Whether the air tactical mission is IA or a project incident, all types of Aerial Supervision personnel must obtain pertinent incident information. Dispatch centers must provide an aircraft dispatch form.

IA Briefings

The following information is recorded on an aircraft dispatch form and is recommended before responding to an incident:

- Incident name or number.
- Agency responsible.
- Incident location – legal location, latitude/longitude and VOR.
- Frequencies and tones: Double check operating mode (N, W, D) and tones.
- Flight following.
- Air-to-Ground.
- Air-to-Air (FM and/or AM).
- Contacts: ground and air.
- Air resources assigned or to be assigned, Estimated Time En route (ETEs), type, and identifier.
- Other resources dispatched (as practical).
- Approximate incident size and fire behavior.
- Other available air resources.
- Aerial and ground hazards.
- Special information such as land status, watershed, wilderness, and urban interface.
- Airtanker reload base options and turnaround times.

Extended Attack Briefings

If possible, Aerial Supervision personnel should attend incident briefings. If this is not possible, critical information should be relayed by phone, radio, email, fax, or messenger. A copy of the Incident Action Plan (IAP) is preferred. Aerial supervision personnel may have to seek some of this information:

- Incident objectives by division (ICS 204).

- Organization Assignment List (ICS 203) or list of key operations people.
- Air Operations Summary (ICS 220) or list of assigned aircraft.
- List of all aircraft by make/model and identification.
- Incident Radio Communication Plan (ICS 205) or list of frequencies.
- Incident Map.
- Fire Behavior Report and local weather.
- Air resource availability/status.
- Incident Medevac Plan and Medevac helicopter assigned.

Mission Safety Briefing for Pilot

Prior to departure on an air tactical mission the aerial supervisor will brief the pilot on the following:

- General scope of the mission.
- Incident location: latitude-longitude and bearing-distance.
- Resources assigned.
- Radio frequencies.
- Special information including hazards and military operations.
- Expected duration of mission.
- Intended destination airport.

Pilot Pre-Takeoff Responsibilities

Complete the appropriate aircraft checklists.

Complete preflight including passenger safety briefing.

Initiate Mission Checklist with aerial supervisor.

Confirm fuel quantity.

Obtain route clearances through SUA as required.

Program GPS to incident location.

ATGS/AITS Responsibilities

Obtain, record, and set local altimeter setting (from pilot or airport advisory).

Program radios (AM/FM) – Check with pilot before programming the AM.

Confirm fuel quantity and estimated flight time available for mission.

Check with dispatch regarding status of military aviation operations (Restricted, MOAs, MTRs) and TFRs.

Assist with start, taxi, and pre-takeoff checklists as requested by the PIC.

En Route Procedures

After Take Off

- Record take off time (takeoff roll).
- Observe sterile cockpit protocol as previously agreed to with pilot.
- Establish flight following:
    - Call sign.
    - Departure location.
    - Number on board.
    - Fuel on board (hours).
    - ETE.
    - Destination.
    - Confirm AFF.
- Notify pilot of any information or situation affecting the flight.
- Assist pilot as requested. Be an active crew member.
- Complete Mission Checklist.

En route Communications

Maintain communications with dispatch and other aircraft concerning:

- Incident air resource updates.
- Status of SUA (TFR, MOA, etc.)
- 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.
- Monitor the fire frequencies to enhance situational awareness before arrival.

FTA Entry Procedures

12 NM from the center point of the incident, Aerial Supervision personnel must follow the FTA entry procedures listed below. There are three scenarios: 1) Aerial supervision is on scene; 2) Aerial Supervision is not on scene, but other aircraft are; or 3) there are no aircraft on scene.

Scenario 1: Aerial Supervision is On Scene

- Change to incident frequencies.
- Give 12-mile radio call to Aerial Supervision. Give your location and altitude.
- Obtain clearance:
    - Altimeter setting.
    - FTA clearance Altitude.
    - Altitude of Aerial Supervision.

- Altitudes of other aircraft.
- Hazards.

- Read back/enter the incident airspace, as briefed.
- Watch for on-scene aircraft and call out a distance and clock reference when in sight.
- Receive transition briefing and confirm positive handoff of Aerial Supervision responsibilities.
- Outgoing Aerial Supervision will notify dispatch and incoming Aerial Supervision will notify IC/ground personnel and confirm objectives and priorities.

Scenario 2: Aerial Supervision is not On Scene, but Other Aircraft are On Scene

- Change to incident frequencies.
- Give 12-mile call in the blind on assigned air-to-air frequency. Call receiving unit, give your call sign, location, altitude, intent, and frequency. An on-scene aircraft should respond on the assigned primary air-to-air frequency.
- Obtain clearance into FTA by getting:
  - Altimeter setting.
  - FTA clearance altitude.
  - Altitudes and locations of other aircraft on scene.
  - Hazards.
- Read back/enter the incident airspace, as briefed with on-scene aircraft.
- Watch for other aircraft and call out a distance and clock reference when in sight.
- Get status of all on-scene aircraft (location, mission type, etc.)
- Call IC and get objectives and priorities.
- Notify dispatch you are on scene and now the incident Aerial Supervision.

Scenario 3: There Are No Aircraft On Scene

- Give 12-mile and 7-mile calls in the blind on the primary and secondary assigned air-to-air frequencies.
- Call the IC/ground personnel on the assigned FM air-to-ground frequency and verify no other aircraft are on scene.
- Proceed to the incident. Maintain at least 2,500 feet AGL and watch for other aircraft.
- Obtain center point and record sizeup information.
- Call dispatch, notify you are the on-scene aerial supervision and provide sizeup.
- Call the IC/ground forces and establish objectives and priorities.

Entering Incident Airspace

ATGS fixed-wing enters the airspace in a right-hand orbit at 2,500 feet AGL unless the situation dictates a different altitude (smoke/terrain). LPILs/ASMs enter in a left orbit, or as directed by Aerial Supervision.

TFR Entry Procedures

All assigned/ordered aircraft must obtain clearance into the incident TFR by the on-scene aerial supervisor or the official in charge of the on-scene emergency response activities.

- A ROSS order or Aircraft Dispatch form is **not** a clearance into a TFR.
- The first responding aircraft, typically on extended attack incidents, must have reasonable assurance that there are no other aircraft in the TFR by making blind calls on the TFR frequency, other assigned air-to-air frequencies, and double-checking with ground personnel (IC, OPS, or Helibase).
- There may be multiple aircraft operations areas within a TFR.
- Remember – Non-Incident aircraft may enter the TFR under the following conditions:
  - The aircraft is carrying a law enforcement official.
  - The aircraft is on a flight plan and carrying properly accredited news representatives.
  - The aircraft is operating under the ATC approved IFR flight plan.

The operation is conducted directly to or from an airport within the area, or is necessitated by the impracticability of VFR flight above or around the area due to weather, or terrain; notification is given to the Flight Service Station (FSS) or ATC facility specified in the Notice to Airmen (NOTAM) to receive advisories concerning disaster relief aircraft operations; and the operation does not hamper or endanger relief activities and is not conducted for observing the disaster.

Aerial Supervisor On-Scene Responsibilities

The Aerial Supervisor Must:

- Watch for aircraft and make visual/radio contact with each one.
- Determine ground elevation and/or mission flight altitudes to establish FTA altitudes for incoming aircraft including helicopters, airtankers, LPIL/ASM, smokejumpers, relief Aerial Supervision, and media if not previously determined.
- Determine flight hazards – Power lines, antennas, snags, terrain, thunderstorm activity, excessive wind, poor visibility, airspace conflicts, etc.
- Confirm incident objectives and priorities with the IC/ground personnel.

Standard Briefings

All aircraft will receive briefings:

Initial Briefing

<u>Clearance to Enter</u>

- Altimeter setting.
- Clearance altitude.
- ATGS altitude.
- Other aircraft altitudes.
- Hazards.

Example: “Tanker one-four, Altimeter two nine-nine two, cleared in three thousand five hundred, air attack is four thousand five hundred, one helicopter at or below two thousand five hundred, caution power lines.”

Tactical Briefing

Orientation

Specific Hazards

Objectives

Direct, indirect, parallel, pretreating, point protection, or applicable terminology to explain what is to be accomplished and why.

Target Description

- Concise communication using standard terminology expedites the task and increases safety.
- A standard target description includes the following:
    - Target location
    - Coverage level/Portion of load
    - Drop objectives/Type of drop
    - Hazards

Methods to Describe Work Location

Long Range (Greater Than 12 Miles)

- GPS reference points – in limited visibility (inversions), latitude and longitude references can significantly increase safety while reducing radio traffic.

Note: Be aware that the standard datum and coordinate format aviation GPS equipment is World Geodetic System (WGS) 84 and decimal minutes whereas many GPS units used by ground personnel default to a North American Datum (NAD) 27 datum and are in degrees, minutes, and seconds format. The use of different datum and formats may result in misinterpreting the location of a specific target. Ensure that the target location is confirmed with ground personnel.

Medium Range (1 to 12 Miles)

- Fire anatomy: Left and right flank, head, heel (tail in AK), etc.
- Elevation: Specify above sea level (MSL) or AGL.

Short Range (Less than 1 Mile)

Geographic features: Ridges, saddles, spur ridges, lakes, streams, etc.

- Specific activity: Dozer working, firing operation, parked vehicles, previous drop, etc.
- Incident features: Helibase, helispots, fireline, and division breaks, etc.
- Use standard terminology: See the *NWCG Glossary of Wildland Fire*, PMS 205, https://www.nwcg.gov/glossary/a-z.

Guiding Aircraft to Targets

- Clock directions, left or right, etc.
- Signal mirrors, ground panels, lights, etc.
- Have an on-scene aircraft lead new aircraft to the target area.
- Discuss target locations when the other aircraft is in position to observe.

Example:

ATGS: “Tanker one-four do you have the existing retardant line?”

Airtanker: “Tanker one-four, Affirmative”

ATGS: “Objective is direct line, tag and extend, coverage level eight, full load, exit straight out, caution power lines along the road”

Airtanker: “Tanker one-four has the target”

Table 6. Clearance to Maneuver Script

ATGS Script	Airtanker Script
“Clear to Maneuver”	
Observe: Acknowledge when able	***Call** “Downwind”
Observe: Acknowledge when able	***Call** “Base”
Observe: Acknowledgment required	**Call** “Final”
“I have your final.” “Clear to drop”	

* When approved for non-standard right-hand patterns the airtanker will preface each flight leg call with “Right.”

Note: The ATGS is required to clear airtankers to “maneuver” and airtankers to “drop.” ATGS are not required to acknowledge downwind and base legs. Every attempt should be made for the ATGS to visually observe and acknowledge airtankers flight patterns once an airtanker is cleared to maneuver until drop sequence is complete.

Definition

<u>Clear to Maneuver</u>

The pilot is cleared to leave the orbit altitude and maneuver the aircraft as needed for the drop.

<u>Clear to Drop</u>

On line for target, line is clear, and clear to drop.

Go Around

At any time, a “go around” may be communicated by anyone (aerial supervisor, ground personnel, airtanker, helicopter, etc.) for the safety and/or efficiency of the operation. During a “go around” the airtanker should:

- Re-establish downwind, or
- If load was released, exit the FTA following the exit brief.

Note: If the aerial supervisor does not affirm the final; or call clear to drop; a “go around” should be done. At any time the airtanker may need to release the load for safety-of-flight.

Example:

ATGS: “Tanker one-four, you are cleared to maneuver.” or “Tanker one-four, you are cleared right-hand-maneuver.”

Airtanker: “Tanker one-four is downwind.” or “Tanker one-four is on a right-downwind.”

Airtanker: “Tanker one-four is base.” or “Tanker one-four is on a right-base.”

Airtanker: “Tanker one-four is on final.”

ATGS: “Tanker one-four, I have your final; clear to drop.”

Right-Hand Drop Pattern

Right-hand patterns will never be executed at the airtanker entry/orbit altitude. When in right-hand drop patterns, airtankers will call “right-downwind,” “right-base.”

Departure Briefing

Drop Evaluation:

- Start.
- Line.
- End.

Instructions:

- Load and return/hold/release.
- Location.
- Special instructions.

Example: “Tanker one-four, half load late, off one wingspan right, load and return.”

Emergency Brief

- Consider load.
- Acknowledge/maintain visual.
- Communicate.

Example: “Tanker one-four, consider load, I have you in sight, helicopter five oh two hold position, tanker traffic; I’ll notify dispatch.”

Aircraft Separation

Terrain, visibility, number, and type of aircraft, TFR dimensions, and other factors influence requirements for maintaining safe separation.

Common Principles of Aircraft Separation

- Use standard aviation ‘see and avoid’ VFR.
- Utilize the appropriate air-to-air frequency for position reporting.
- Adhere to FTA procedures.

Aerial Supervisors Ensure Aircraft Separation By:

- Structuring the incident airspace and briefing pilots.
- Monitor radio communications for:
  - Pilot-to-pilot position reports.
  - Blind call position reports.
  - Tracking aircraft.
  - Giving specific directions to pilots as needed.
  - Advising pilots on the location and heading of other aircraft.

Note: The coordinates of the incident or IP must be verified, updated, 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.

Vertical Separation

500 feet is the minimum vertical separation for missions in the same airspace. 1,000 feet is preferred and should be used whenever possible.

- Assign helicopters a hard ceiling (i.e., at or below 4,500 feet). Do not assign them 500 feet AGL or “low-level.”
- Vertical stacking of airtankers is discouraged. Utilize an orbit altitude racetrack pattern.
- It is common practice to put media helicopters above the ATGS to keep them away from firefighting aircraft.
- Standard operational altitudes and patterns are:

Table 7. Standard Operational Altitudes and Patterns

Mission	Standard AGL (feet)	Standard Pattern
Media	3,500	Right or left
ATGS – Fixed-Wing	2,500	Right
ATGS – Helicopter	500 to 2,500	Left
HLCO – Helicopter	500 to 1,000	Right or Left
Airtanker Orbit	1,500	Left
Airtanker Maneuvering	150* to 1,000	Left
LPIL	150 to 1,000	Left
Helicopters	0 to 500 (hard ceiling)	Left or right
Smokejumper Ram-Air Chute	3,000	Left
Smokejumper Round Chute	1,500	Left
Paracargo	150 to 1,500	Left
Streamers	1,500	Left

Horizontal Separation

- Aerial supervision must ensure there is adequate visibility to conduct operations safely regardless of the airspace classification.
- Flight patterns must be adequate.
    - Consult pilots before finalizing patterns and routes.
    - Advise pilots on location of other aircraft if visual contact has not been reported.
    - Air-to-air frequency must be clear for pilots to give position reports.
    - Geographic references, such as a ridge or a river, can be used as a virtual fence to separate aircraft provided aircraft maintain assigned flight patterns.
    - No-fly zones must be established to ensure safe separation when simultaneous missions at the same elevation are within close proximity.
    - 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.
    - Near geographic dividing lines (virtual fence): If simultaneous operations near the dividing line conflict, a horizontal “no-fly zone” must be established or missions must be sequenced to ensure adequate separation.

Virtual Fences

Effective for managing airspace with minimal radio traffic on the air-to-air frequency.

Pilots may be required to report arrival at a virtual fence and wait for clearance from ATGS before proceeding. Geographic locations that make effective checkpoints and virtual fences include:

- Roads.

- Power lines.
- Ridges.
- Lakes.

Helicopter Routes

Established point-to-point flightpaths for repetitive missions from helibase to helispots or sling sites, from dipsites 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:

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.

Helicopter Routing Clearances

- "Cleared to target."
  - Denotes a helicopter is cleared to a target/drop area.
- "Cleared to transition."
  - Denotes a helicopter is cleared through the area (on way to helispot/slingspot, back to helibase, on a recon, etc.).
- "Cleared unrestricted."
  - Denotes to a helicopter that the active sequencing has stopped and no longer a need to call for clearances at the designated checkpoint.

Note: By using this specific language the situational awareness for all aircraft in the FTA will be improved. The sequencing clearances should not be confused with "cleared in" which denotes the clearance for an aircraft to enter into the FTA/TFR.

Helicopter Daisy Chains

Two or more helicopters can be assigned to the same targets and dipsites for repeated waterdrops. The ATGS, in consultation with helicopter pilots, will establish a "daisy-chain" flight route for these operations ensuring helicopters maintain the same orbit direction and separation.

Helicopter Recon Flights

These flights can be difficult to monitor. Consider the following procedures to maintain safe separation of aircraft:

- Schedule recon flights during slow periods.
- Assign a specific route for the recon (clockwise, maintain assigned altitude).
- Establish Check Points and clearance protocol with recon aircraft.

Incident Entry and Exit Corridors

Aerial supervision 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.

IPs, Checkpoints, and Holding Areas

The aerial supervisor assigns incoming aircraft to non-conflicting airspaces, or holding areas, as needed. Coordinates or a geographic reference work best.

IP

A fixed-wing reporting location clearly identified by the aerial supervisor. It may be a latitude/longitude or geographic point (landmark). IPs are used to route incoming aircraft to a known location before engaging in tactics.

- Aircraft entering IPs will announce their direction of approach and intended destination via call in the blind script on the assigned primary air-to-air frequency.

Checkpoint

A helicopter reporting location clearly identified by the aerial supervisor. It may be a latitude/longitude or geographical point (landmark). Check points are used to route helicopter to and from assignments.

- Helicopters using check points while transitioning an established route will announce their direction and intended destination via call in the blind script on the assigned air-to-air frequency. When sequencing aircraft helicopter check point should be set up close to the target area that is not in the fixed-wing final/departure flight path. Helicopters should call off each dip, drop.

Holding Areas

Any known location can be used by aerial supervisors to hold aircraft. There can be multiple areas on an incident being used at the same time for multiple aircraft at different locations.

- Pilots must be aware of other aircraft in their assigned holding area.
- Pilots must be able to communicate position reports to each other.
- Holding area must be clearly defined – by a geographic reference point or distance and direction relative to the incident aircraft will normally establish a "race track" pattern where they are flying at the same altitude and providing their own visual separation.
- Aircraft must receive clearance to depart the holding area once assigned.
- Helicopters can be held on the ground or in the air as needed to maintain adequate separation. Considerations include:
    - Pilots should be able to maintain forward flight rather than constant hover.
    - Long periods of holding helicopters should be done on the ground.

Sequencing

Sequencing is a technique used to deliver multiple aircraft to a shared target area. Sequencing can be done between fixed and helicopter aircrafts to the same target area but should be actively managed by an aerial supervisor. Aerial supervisors should establish an order and provide clearance for each aircraft to the target/drop area.

Caution:

Consider wake turbulence when sequencing any type of aircraft. VLATs require a minimum 3 minute delay for wake turbulence.

Example:

Beaver Air Attack: "Helicopter five two five call your dips, drops, and call at Rock Check."

Helicopter 525: "Helicopter five two five is off the dip"

Helicopter 525: "Helicopter five two five is at Rock Check"

Beaver Air Attack: "Helicopter five two five clear to target, number 2 behind tanker one zero one on left base, caution wake turbulence."

Helicopter 525: "Helicopter five two five has visual on tanker one zero one, clear to target number 2"

Airtanker 101; "Tanker one zero one is turning final"

Beaver Air Attack: "Tanker one zero one, I have your final, clear to drop. You'll have a helicopter off to your left with reported visual on you"

Airtanker 101: "Copy clear to drop, I have the helicopter on my left."

<u>Air-to-Air Communications</u>

Pilots must monitor the assigned air-to-air frequency to receive direction and maintain aircraft separation. If needed, separate air-to-air frequencies for helicopters and airtankers. The primary air-to-air frequency should be retained for fixed-wing operations.

Intersecting Routes

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

Non-Standard Patterns

Occasionally terrain, visibility, wind direction or other factors require patterns that are modified or reversed.

The mission pilot, airtanker, LPIL, or HLCO shall advise ATGS of situation and request a deviation from standard procedures. The ATGS will advise other aircraft before granting the request and notify appropriate incident aircraft of the deviation and when the non-standard maneuvers are complete.

Coordination between Aerial Supervisors

Each incident is unique and circumstances dictate that workload shifts between LPIL, ATGS, HLCO, and ASM as their responsibilities overlap in several areas. Operational continuity is achieved by briefing and positive hand off.

It is important that ATGS, ASM/LPIL, and HLCO work as a team and share workload commensurate with fire complexity, training, and position authority.

Positive Hand Off of Aircraft

Anytime aircraft is handed off (whether requested or offered) to another aerial supervisor, both aerial supervisors first must agree to that handoff, and a positive hand off will occur. A positive three step process using call sign of those aircraft being handed off will be used.

Example:

(AA) "Bravo-four, I'd like to hand off helicopter one echo echo and helicopter five three one for you to coordinate and sequence between airtankers."

(B-4) "Roger. Bravo-four has control of helicopter one echo echo and helicopter five three one."

(AA) "Affirmative."

Airtanker Mission Sequence between ATGS and LPIL/ASM

- ATGS and ground operations jointly determine tactical objectives.
- ATGS briefs LPIL/ASM on next target, coverage level, etc.
- Airtanker makes 12-mile check-in with ATGS or LPIL as agreed upon by the aerial supervisors.
- LPIL/ASM briefs airtanker on target, coverage level, etc.
- ATGS/ASM/LPIL clears conflicting air resources from the airspace and gives verbal clearance to LPIL/ASM for low-level operations. The ATGS may also elect to hand off conflicting air resources to LPIL/ASM to reduce radio traffic.
- ATGS/ASM/LPIL clears ground personnel from target area.
- ATGS will maintain radio silence on the primary air-to-air while LPIL/ASM and airtanker are working, particularly when on final approach or exiting the drop area, unless the drop needs to be called off.
- LPIL/ASM will do low-level recon to determine hazards, targets, elevations, location of people, equipment, facilities, safe patterns, exit routes, etc.
- LPIL/ASM briefs airtanker on objectives, flight route, coverage level, drift potential, and hazards.
- LPIL/ASM may make a "show-me" run with airtanker in tow on the intended target.
- ATGS/ASM/LPIL confirms ground personnel are clear of target area.
- Airtanker makes drop(s). Airtanker may or may not require a lead.
- ATGS pilot positions aircraft to monitor and evaluate drop.
- ATGS evaluates drop and gets ground feedback. LPIL/ASM 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, begin earlier or later. These adjustments are expressed in wing-spans or rotor-spans, not feet or yards.

- ATGS/ASM/LPIL gives feedback to the airtanker after clear of drop area (LPIL/ASM and airtanker may have already heard the same feedback from ground if they are monitoring assigned air-to-ground frequencies).
- LPIL/ASM and airtanker make adjustments as needed on subsequent drops.
- LPIL/ASM gives airtanker reload instructions based on instruction from ATGS.
- ATGS/ASM/LPIL informs ground when clear to return to work area.
- Airtanker informs dispatch on status – load and return or hold.

Maintaining Air Tactics Continuity

Complex air operations or air operations involving a mix of air resources requires continuous supervision by an ATGS, ASM, LPIL, or HLCO. To maintain continuous supervision, the following procedures should be followed. Good planning will ensure continuity:

- Use ASM to fill gaps in ATGS coverage and manage air/ground operations in designated areas on complex incidents.
- Stagger aircraft refueling so all aircraft are not down simultaneously.
- Monitor flight times. Anticipate the need for a relief pilot, LPIL or other air resources. Notify dispatcher or AOBD in a timely manner.
- Anticipate fuel needs.
- Recommend activation of portable reload bases to reduce turnaround time.
- Coordinate refuel and relief needs between aerial supervisors to ensure continuity of airspace management/supervision.

Relief Guidelines

Aerial supervision is mentally demanding. Long flight hours result in mental fatigue and reduced effectiveness. Consider the following staffing guidelines:

- If the aerial supervisor will fly more than 4 hours on any one flight, order a relief.
- On multi-day incidents, assign a second aerial supervisor and rotate.

Diversion of Aerial Resources

Higher priority incidents may require diversion of aircraft. A reassignment may be given through dispatch or through IC/Operations. Incident tactics may have to be modified. Aerial supervision may also be diverted to manage the new incident. Upon receiving a divert notice, the aerial supervisor must release and brief the requested resources using the standard dispatch form information:

- Incident location.
- Air and ground contacts.
- Radio frequencies.

No Divert Request

The IC can request through dispatch a “no divert” for airtankers when an imminent threat to life exists. This requires 30-minute re-evaluation with IC and dispatch. A no divert status shall be released as soon as the threat is mitigated.

Note: Check with Geographic Area Mobilization Guide for specific guidance on “no divert” procedures.

Coordination with Ground Personnel

Primary Contacts

- On Type 1 and 2 incidents, aerial supervisors work with Air Operations, Operations, Division Supervisors, and other line personnel.
- On Type 3 and 4 incidents, aerial supervisors work primarily with the IC, operations, ground crews, or dispatch.
- Aerial supervisors provide intelligence to tactical personnel and dispatchers in order to facilitate the briefing process.

Sizeup the Fire and Get Oriented

- Sizeup the Fire – Make initial assessment and communicate critical safety, strategy, and tactics inputs to ground contact and/or dispatch.
- Get oriented – Develop a mental or sketched map of the incident that includes:
  - Cardinal directions.
  - Landmarks: Roads, streams, lakes, mountains, improvements, etc.
  - Fire flanks, head, etc.
  - Visible work accomplished: Dozer lines, handline, retardant line, etc.
  - Record GPS coordinates to identify reference points.
  - Review IAP map; note frequencies, aircraft assignments/availability, division breaks, helispots, etc. Assign Air Resources.
- Make assignments based on Operations/ICs strategy, tactics, & mission priorities.

Determine TFR Requirements

- Vertical and horizontal dimensions.
- If needed, order through dispatcher or AOBD.

Check for Airspace Conflicts

- Identify MOAs, MTRs, airports, etc.
- Values at risk: Life, property/structures, resources.
- Current fire size and potential size estimate.
- Fuel models and rates of spread.
- Fire behavior elements (wind, terrain, aspect, etc.).

Recommend Strategies, Tactics, and Resources

- Direct, indirect, or parallel strategies.
- Target locations and priorities.
- Access.
- Anchor points.
- Water sources.
- Potential helispots.
- Location of spot fires.
- Number and types of aircraft required.
- Use of specialized resources (helitack, rappellers, smokejumpers, and paracargo).

Provide Airdrop Information to Ground Crews

- Advise personnel airtanker, bucket, or paracargo drops in their work area and the need to clear the area.
- If drops are near power lines, determine status of lines (live or de-energized?); Advise ground personnel of danger of being near power lines during drops.
- Confirm with ground if run is to be dry or live.
- Notify ground when drop is complete and personnel can return to work area.
- Solicit feedback from ground crews relating to drop effectiveness.
- Provide safety oversight to ground crews.
- Monitor personnel locations relative to fire perimeter, blowup areas, etc.
- Assist with locating safety zones and escape routes. Final determination must be made from ground.
- Monitor weather – advises personnel of approaching fronts or thunderstorms.
- Advise personnel on adverse changes in fire behavior.
- Direct air resources, as top priority, to protect and aid in evacuation of endangered personnel.
- Personnel and equipment in the flight path of intended aerial drops should move to a location that will decrease the possibility of being hit with a drop.
- Personnel near aerial drops should be alert for objects (tree limbs, rocks, etc.) that the drop could dislodge. The IRPG provides additional safety information for personnel in drop areas.

Determine the Procedures for Ordering Tactical Aerial Resources

- The authority to order retardant and helicopter support varies between dispatch centers, ownership, and incident complexity. Determine the procedure before the mission begins and confirm with the IC.
- On extended attack incidents, Division Supervisors are typically delegated the authority.

However, consult with AOBD/OSC.

- On IA incidents, the IC makes aircraft orders. The IC may choose to delegate this to the aerial supervisor. Confirm it before ordering.

Coordination with Dispatch

Provide dispatch the following information in a timely manner:

- A fire sizeup including a center point and resource needs.
- Horizontal and vertical dimensions of a TFR if needed. Remember that TFRs are based on degrees, minutes, and seconds. Dispatch centers may assist with conversion of latitude/longitude.
- Airspace conflicts with civilian or military aircraft.
- The need for airtankers to load and return or hold.
- Aircraft incidents/accidents.
- Projected needs for next shift – number of aircraft by type, time requested, frequencies, TFRs, etc.
- Aerial supervision flight/duty hours used and projected needs to complete the mission.
- Advise on need for aircraft maintenance and projected availability for next day.
- Advise if airtanker has in-flight difficulty, must abort load, and return to base.
- Request Aerial Supervision relief two or more hours before you need it.

Transition Briefings

The responsibility is on the current aerial supervisor to provide a quality transition briefing to the incoming aerial supervisor. Incoming Aerial Supervision should listen to assigned frequencies in route to gather situational awareness. During transition briefing, each pause should be acknowledged back with affirmation that the message is received.

Elements of a Transition Brief

- Frequencies – Confirm all assigned frequencies.
- Operational Objectives – Priorities (first, second, third…), chain of command.
- Fire Anatomy – Hazards, DIVS/Branch, dip site/MRB, IP, checkpoints, routes, roads, helispots, retardant avoidance, etc.
- Resource – Aircraft, engines, crews, airtanker bases, ground contacts, UAS, helibase, etc.
- Tasks – Point protection, aerial ignition, firing, direct/indirect, recons, repeater mission, etc.
- Questions – Open up for incoming ATGS to ask questions.
- Aerial supervision relief times – Local time will be used and time is estimated time of arrival (ETA) over the fire.
- Positive handoff – Incoming ATGS assumes fire name air attack and takes all fire frequencies; outbound ATGS goes back to tail number air attack and communicates transition complete and relief order to dispatch.

Note: Plan and order what is needed for briefing frequencies, tactical frequencies, etc. and include in transition. Keep frequency open to Leads/ ASMs for Airtanker operations. Example:

Incident ATGS: “Air Attack one sierra alpha, Rock Air Attack on 122.925. Do you have the assigned frequencies?”

Incoming ATGS: “Yes.”

Incident ATGS: “On scene is tanker one zero three and helicopter five four echo. One additional tanker and helicopter on order no fill information. No observed hazards.”

Incoming ATGS: “Copy.”

Incident ATGS: “We have two divisions, Alpha and Zulu. Priority is retardant and buckets in Division Zulu working with Engine four-twenty-two.”

Incoming ATGS: “Copy.”

Incident ATGS: “Priority two is a sling load in Division Alpha to Crew three. They have not determined a sling site yet.”

Incoming ATGS: “Copy.”

Incident ATGS: “Questions?”

Incoming ATGS: “No.”

Incident ATGS: “What time do you anticipate needing relief?”

Incoming ATGS: “If we need relief, plan on 1500, but we will confirm through dispatch.”

Incident ATGS: “Air Attack one sierra alpha if you have the fire I will notify dispatch.”

Incoming ATGS: “Air Attack one sierra alpha is now Rock Air Attack.”

Before Leaving the Incident

- Coordinate with remaining LPIL, ASM, ATGS or HLCO to ensure continuity of Aerial Supervision and provide briefing.
- Notify Operations of Estimated Time of Departure (ETD), and who will supervise air operations if not a relief ATGS.
- Notify air resources of ETD and whom they will report to if not a relief ATGS.
- Notify the IC, Operations/Air Operations, DIVS, helibase, LPIL, ASM, and HLCO when departing.
- Notify dispatch of ETE to base.
- If you are on the last shift of the day:
    - Plan your release to allow for return within daylight hours (not necessary for twin-engine aircraft).
    - Update Operations personnel on fire status.
    - Remind remaining aviation resources of daylight restrictions, if applicable.
    - Coordinate with dispatch the status of air resources – rest overnight (RON) or return to home base. Inform air resources of RON locations.

Emergency Procedures

Flight Emergencies for On-Scene Aircraft

When a flight emergency is declared, possibly as "Mayday, Mayday, Mayday" the aerial supervisor manages the emergency using appropriate procedures from the list below:

- Emergency is highest priority until aircraft lands safely.
- Determine pilot's intentions for managing situation.
- Clear the airspace for the pilot as needed.
- Dedicate and clear a frequency for the emergency.
- Jettison load if feasible.
- If problem persists, assist aircraft to return to base or alternate landing site.
- Alert incident medevac units.
- Prepare for suppression of a fire associated with an aircraft crash.
- Notify dispatch or airport tower for necessary crash/rescue protocol.

Incident Aircraft Mishap Considerations

When a mishap has occurred or an aircraft is missing, on-scene aerial supervision manages situation using appropriate procedures below:

- Consider ordering additional Aerial Supervision.
- Assign aircraft as needed to conduct search.
- Determine location. Check with dispatch for AFF last known coordinates and direction of flight.
- Monitor emergency frequency (121.5) if crash site is not known or if the aircraft is missing and its status is unknown.
- Assign remaining aircraft to holding areas or return to base.
- Activate incident medevac plan through medical unit.
- Assign on-site aircraft and personnel to control aircraft fire and initiate life-saving measures if they can do so without jeopardizing their safety.
- Advise IC/Operations.
- Consider suspending non-essential aircraft operations.
- Direct ground resources to crash site.
- Direct air support operations.

Medevac of Incident Personnel

Consider the following as appropriate:

- Serve as a relay between accident site, helibase, and medical personnel.
- Determine accident site location – latitude and longitude.

- Obtain Medevac helicopter frequency – may be listed in Medevac Plan.
- Assist rescue personnel with helispot location, etc.
- Provide helispot dust abatement with helicopter buckets as needed.
- Guide Medevac helicopter to accident site.

Note: IMTs and local dispatch centers typically have established procedures for incidents within the incident.

Post Mission Procedures

- Confirm need for Aerial Supervision aircraft for next day and notify pilot of start of duty time, etc.
- Debrief with available flight crews (ATGS pilot, airtanker pilots, HLCO, LPIL, ASM, and helicopter pilots).
- Debrief with AOBD and dispatch.
- Attend or provide input to incident planning meeting for next day's operations.
- Request and review IAP and map for next day's operation.
- Complete payment documents.
- Submit SAFECOMs as required.
- Update ATGS logbook.
- Update contract daily diary.

Chapter 7 – Aerial Fire Suppression Strategies

Principles that apply to ground operations also apply to air operations (anchor, flank, and pinch, etc.). Strategies are based on values at risk and resource management objectives, while tactics are based on fuel type, fire intensity, rate of spread, resource availability, and estimated line production rate.

As an aerial supervisor, you will be making tactical decisions based on objectives developed by incident command personnel. Aerial supervisors are obligated to assist the IC and Operations personnel with strategic advice during multiple ignition events and extended attack incidents relating to aviation resource capabilities and needs.

Note: Aerial application of suppressants and retardants should be used in support of ground resources support and be anchored.

Aerial Fire Suppression Strategies

There are three general suppression strategies:

Direct Attack

Drops directly adjacent to fire edge for retardant and directly on the fire edge for retardant, water, and suppressants; in support of ground forces. If you want retardant to land in or partially on the fire edge, it needs to be specified (half in/half out, etc); conversely if you want water/suppressants to land directly adjacent to the fire edge, it needs to be specified (pretreat the green).

Parallel Attack

Parallel to and within a hundred feet of perimeter. Anticipate lateral fire spread, safety, and line construction rates of resources assigned. This is a common practice for retardant use when ground fuels are carrying the fire as it allows time to tag on and extend prior to individual drops being hooked around by the fire.

Indirect Attack

Used to enhance control lines established by ground forces in advance of the fire. Also used for structure defense and safety zones.

Aerial Fire Suppression Tactics

A single airtanker often can make multiple drops forming a retardant line around a small fire or “V” off the head or heel.

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.

Full Coverage Drop (Delayed Attack Fires and Spot Fires)

To control fire intensity and spread, drops should blanket over 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. IA and Multiple Fire Operations

IA Mission Priorities

During IA, aviation resources must comply with FTA protocol. Aerial supervisors should consider the following:

IA Responsibilities with no IC

The ATGS, in consultation with dispatch, has the following responsibilities on IA incidents with no IC:

- Make initial fire sizeup.
- Recommend specific resources based on fire behavior, access, response time, resource availability and capability.
- Develop tactical plan.
- Give periodic status reports to dispatch or responding resources.
- Assist responding resources with locating the incident.
- Brief ground resources on potential safety concerns and fire behavior.
- Assign arriving resources based on tactical plan until a qualified IC arrives.

Multiple Fire Situations

An ATGS may be activated during multiple fire starts and are likely to assist with:

Fire Detection

Latitude/longitude coordinates, legal descriptions, etc.

Incident Priorities Are Based on the Following:

- Threat to life and property
- Ownership
- Fire behavior – current and expected spread
- Environmental sensitivity
- Political considerations
- Potential resource loss

Determine Access

Aerial delivery of firefighters, roads, trails, distance, and time requirements.

Recommend IA Resources

Based on resource capability, mode of access, probable availability and response time.

Develop IA Strategy and Tactics

- Based on resource objectives, fire behavior, type and numbers of air and ground resources responding within specific time frames.
- Direct Resources per strategic and tactical plans until a qualified IC arrives.

- Report Intelligence to dispatch and IC.
- Reassign Resources – to higher priority incidents if they develop.

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.

During these situations the ATGS will:

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

Wildland Urban Interface

During operations within the wildland urban interface consider the following:

Policy and Regulations

Fires in the urban interface are considered to be in “congested areas.” Refer to Chapter 3 for more detail.

- Order a LPIL/ASM – As required under FAR 91.119 – USDA Grant of Exemption 392. Refer to Chapter 3 for specific requirements.
- Implement a TFR – Under 14 CFR 91.137 if the incident meets the criteria for implementation. Refer to the Interagency Airspace Coordination Guide.
- Assign an aerial supervisor.

Urban Interface Hazards

The following hazards to aircraft are often associated with urban interface incidents:

- Dense smoke and poor visibility.
- Power lines (may have to be de-energized).
- Antennas.
- Tall buildings.
- Media aircraft.
- Propane tanks.

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 additional risk.

Effectiveness of Resources

It is critical that airtanker and helicopter drops must be closely supervised to prevent inadvertent drops on non-incident persons and unnecessary damage to improvements. The aerial supervisor is responsible for providing the best available resources that can:

- Minimize risk to people and improvements.
- Provide assignments to aircraft which have increased maneuverability, drop accuracy, and quick turnaround times to targets.
- Drops are generally not effective on structures that are burning beyond the initial start phase.

Urban Interface Tactical Planning Principles

Apply the following principles in developing the tactical plan for air resources:

- Assess the situation and identify the following:
    - Identify air operational hazards.
    - Locate non-incident people in operations area.
    - Protection of evacuation routes.
    - Triage structures.
    - Identify possible dipsites and portable retardant plant sites.
    - Determine how air resources can best support suppression objectives.
- 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.
- Determine where airtankers or helicopters can be most effective.
- Use airtankers in areas where visibility, hazards, flight routes, and target selection ensure reasonable effectiveness and acceptable risk.
- Use helicopters on targets requiring more maneuverability and accuracy.
- When possible, avoid holding patterns with airtankers over populated areas.

Chapter 8 – Tactical Aircraft Operations

Coordination and Control

Aerial firefighting occurs in a very dynamic environment. Firefighting aircraft often work in close proximity to each other, ground personnel, and surrounding terrain. This is routinely accomplished under conditions that are less than ideal as aircrews contend with high temperatures, wind, turbulence, and visibility restrictions caused by smoke and terrain. Furthermore, firefighting aircraft, in contrast to most commercial aviation, must provide their safe separation. It is for these reasons that airspace coordination is of the utmost importance to safety. Though the aerial supervisor is responsible for overall control of aircraft on an incident, it is incumbent upon all aircrew personnel to participate in this endeavor by adhering to the rules set by policy and the instructions given by the aerial supervisor.

Operational Coordination and Control

The aerial supervisor is responsible for providing ATC and coordination at an incident.

The aerial supervisor will:

- Discontinue flight operation anytime conditions appear unsafe.
- Advise inbound aircraft of known hazards such as obstacles, power lines, turbulence, visibility restrictions, and other air traffic on the incident, etc.
- Issue a clearance to each inbound aircraft prior to their arrival utilizing the standard Clearance to Enter script. Include specific routing when applicable.
- Establish Traffic Patterns and control procedures.
- Ensure that during airtanker drop runs, the frequency used to direct the drops remains clear throughout the base, final and release; communications during airtanker drops will be limited to transmissions between the dropping airtanker and the controlling aerial supervisor.
- Deconflict and approve all non-standard maneuvers as deemed necessary and as briefed to all other affected aircraft.

Pilots will advise the aerial supervisor:

- 12nm from an incident – stating their distance, direction, and altitude.

  Note: Aircraft inbound to an incident will not proceed closer than 7 nm until Clearance to Enter is received from controlling aerial supervisor.
- Arrival on scene.

  Note: Depending on fire size and complexity, “on scene” may include areas as far as 5 nm from incident center coordinates.
- When lifting off for helicopter missions.
- When moving between operating/target areas.
- When departing or re-entering an incident area.
- When changing radio frequencies.
- When encountering any unusual or unsafe situations.

- Before performing a non-standard maneuver.

Pilots are responsible for maintaining aircraft separation, radio contact, and adherence to correct flight patterns and altitudes.

Helicopter operations will be cleared and coordinated through the aerial supervisor. In absence of an aerial supervisor, helicopters will establish communications and a control procedure with airtankers to avoid possible conflicting flight paths.

Non-Standard Maneuver

A non-standard maneuver is an action by a pilot (and aircraft) performed in a way other than the standard method. Non-standard maneuvers are necessary at times when the standard method would be either unsafe or ineffective. It must be understood, however, that a non-standard maneuver may require the suspension of other ongoing operations. Some examples of non-standard maneuvers are:

- A target identification pass (high show-me profile) by the ATGS aircraft.
- An airtanker drop performed out of a right-hand pattern.
- ATGS aircraft flying a left-hand orbit.
- A helicopter flying a new or unassigned route within the incident boundary or above the helicopter ceiling altitude.
- Any aircraft deviating from the assigned or expected altitude.

Before a non-standard maneuver is executed:

- Non-standard maneuvers must be requested by the pilot intending to perform the maneuver.
- Non-standard maneuvers must be approved by the controlling aerial supervisor.
- All pilots of aircraft that may be affected by the maneuver must acknowledge that they are aware of the maneuver about to take place.

Low-Level Operations (LPIL/ASM)

Low-level flight operations involve fixed-wing aircraft flying below 500 feet AGL. Low-level flight operations require a clearance. LPIL/ASM will request low-level clearance from ATGS if one is on scene. Low-level missions are performed by LPIL/ASM to increase airtanker drop effectiveness and safety. Aircraft and flight crews are specially trained and authorized for low-level missions. Situational awareness is the responsibility of each LPIL/ASM crew member to ensure safe flight operations. The LPIL/ASM conducts these operations in the following manner:

LPIL/ASM Tactical Flight Checklists

- High-level reconnaissance.
  - A high recon pass is executed prior to descending to low level.
  - Look for aircraft over the incident including media and nonparticipating aircraft.
  - Analyze the terrain. Identify potential approach and departure paths while identifying prominent target features. Fly the patterns at an altitude to detect hazards. Study the lay of the land to establish emergency exits.

  Note: The flight crew completes tactical checklist before conducting low-level flight.

- Low-level reconnaissance.
    - Obtain clearance from ATGS for low-level operations.
    - Check for turbulence, hazards to low-level flight, and low-level target identification features.
    - Fly the emergency exit paths to locate potential hazards not identified from a higher altitude.

Tactical Flight Profiles

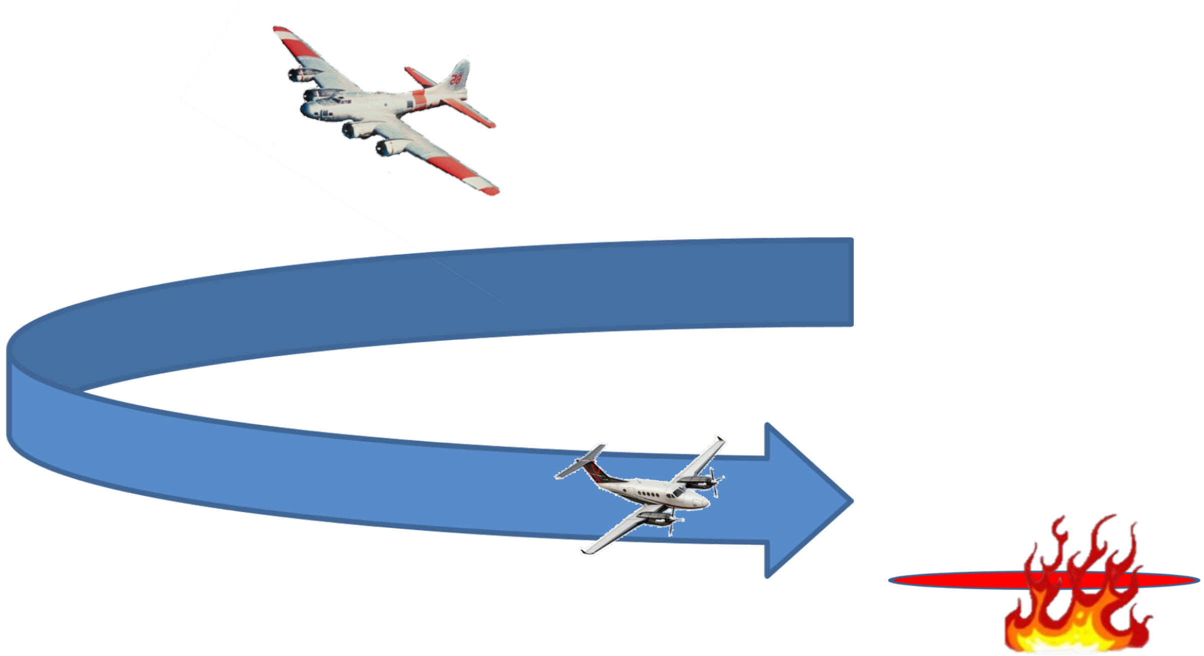
<u>Show-Me Profile</u>

A show-me profile is a low-level pass made over the target using the physical location of the aircraft to demonstrate the line and start point of the retardant drop.

The show-me profile is normally used for the first airtanker on a specific run or when an incoming airtanker has not had the opportunity to observe the previous drop. A show-me can be used alone or before other profiles.

The pilot begins the run when the airtanker crew can visually identify the aircraft, hazards, line, start and exit point of the drop. The standard “show-me” is to fly the line you want the retardant on, not corrected for drift.

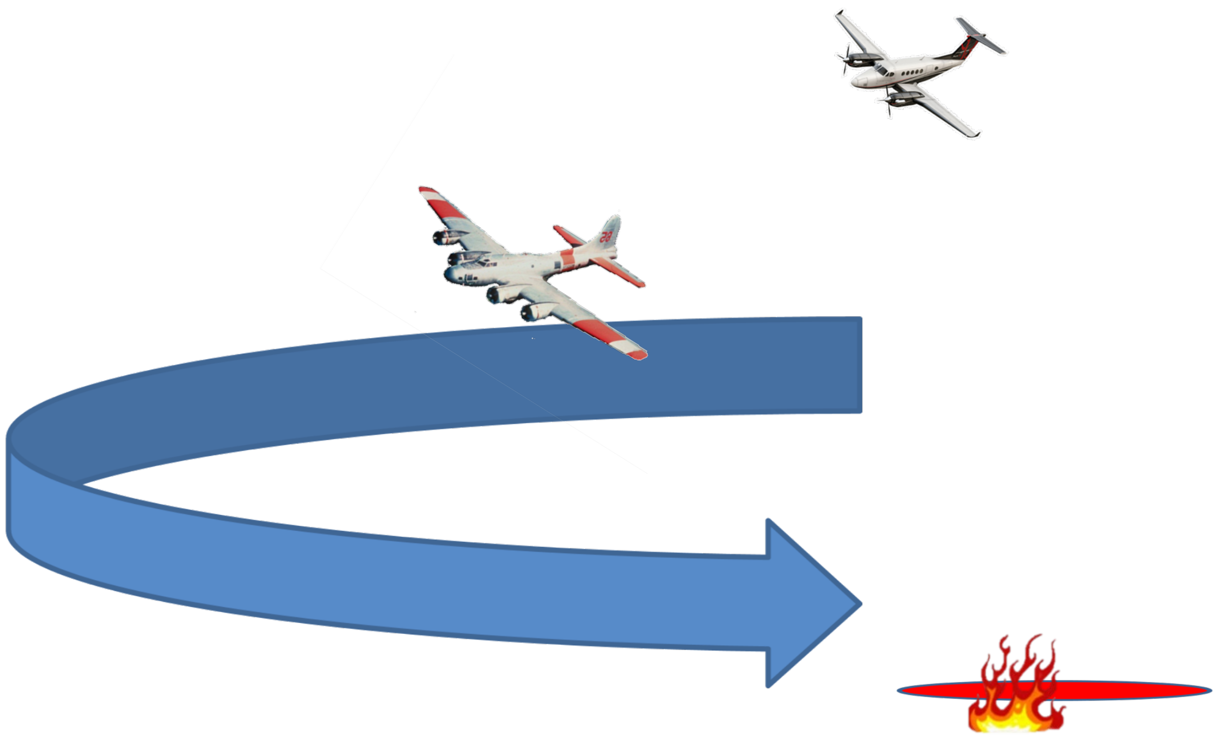
Figure 4. Show-Me Profile



Chase Position Profile

The Chase Position Profile is an observation position in trail of, and above the airtanker, at a position of 5 to 7 o'clock. The Chase Position Profile is used to verbally confirm or adjust the position of the airtanker when on final, and to evaluate the drop.

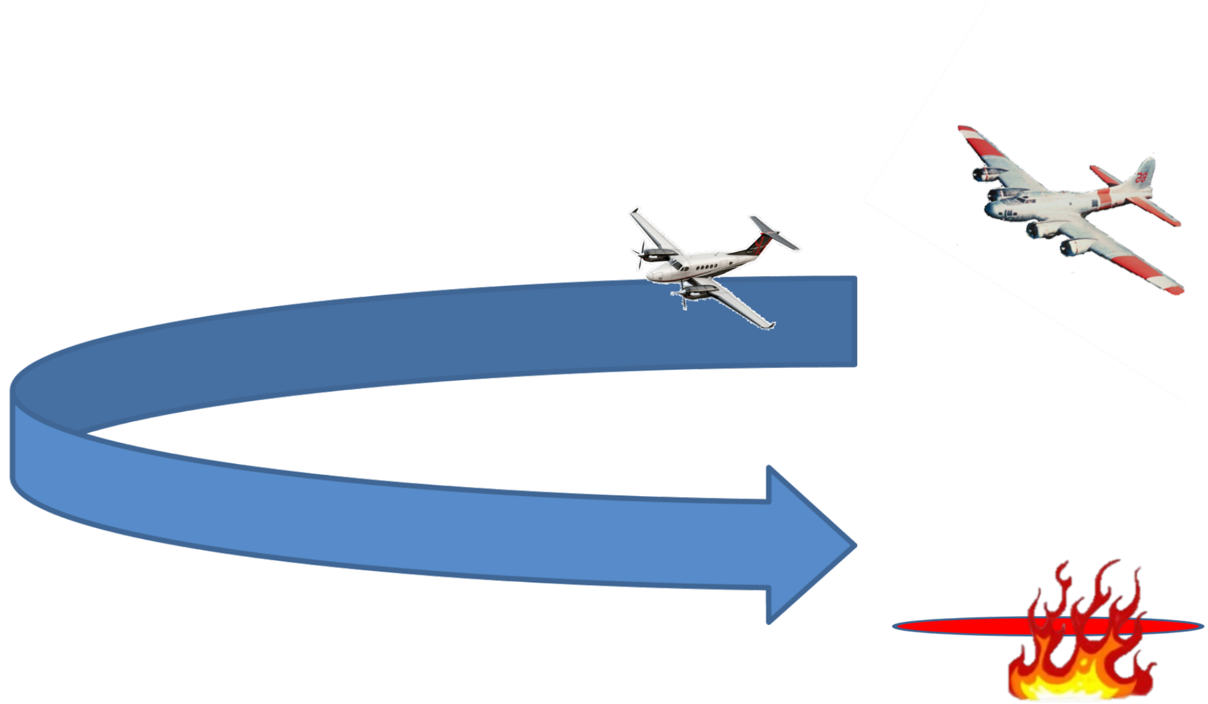
Figure 5. Chase Position Profile



Lead Profile

The lead profile is a low-level (below 500 feet AGL) airtanker drop pattern, made with the lead plane approximately 1/4 mile ahead of the airtanker. The lead profile is used at the request of the airtanker crew, or when the line or start point is difficult to see or to describe due to lack of visibility or references.

Figure 6. Lead Profile



Maneuvering

When leading airtankers, shallow to medium bank angles of 30 degrees should be used. When bank angles exceed 30 degrees, the LPIL shall notify and brief the tanker. Bank angles will not exceed 45 degrees. Airspeed control is critical to a safe pattern. The shape, airspeed, and size of the pattern shall be well planned to minimize the airtanker pilot's maneuvering workload.

Minimum Airspeed

Airspeed during normal operations shall not be flown below minimum controllable airspeed one engine inoperative (Vmca).

Approach and Descent to the Target

The run should be downhill, down canyon, down sun with the greatest degree of safety in mind. Use the agreed upon airspeed to maintain approximately ¼-mile separation between the LPIL and airtanker. A descending approach with a constant rate of descent is desired, terrain permitting. Brief the airtanker pilot ahead of time if special maneuvering is anticipated. Advise the airtanker of hazards (i.e., turbulence, down air, restrictions to visibility, obstacles, etc.).

Final Approach to the Target

Power up and clean up drag devices (when applicable) to cross the target area at the briefed airspeed. Do not accelerate too soon and run away from the airtanker. The standard "live run" is to fly the expected drift line.

Drop Height

- The minimum is 250 feet above the top of the vegetation for VLAT.
- The minimum is 150 feet above the top of the vegetation for LAT.
- The minimum is 60 feet above the top of the vegetation for SEAT.

It is important for the retardant to "rain" vertically with little or no forward movement. The airtanker pilot is responsible for maintaining safe drop heights.

Note: Generally, drop heights should be increased when using higher coverage levels.

Over the Target

Identify the start point with a verbal, "Here."

Exiting the Target

Comply with the briefed exit instructions. When possible, turn off the centerline of the run before initiating a climb (be aware of the airtankers position at all times). Exiting is a critical maneuver at low altitude. Take every precaution to ensure that airspeed and aircraft attitude are within safe limits. Safety-of-flight has priority over the drop evaluation.

Emergency Overrun Procedures

In the event of an imminent overrun of the LPIL by the airtanker, the airtanker crew will attempt to communicate the overrun and utilize the following standard overrun procedures unless otherwise briefed:

- Straight out flight paths: Pass the LPIL on the right.

- Left or right turn flight paths: Pass the LPIL outside the turn.
- Terrain or visibility limitations: When the previous two options are not available pass above the LPIL.

Airtanker Operations

Airtanker Advantages

- High cruise speed.
- Long range.

Reload Bases

Airtankers are loaded at either permanent or temporary retardant bases. When sending airtankers for load and return consider the following:

- Turnaround time.
- Fuel available.
- Retardant available.
- Airtanker base approved for specific aircraft.

Factors Influencing Drop Effectiveness

A number of factors affect drop accuracy. These factors include:

<u>Pilot Skill</u>

Ability to make accurate, timely, and effective drops.

Aircraft Make and Model – Each aircraft make and model has advantages and disadvantages in different operating environments. Elements include power, maneuverability, pilot’s visibility, and airspeed control.

<u>Tanking, Gating or Door System</u>

Quantity of liquid, tank configuration, flow rate, and door release mechanism.

<u>Airtanker Drop Height</u>

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.

<u>Airtanker Speed</u>

Airtanker drop speeds are variable depending on type of aircraft and environmental conditions. Faster speeds generally reduce peak coverage levels, increase pattern momentum.

<u>Visibility</u>

Smoke, sun angle, shadows, etc.

Terrain

Drainage, steepness, etc.

Wind

The effect of wind is to deflect retardant and greatly increase the pattern’s fringe area. The effectiveness of retardant/waterdrops should be closely evaluated in high winds.

Headwind: The effect of dropping into the wind is to shorten the line length and increase coverage level.

Crosswind drops will result in increased line width and cover a larger area at reduced coverage levels.

Thunderstorms and downdrafts/updrafts.

Flame Lengths

Direct Attack with retardants at the prescribed coverage level is 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. Retardant is most effective when applied to available fuels outside of the fire perimeter.

Canopy Density

Drops in timber or fuel models with a dense concentration of tall trees are often ineffective. Canopy interception significantly reduces penetration to ground fuels. An open canopy allows for better penetration.

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 a reasonable time.

Retardant Coverage Levels

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.1 to greater than 8. The ATGS instructs airtanker pilots to make drops at specific coverage levels.

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.

Table 8. Recommended Retardant Coverage Levels

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

Airtanker Flight Routes

For route safety, the approaches and exits must allow for a level or downhill flight maneuver.

Airtanker Drop Patterns

The ATGS must know the various drop pattern options and the coverage level required for various fuel models.

Salvo Drop

Generally used on small targets such as spot fires or targets requiring heavy coverage levels.

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.

Heavy Airtanker Line Length Production

This chart displays line production by coverage level and gallons dropped for drops made at the recommended drop height and airspeed.

Table 9. Airtanker Line Length Production Cart (feet)

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

Ten Principles of Retardant Application

- Determine the strategy; direct, parallel, or indirect, based on fire sizeup and resources available.
- Establish an anchor point and work from it.
- Use the proper drop height.
- Apply proper coverage levels.
- Drop downhill, down sun, when feasible.
- Drop into the wind for best accuracy.
- Maintain honest evaluation and effective communication between the ground and air.
- Plan drops so that they can be extended or intersected effectively.
- Monitor effectiveness of retardant and adjust use accordingly.

Water Scooping Operational Principles

Water scooping aircraft are valuable resources in the support of wildland fire suppression and management. The current models include the following:

Table 10. Water Scooping Aircraft Capabilities

Type	Max Capacity (gal)	Cruise (kt)	Power (hp)
Fireboss	800	140	1600
CL215T	1,300	180	4760
CL415	1,600	180	4760

Many scooping aircraft are capable of injecting gel or foam to the scooped load. The Air Attack must determine if water enhancers are authorized for use on the incident as some agencies and/or contracts do not approve of their use. Some of the aircraft are equipped with infrared imagery systems that may provide a more precise drop.

Aerial supervisors need to understand the capabilities and limitations of these aircraft. Factors such as invasive species, cross-contamination, scoop site length requirements, distance from scoop site to drop, terrain, visibility, wind direction, and load pickup limitations will be considered when deciding if they are an appropriate resource for the mission. The PIC of each scooping aircraft will have the final determination regarding scoop site and drop feasibility.

Water scooping aircraft will be treated the same as standard land-based airtankers for purposes of the FTA. After the drop-scoop pattern is established and only when safety for all aircraft allows, it may be more efficient to clear scooping aircraft into the FTA at an altitude 500 feet above their drop altitude.

Additional References Related to Water Scooping Aircraft

- *FS Standards for Water Scooping Operations*: https://www.fs.fed.us/managing-land/fire/aviation/publications.
- *Guide to Preventing Aquatic Invasive Species Transport by Wildland Fire Operations,* PMS 444, https://www.nwcg.gov/publications/444.

SEAT Operational Principles

For additional information see *NWCG Standards for Single-Engine Airtanker Operations, PMS 506,* https://www.nwcg.gov/publications/506.

- Minimum SEAT drop height is 60 feet above vegetation.
- When collocated with Aerial Supervision utilize both resources for IA.
- SEATs are most effective on small, emerging incidents.
- Reduce turnaround times by setting up portable retardant base(s) as close as possible to the incident.
- Efficiency is maximized when time spent over the target is minimized. LPILs typically utilize the show-me and chase profiles.
- Integrate SEATs with other resources – Use SEATs in conjunction with helicopters and large airtankers. SEATs may be used in flights.
- Use retardant or suppressants with SEATs – Foam and gels work well for direct attack.
- SEAT pilots are trained to apply the ASHE acronym for safe operations:
  - Approach
  - Speed
  - Height
  - Exit

Flights of Single-Engine Airtankers or Scoopers

Flights of aircraft are comprised of two or more SEATs or Scoopers of the same make/model in close proximity to one another operating with a common objective. Flights are not authorized by CAL FIRE.

There must be enough distance between aircraft to allow Aerial Supervision to convey updated directions to the airtanker considering the preceding drop or a change in objectives.

The trailing aircraft are responsible for separation between their aircraft and the aircraft they are following.

The lead aircraft in the flight will be primarily responsible for communications. During the initial transmission to the FTA, the lead aircraft will identify their airtanker number followed by the term "flight of" and then the total number of aircraft in the flight. ("Tanker eight zero two twelve miles west, flight of three") Following this transmission, the number two aircraft in the flight will identify themselves by call sign and "number two" and so forth. ("Tanker eight zero zero, number 2," "Tanker eight two two, number 3") Aerial supervision will then communicate FTA clearance to the lead aircraft in the flight for all of the aircraft. Understanding of the initial briefing can be acknowledged by simply transmitting the airtanker call sign and should be done in the order of the aircraft in the flight.

Further communications will be given to the lead aircraft in the flight unless specific instructions need to be given to other aircraft. If the same directions are given to each aircraft in the flight, such as tag and extend from the existing retardant line, each aircraft in the flight can acknowledge by transmitting their call sign. If directions are unclear to any aircraft in the flight, the pilot should seek clarification prior to the drop.

Helicopter Operations

Helicopter Advantages

Helicopters are often a very cost-effective resource on extended attack and project incidents because of the following:

- Short turnaround times.
- A Type 1 helicopter with a 3-minute turnaround can deliver upwards of 45,000 gallons per hour (Boeing 234, S-64). By comparison, a Type 1 airtanker will typically deliver 2,000 to 3,000 gallons per hour based on a one-hour turnaround.
- Low-speed and accurate drops.
- The ability to do hover or low-speed drops makes helicopters very accurate. Helicopters are an excellent choice for targets in confined airspaces or steep and dissected terrain.
  Caution: Drops on steep slopes may dislodge rocks onto crews below.

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:

- 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.
- Helicopters equipped with a tank and snorkel require water depth of 18 inches to 3 feet for hover filling.
- Be aware of any local resource concerns and fire management plan restrictions – ask the local fire managers and/or dispatch for specifics.
- Approach, departure, and dip site must be free of hazards.
- Avoid fast-moving streams and rivers.
- 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).

- 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.
- Utilize dip site managers (when available) to provide an added margin of safety at established dip sites.

Longline Bucket Operations

- Effective for dipping out of confined sources, e.g., dipsite surrounded by tall timber.
- Reduced rotor wash on the fire.
- Effective for filling portable tanks.

<u>Establish Direct Communications between Helicopters and Ground Contacts</u>

If air-to-ground is too congested, request an additional air-to-ground frequency.

<u>Allow Pilots to Select Drop Approach</u>

- Cross-slope, usually most preferred.
- Downslope, second choice.
- Upslope or downwind, least desirable approach.

Helicopter Utilization by Type

- Helicopters of all types can work together if all pilots involved are comfortable with the pattern and separation.
- Type 1 and 2 helicopters can be effective for line production.
- Use Type 3 helicopters on isolated targets requiring lower volumes of water.

<u>Helicopter Drop Height</u>

Critical in terms of accuracy, effectiveness, and effect of rotor wash on fire behavior. Look for flare-ups after drops.

Helicopter Delivery Systems

Some systems can regulate flow rate and are capable of multiple or partial drops.

<u>Buckets</u>

Three basic types of buckets are:

- Rigid shell buckets – Some capable of multiple drops.
- Collapsible buckets (and foldable) – Some capable of single drop only.
- Power fill buckets – Capable of multiple drops.

Fixed Tanks

Different operators and agencies have developed a variety of tank systems. Most 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 tank 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. Example: S-64 Sky Crane with a 2,500-gallon tank, hover fills from 18 inches in 45 seconds, and provides prescribed coverage level from metered flow door system).

Helicopters

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

Note: Caution when mixing multiple helicopters with dissimilar delivery systems (i.e., Belly Hooked Bucket, Longline, and Tanked Aircraft). Different airspeed, maneuverability, flight profile and pilot site picture have potential to impact aircraft separation. To increase safety and efficiency of the operation, the aerial supervisor may request long line bucket operations be belly hooked.

Helicopter Drop Patterns

In a hover, a helicopter can deliver a salvo drop, while in forward flight it can deliver a trail drop.

Night Helicopter Operations

See Night Helicopter Operations Plan.

Smokejumper Operations

Smokejumper aircraft are dispatched with a standard load of 8-12 smokejumpers and equipment to be self-sufficient for 48 hours. A qualified smokejumper spotter (senior smokejumper in charge of smokejumper missions) may "coordinate" with on-scene aircraft over a fire until a qualified ATGS arrives. See the *Interagency Smokejumper Operations Guide* (ISMOG) for further information at https://www.fs.fed.us/managing-land/fire/aviation/publications.

Approach to the Fire

Smokejumper aircraft normally approach the fire at 1,500 feet AGL (streamer drop altitude for both the BLM and Forest Service).

Drop Mission

The drop mission is a four-part operation:

1. Jump Spot Selection

   Selecting a safe jump spot sometimes requires the smokejumper airplane to make a low-level pass at approximately 500 feet AGL to identify potential hazards. Letting the smokejumper aircraft orbit above other tactical aircraft to view the fire area if the lower airspace is being utilized can save time. Jumpers can also be deployed a short distance from the fire in order to conduct simultaneous tactical operations.

2. Streamer Runs

   The smokejumper aircraft will usually initiate a left-hand pattern over the selected jump spot at a minimum of 1,500 feet AGL (measured from the jumper release point). One to three streamer passes are conducted to verify the wind direction and speed.

3. Jump Runs

   Round or ram-air parachute systems may be used. Jump runs may be conducted at 1,500 feet AGL for jumpers on round canopies, or at 3,000 feet AGL for those on ram-air parachutes. Loads may be mixed. When dropping mixed loads, the standard practice is to drop round parachutes first then request clearance to climb to deploy the ram-air jumpers. Smokejumpers are deployed in one to four person sticks depending on the size of the spot, wind, and the aircraft.

4. Cargo Runs

   After the jumpers are verified safely on the ground, the airplane descends to drop the paracargo. Cargo run patterns are similar in altitude to retardant drops, 150 to 200 feet over the drop point. The number of passes depends on the number of jumpers deployed, size of spot, and equipment needed. The spotter will notify the ATGS or LPIL of the number of passes anticipated and when the mission is completed.

Considerations

Priorities vary on deploying resources on incidents but it is advisable to get the firefighters on the ground as soon as possible. Unless extenuating circumstances dictate otherwise, let the smokejumper airplane come in and perform the entire 4-part operation. If it is necessary to break into the mission to deploy other tactical aircraft, interrupt the smokejumper operation between the jump spot selection and streamer run, or between the last jump run and first paracargo run. Keep in mind that the jumpers need their tools to be effective.

When other priorities and congested airspace are an issue, consider deploying the jumpers preferably using non-conflicting flight patterns or when this is not practical, a short distance from the fire.

Helicopter Rappel Operations

Type 2 and Type 3 (National Park Service) helicopters are used for rappelling. Type 3s carry up to two rappellers and a spotter; Type 2s carry up to four rappellers and a spotter.

Arrival

Rappel helicopters approach the incident at 200 to 500 feet AGL or the altitude assigned by the aerial supervisor. Upon arrival at the incident site, they will survey the area to determine the best method to deploy the firefighters. The helicopter may or may not arrive configured to rappel. Normally, the helicopter is dispatched configured to rappel unless they know that a rappel is not necessary from intelligence provided by personnel at the site

If not configured for the rappel, the helicopter will survey the rappel location and then fly to a landing site within a few miles of the incident to reconfigure for the rappel. It takes 5 to 10 minutes to reconfigure.

Suitable Landing Site

Providing there is a suitable landing site close to the incident and the terrain, and vegetation between the landing site and the incident will not inordinately delay the firefighters walking to the incident, this alternative will be used versus rappelling.

Rappel Operation

If no landing site is available, the firefighters will rappel into the incident. The helicopter will approach the selected rappel site and perform a high hover power check (above 300 feet AGL). Once this is completed, they will descend to a stationary hover position at 250 feet AGL or lower (depending on the height of the vegetation) and perform the rappel operation. Once all the rappellers are on the ground, and their ropes released from the helicopter, the spotter deploys the cargo (cargo is sometimes deployed before the rappellers).

Note: Density altitude may require the helicopter to make multiple trips to deploy partial loads. The spotter will communicate this if it is a factor.

Communications

The pilot and spotter will monitor the Guard frequency at all times and the assigned tactical frequency except on occasion when deploying personnel and cargo. When the tactical frequency is very active, the rappel helicopter may request to not monitor this frequency because a sterile cockpit is essential during the actual rappel phase. Do not communicate with the helicopter during this phase unless there is an emergency.

Considerations

The rappel helicopter has limited fuel duration over the incident. It is helpful to survey the area prior to the arrival of the rappel helicopter in order to point out potential landing sites or to relay that there are no landing sites near the incident. If delays are anticipated or required, consider directing the helicopter to land nearby to conserve fuel. Keep in mind that it is important to get the firefighters and their tools on the incident.

Water Scooper Operations

Scooping Site Requirements

The water source should be free of obstructions and suitable to the PIC. The scooping path does not have to be straight, as the aircraft is 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.

Refer to agency-specific information for additional requirements.

<u>Consistency and Water Temperature</u>

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.

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.

Environmental Limitations

- Foam is not recommended within 300 feet of lakes and streams.
- In steep drainages or sensitive areas, check local agency policy on foam use.
- 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.
- Obtain a briefing from the IC or responsible agency on the limitations of foam use, if any, prior to using.

Rinsing Tanks

Provide for two rinse loads of water before departing to a fire.

USFS: Per the contract, water scoopers shall not be loaded with chemical retardant, water enhancers, or foam.

Tactical Considerations

Tank Configuration

The CL-215 has two compartments totaling 1,400 gallons, and the CL-415 has four compartments totaling 1,600 gallons and Fireboss has one compartment up to 800 gallons. Loads can be dropped salvo, in trail, or split into separate drops.

Drop Height

Drop height ranges from 60” to 150 feet, depending on factors such as foam vs. straight water and direction of run (into wind vs. downwind).

Flight Patterns and Turnaround Times

Standard Flight Pattern

The standard flight pattern is an oval racetrack, with a scoop into the wind and a downwind drop on the fire.

Scooping Operation

During the scooping operation, including approach and departure from the lake, communications with the airtanker should cease to allow the crew to concentrate on the pickup. The airtanker will call when “up” or “off” the water, which will signify to the ATGS that it’s okay to transmit.

Traffic over the scoop area can be a source of conflict. Identifying approach and departure routes may become important.

Chapter 9 – All Hazard Incidents

Fire incidents have long utilized Aerial Supervision for coordinating aerial resources. The same principles of supervising and directing aircraft can be applied to other types of incidents commonly referred to as "all hazard incidents." All hazard incidents include volcanic eruptions, earthquakes, search and rescue operations, floods, oil spills, hurricanes, and spray projects.

Non-Wildfire Incident Aerial Supervision

On non-fire incidents when the level or complexity of air operations exceeds the supervisory capability of the ATGS/ASM, the organization may be expanded to include a Helicopter Coordinator (HLCO).The HLCO position reports to the ATGS/ASM. The roles and responsibilities are basically the same as fire incidents.

- Large or complex incidents, which have a mix of fire and other disaster operations (earthquake or volcanic eruption), require both an ATGS/ASM and a HLCO to coordinate and integrate the mix of aviation assets.

Criteria for Assigning Aerial Supervision

Without adequate supervision and coordination air operations will very likely be less efficient, more costly and less safe. An ATGS/ASM should be assigned when an incident meets the criteria listed below.

- Multiple aircraft operating in incident area airspace.
  - Mix of fixed-wing and helicopter operations.
  - Mix of low-level tactical/logistical aircraft.
  - Periods of marginal weather, poor visibility, or turbulence.
- Two or more branches utilizing air support.
- Mix of both civil and military aircraft operating in the same airspace or operations area.
- When conditions require airspace management, ATC and air resource mission priority setting and coordination.
- Ground stations have limited ability to communicate with flying aircraft due to terrain or long distances.

Aerial Supervision Interaction and Communication

Although all hazard incidents retain the basic ICS organization and roles, there are incident specific technical specialist positions added to the ICS organization to supervise, coordinate and lead specific incident functions. Aerial supervisor roles may be modified to fit the incident situation and they may be coordinating directly with persons other than the traditional OSC, Division/Group Supervisor, or Strike Team/Task Force Leader. It is critical that we understand the roles and responsibilities of the Technical Specialist positions, how they are identified, and how our role interacts with them (chain of command, communications protocol, authority, etc.).

Use of Military Aircraft

It is important to fully understand the military organization(s), their SOPs, military aircraft capabilities and limitations, and how the ICS interfaces with military operations. An assigned agency Aviation

Military Liaison (civilian) and Military Air Operations Coordinator (civilian) will work with the AOBD and Aerial supervisor in assigning and coordinating military air operations.

The availability of military air tactical resources may vary dramatically due to global defense strategies. Refer to the *Military Use Handbook* for additional information and guidance.

Chapter 10 – Safety

Safety is the principal consideration in all aspects of Aerial Supervision. A safe aviation operation depends on accurate risk assessment and informed decision-making.

Risk levels are established by the severity of possible events and the probability that they will occur. Assessing risk identifies the hazard, the associated risk, and places the hazard in a relationship to the mission. A decision to conduct a mission requires weighing the risk against the benefit of the mission and deciding whether the risks are acceptable.

Examples of the Risk Management Process are available in the *IRPG*, the *Interagency Standards for Fire and Fire Aviation Operations* (Red Book), CAL FIRE 8300, and the *NWCG Standards for Helicopter Operations*, PMS 510, https://www.nwcg.gov/publications/510.

Factors to Consider During the Risk Assessment Process

- 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).
- The aerial supervisor must identify hazards, analyze the degree of risk associated with each, and place hazards in perspective relative to the mission or task.
- Hazards might not always be limited to the performance of flight, but may include hazards to personnel if the flight is not performed.
- The risk assessment may include the aerial supervisor, AOBD, Duty Officers, agency fire management staff, ICs, dispatchers, and Line Officers/managers.
- Ultimately, the PIC has the authority to decline a flight mission that they consider excessively hazardous.

USFS: All Forest Service flights require a risk assessment. Refer to USFS Manual 5700 and USFS Handbook 5709.16.

Mitigating Risks

In some cases the aerial supervisor may have to shut down air operations. Air operations must not proceed until risk mitigation measures are implemented. Risk mitigation measures to consider:

Modifying Air Operations

There is no way to define an exact trigger point for adjusting, downsizing, or completely suspending aviation operations. The factors listed below should be evaluated to determine whether additional Aerial Supervision resources are needed or tactical/logistical missions need to be modified/suspended:

- Complexity of aviation operations
- Communications
- Topography (fire size, position on slope, location, etc.)
- Firefighter and public safety
- Poor visibility
- Wind

- Turbulence
- Fire behavior
- Aircraft incident/accident
- Aircraft/aircrew performance

Monitor the Overall Aviation Operation for Human Factors Related Issues

- Task saturation
- Fatigue, burnout, and stress
- Normalization of risk
- Lack of situational awareness
- Mental and physical health

Monitor Effectiveness of the Overall Air Operation

- Ensure suppression objectives are truly obtainable.
    - Risk versus reward – Is the mission worth it?
    - Is there adequate ground support?
    - Are there adequate aerial resources?
- Is there enough time in the operational period?
- Monitor weather conditions for increasing winds, turbulence, thunderstorms, or decreasing visibility.
- Be proactive in communicating current fire and fire weather conditions.
- Provide realistic input regarding resource needs commensurate with successful completion/modification of incident objectives.

Utilize the Appropriate Aircraft for the Mission

- Turbine vs. piston engine
- Pressurized vs. unpressurized
- VLATs, LATs, and/or SEATs
- Consider density altitude
- Helicopter types and delivery systems
- Single-engine service ceiling

Communications Planning

When discrete radio frequencies are used during incident operations, ensure contact frequencies such as command and air-to-ground are monitored by appropriate ground personnel. Make sure that ground personnel know how to reach the aerial supervisor.

Order Additional Frequencies

Order additional frequencies as needed for operations; as incident complexities increase, the aerial supervisor must ensure adequate radio frequency coverage. Be proactive. There can be up to a 24-hour delay from the time a frequency is ordered to the time it is assigned to the incident.

Establish Positive Airspace Management

Hold aircraft in the air or on the ground until structured traffic patterns can be established.

Span of Control

Limit number of aircraft working an incident based on visibility, routing procedures, and communications capabilities.

Obtain Input

Discuss operations safety with LPIL, HLCO and mission pilots. Mission debriefings are an excellent source of information; Air crewmembers and support personnel will utilize an AAR to critique mission effectiveness.

System Safety Assessment

The effectiveness of risk assessment and management can be increased through utilization of the current System Safety Assessment for Aerial Supervision Operations.

The following assessment of Aerial Supervision operations has been developed for aerial supervisors. It identifies hazards, the likelihood of encountering them and the risk associated with exposure to the hazard. Mitigations are listed for each hazard as well as the post mitigation risk.

System Safety Utilization is a standard operating procedure and covers all aspects of aerial supervision. It should be used for incident operations, training, and review by agency air crewmembers.

Table 11. System Safety Assessment for Aerial Supervision

System – Aircraft

Subsystems	Hazards	Pre-Mitigation Likelihood	Pre-Mitigation Severity	Pre-Mitigation Outcome	Mitigation	Post Mitigation Likelihood	Post Mitigation Severity	Post Mitigation Outcome
Avionics	Avionics failure.	Occasional	Marginal	Medium	Minimum Equipment List establishes minimum requirement. Mission requirements as determined by the flight crew. Integrate into Preflight Checklist.	Improbable	Negligible	Low
	Avionics package insufficient for mission complexity.	Probable	Critical	High	Contract specifications that recognize mission requirements. Ensure necessary type, configuration, and number of radios to complete mission safely. Reduce span of control. Limit operations.	Remote	Marginal	Medium
	Contract pilot unfamiliar with avionics. (Cannot run radios or GPS, etc.).	Occasional	Marginal	Medium	Release, replace the pilot, and enforce contract specifications.	Remote	Negligible	Low
Aircraft Type	Reduced field of view for the flight crew.	Occasional	Critical	Serious	Ensure aircraft is appropriate for the mission. Flight profile altered to maximize visibility. Use of TCAS. Clear communication with other aircraft. Alter interior configuration (headrest, seat, windows).	Improbable	Negligible	Low

Subsystems	Hazards	Pre-Mitigation Likelihood	Pre-Mitigation Severity	Pre-Mitigation Outcome	Mitigation	Post Mitigation Likelihood	Post Mitigation Severity	Post Mitigation Outcome
Performance Standards	Poor engine performance (single/twin, turbine/recip) for the ATGS mission.	Occasional	Catastrophic	High	Plan for high-density altitudes. Download cargo/fuel load. Relocate to favorable location. Alter the mission. Upgrade the aircraft. Ensure aircraft is appropriate for the mission. Perform preflight planning.	Remote	Catastrophic	Serious
Contracting	Contract pilot skill/fire experience leading to substandard performance (i.e., working avionics, flight skills) during flight operations.	Remote	Critical	Medium	Thorough briefing. Ride along with veteran fire pilot. Use contract evaluation process. Contractor training. Computer-based training. Give air attack pilots a check-ride every 3 years.	Improbable	Critical	Medium
Fuel	Capacity and procedure, ground-fueling errors.	Frequent	Catastrophic	High	Verify adequate volume of fuel for mission. Ensure proper fueling procedures are followed for type of aircraft.	Remote	Critical	Medium

1 System– Flight Operations

Subsystems	Hazards	Pre-Mitigation Likelihood	Pre-Mitigation Severity	Pre-Mitigation Outcome	Mitigation	Post Mitigation Likelihood	Post Mitigation Severity	Post Mitigation Outcome
Mission	Restricted visibility.	Frequent	Catastrophic	High	Limit exposure. Determine effectiveness of the operation (risk vs. benefit) and discontinue if warranted. Limit number of aircraft in operating area. Increase vertical/horizontal separation of aircraft.	Occasional	Critical	Serious
	Wake turbulence.	Occasional	Critical	Serious	Situational awareness assists prevention. Communication helps to avoid wake turbulence areas. Wake turbulence avoidance procedures (altitude, time, distance).	Remote	Critical	Medium
	Weather (Turbulence/wind/T-storms).	Frequent	Critical	High	Adjust tactics or shut down air operations. Increase vertical/horizontal separation of aircraft. Utilize human aided technology (weather radar, etc.). Encourage dispatch to obtain/communicate weather information. Utilize and share pilot reports of severe weather.	Occasional	Critical	Serious
	Poor fuel management.	Occasional	Critical	Serious	Monitor fuel quantities. Follow fuel transfer procedures.	Remote	Critical	Medium
	Controlled flight into terrain due to low-level operations.	Frequent	Catastrophic	High	Ensure high-level recon is completed before commencing low-level flight. Manage radio communication. Proper aircraft configuration. Reduce exposure time in low level. Consult sectional chart/hazard map and ground personnel/other aircraft (AC). Obtain unit in-brief. Utilize local knowledge.	Remote	Catastrophic	Serious
	Operating in close proximity to other aircraft (collision potential).	Frequent	Catastrophic	High	Ensure communication is established with all aircraft. Use situational awareness. Use of TCAS. Establish clear and concise directions for simultaneous operations, (virtual fence, geographic separation, altitude separation, holding/timing). Establish IPs, ingress/egress route.	Remote	Catastrophic	Serious

1 System– Flight Operations (cont.)

Subsystems	Hazards	Pre-Mitigation Likelihood	Pre-Mitigation Severity	Pre-Mitigation Outcome	Mitigation	Post Mitigation Likelihood	Post Mitigation Severity	Post Mitigation Outcome
Mission	Reliance on technology causes distraction, low situational awareness, division of attention in the cockpit.	Frequent	Catastrophic	High	Maintain situation awareness. Maintain see and avoid techniques Prioritize mission/cockpit workload. Utilize CRM practices.	Remote	Catastrophic	Serious
	Aircraft emergency (engine out, fire, bird strike, mechanical failure, etc.).	Occasional	Catastrophic	High	Crew cross training and familiarization with a/c systems and emergency procedure checklists (pinch hitter/simulator training).	Remote	Catastrophic	Serious
	Exceeded span of control.	Occasional	Critical	Serious	Ensure roles and responsibilities are assigned and understood within Aerial Supervision crew. Assign aircraft to common functions and tasks with a single point of contact. Hold aircraft at base to limit the number of assigned aircraft over the incident.	Remote	Critical	Medium
	Unclear objectives / tactics.	Frequent	Critical	High	Ensure strategy and tactics are clear and understood. Use common terminology, solicit/utilize feedback.	Occasional	Critical	Serious
	ATGS performance results in hazardous operation.	Occasional	Critical	Serious	Shut down the operation, deconflict the area. Return to base to debrief the mission. Coach, proficiency checkride, retrain/recertify.	Remote	Critical	Medium
	Unnecessary exposure due to inefficient operational use of tactical aircraft.	Probable	Critical	High	Use SOPs for all tactical aircraft types. Use the right tool for job. Training, feedback, brief/debrief.	Remote	Critical	Medium
	Aircraft operating without Aerial Supervision.	Frequent	Critical	High	When Aerial Supervision is readily available (within the dispatch area/GACC), they will be ordered for the safety, effectiveness, and efficiency of ground and/or aerial firefighting operations.	Occasional	Critical	Serious

1 **System– Flight Operations (cont.)**

Subsystems	Hazards	Pre-Mitigation Likelihood	Pre-Mitigation Severity	Pre-Mitigation Outcome	Mitigation	Post Mitigation Likelihood	Post Mitigation Severity	Post Mitigation Outcome
Airspace	FTA: Aircraft not complying with procedures.	Probable	Catastrophic	High	Aerial supervision enforces FTA procedures.	Improbable	Critical	Medium
	Multiple IA incidents in same area cause confusion; near miss hazard.	Probable	Critical	High	Coordinate with dispatch and other aircraft. Ensure fire names, frequencies, locations, and aircraft assignments are communicated to all flight crews.	Occasional	Critical	Serious
	Special use airspace: Aircraft not having authorization to enter the SUA, not coordinating with controlling agency.	Probable	Critical	High	See and avoid. Know SUA areas. Establish communication with controlling agency. Conduct thorough briefings.	Remote	Critical	Medium
	Non-incident aircraft intrusion in TFR.	Probable	Catastrophic	High	See and avoid, inform other aircraft on scene. Re-evaluate TFR promotion.	Remote	Catastrophic	Serious
	Fires in proximity to airport/airstrip. Potential for midair collision or intrusion in FTA.	Occasional	Catastrophic	High	Implement/validate TFR as incident expands, deconflict SUA, establish communication with controlling agency, notify other aircraft. Provide TFR transition corridors for non-incident aircraft on large incidents. Increase awareness of General Aviation (GA) operators and other agency flight crews not assigned to incident.	Remote	Catastrophic	Serious
s Communication	Radio frequency congestion.	Frequent	Critical	High	Exercise radio discipline/order additional frequencies as needed.	Remote	Critical	Medium
	State/County/Rural resources on different bandwidth.	Probable	Critical	High	Coordinate with cooperators to find a way to communicate with one another.	Remote	Critical	Medium
	Hazardous air operations resulting from inaccurate information disseminated through the dispatch system.	Frequent	Critical	High	Verify information at time of dispatch. Flight crews will brief/debrief with dispatchers. Provide aviation training for dispatchers. Maintain qualified dispatcher on the A/C desk.	Occasional	Critical	Serious

Chapter 11 – Job Aids and Resources

Required Job Aids (LPIL/ASM)

A full U.S. (Contiguous United States) approach and IFR chart coverage or approved Electronic Flight Bag that is FAA and agency approved.

Aerial Supervision Kit

Each aerial supervisor should have and maintain a kit. The following items are recommended to be on board the aircraft:

- Knee board – Leg board/clipboard.
- Headset, flight helmet, PPE.
- Frequency guide.
- Batteries.
- Flashlight.
- Camera.
- Overnight bag.

Consider electronic tablet with charging cables and or external power supply, which contain the following items:

- Maps.
    - Current FAA sectional chart coverage area.
    - Agency maps.
    - Local hazard map (from Airtanker Base Manager or Dispatch).
    - Incident map (updated daily).
- Air Tactical forms – at https://www.nwcg.gov/publications/505.
    - Fire sizeup.
    - Mission Checklist.
    - ATGS/LPIL/ASM evaluation.
    - Initial Attack/Extended Attack ATGS form.
    - SEAT Pilot Mission Documentation Log.
    - Aerial Supervision Transition Checklist.
    - LPIL, ASM, or ATGS Mission Log.
    - Airtanker Briefing Checklist.
    - Aerial Supervision Cost Summary.
    - Pilot Flight time and Duty Day Tracking.
    - Scripts.
    - SAS.

The *NWCG Standards for Aerial Supervision* is developed and maintained by the Interagency Aerial Supervision Subcommittee (IASS), under the direction of the National Interagency Aviation Committee (NIAC), an entity of the National Wildfire Coordinating Group (NWCG).

Previous editions: 2017, 2016, 2014, 2013, 2011, 2010

While they may still contain current or useful information, previous editions are obsolete. The user of this information is responsible for confirming that they have the most up-to-date version. NWCG is the sole source for the publication.

This publication is available electronically at https://www.nwcg.gov/publications/505.

Printed copies of this guide may be ordered from the Great Basin Cache at the National Interagency Fire Center in Boise, Idaho. Refer to the annual *NWCG NFES Catalog Part 2: Publications*, PMS 449-2, and find ordering procedures at https://www.nwcg.gov/catalogs-ordering-quicklinks.

Comments, questions, and recommendations shall be submitted to the appropriate agency program manager assigned to the IASS. View the complete roster at https://www.nwcg.gov/committees/interagency-aerial-supervision-subcommittee/roster.

Leadplane Training Lesson Plan

12 Standard Aviation Questions That Shout Watch Out

01-01-N9065-HO

Objective:

To familiarize the student with 12 Standard Aviation Questions That Shout Watch Out.

Content:

The following questions should be asked prior to any flight or when conditions change during a flight. If there is any uncertainty with these questions, it should be addressed before the flight continues.

1. Is the flight necessary?
2. Who is in charge?
3. Are all hazards identified and have you made them known?
4. Should you stop the operation on the flight due to change in conditions?
    a. Communications.
    b. Weather.
    c. Confusion.
    d. Turbulence.
    e. Personnel.
    f. Conflicting Priorities.
5. Is there a better way to do it?
6. Are you driven by an overwhelming sense of urgency?
7. Can you justify your action?
8. Are there other aircraft in the area?
9. Do you have an escape route?
10. Are any rules being broken?
11. Are communications getting tense?
12. Are you deviating from the assigned operation of flight?

Anyone can refuse or curtail a flight when an unsafe condition may exist. Never let undue pressure (expressed or implied) influence your judgment or decisions.

Completion Standards:

The lesson is complete when the student can affectively apply the principles of the 12 Standard Aviation Questions That Shout Watch Out.

Leadplane Training Lesson Plan

Safety

01-02-N9065-HO

Objective:

To familiarize the student with the importance of safety in the leadplane mission (Phase 1).

To develop the student's safety mindset in the leadplane mission (Phase 2).

Content:

Aviation safety is the primary goal of the leadplane position. The low-level capabilities of a leadplane enhance the safety of airtanker operations in the fire environment.

When safety of flight is or may be compromised, water or retardant drops become ineffective, or at pilot recommendation, aerial operations should cease.

Communication between all airborne incident aircraft is critical to safety.

Safety is the principal consideration in all aspects of aerial supervision. A safe aviation operation depends on accurate risk assessment and informed decision making. Assessing risk identifies the hazard, the associated risk, and places the hazard in a relationship to the mission. A decision to conduct a mission requires weighing the risk against the benefit of the mission and deciding whether the risks are acceptable.

Risk Mitigation Considerations

- Monitor the overall aviation operation for human factors related issues.
  - Task saturation.
  - Fatigue, burnout and stress.
  - Acceptance of risk as normal.
  - Lack of situational awareness.
- Monitor effectiveness of the overall air operation.
  - Ensure suppression objectives are truly obtainable.
    - Risk versus reward – is the mission worth it?

Are there adequate aerial resources?

Are there adequate ground resources?

Is there enough time in the operational period?

Monitor weather conditions for increasing winds, turbulence, thunderstorms or decreasing visibility.

Be proactive in communicating current fire and fire weather conditions.

Provide realistic input regarding resource needs relative to incident objectives.

System Safety Assessment

The effectiveness of risk assessment and management can be increased through utilization of the current System Safety Assessment for Aerial Supervision Operations. See the System Safety Assessment for Aerial Supervision matrix in the NWCG SAS. It identifies hazards, the likelihood of encountering them and the risk associated with exposure to the hazard. Mitigations are listed for hazards as well as the post mitigation risk. System Safety utilization is standard operating procedure and covers all aspects of aerial supervision. It should be used for incident operations, training, and review by agency air crewmembers.

The Aviation Safety Communiqué (SAFECOM) system is used to report any condition, observance, act, maintenance problem, or circumstance that has potential to cause an aviation-related mishap. Submitting a SAFECOM is not a substitute for "on-the-spot" correction(s) to a safety concern, rather it is a tool used in the documentation, tracking, and follow up corrective action(s) related to a safety issue.

Conservative Safety Mindset

The leadplane pilot must have a safety mindset during all operations. The leadplane pilot should continuously reevaluate flight conditions, feasibility of retardant delivery and retardant effectiveness. The leadplane pilot must communicate any concerns to the ATGS, IC or dispatch and any mitigation measures. It is easy for all participants in suppression operations to become mission focused and lose track of a more strategic view of the operation. The leadplane mission puts the leadplane pilot in an excellent position to evaluate multiple operations. The leadplane pilot must communicate concerns about the operations to the ATGS or IC.

Everyone engaged in fire suppression operations is taught to have a safety mindset and hold safety as the primary objective. People can get so focused on tactics that they lose sight of potential safety issues. The leadplane can fill the role as a safety regulator for aviation operations. It is important for the leadplane pilot to question the safety of continued operations when conditions change.

When to Say No, How to Refuse Risk Properly
Accepting risk is part of the job of being a firefighter. But no employer has the right to force you to take an unacceptable risk, particularly if there are safe alternatives for completing the assignment.

The guidelines published by the National Wildfire Coordinating Group spell out the proper way to exercise your right to refuse risk that you believe extends beyond the boundaries of the job.

NWCG Guidelines, How to Refuse Risk Properly
Every individual has the right and obligation to report safety problems and contribute ideas regarding their safety. Supervisors are expected to give these concerns and ideas serious consideration.

When an individual feels an assignment is unsafe, they also have the obligation to identify, to the degree possible, safe alternatives for completing that assignment. Turning down an assignment is one possible outcome of managing risk.

A “turn down” is a situation where an individual has determined they cannot undertake an assignment as given and they are unable to negotiate an alternative solution. The turn down of an assignment must be based on an assessment of risks and the ability of the individual or organization to control those risks. Individuals may turn down an assignment as unsafe when:

> There is a violation of safe work practices.
>
> Environmental conditions make the work unsafe.
>
> They lack the necessary qualifications or experience.
>
> Defective equipment is being used.

If a turn down situation presents itself, the process for resolving it in the field is as follows:

> Individual will directly inform their supervisor that they are turning down the assignment as given. The most appropriate means to document the turn down is using the criteria (The Firefighting Orders, the Watch Out Situations, etc.) outlined in the Risk Management Process.
>
> Supervisor will notify the Safety Officer immediately upon being informed of the turn down. If there is no Safety Officer, notification shall go to the appropriate Section Chief or to the Incident Commander. This provides accountability for

decisions and initiates communication of safety concerns within the incident organization.

If the supervisor asks another resource to perform the assignment, they are responsible to inform the new resource that the assignment has been turned down and the reasons that it was turned down.

If an unresolved safety hazard exists or an unsafe act was committed, the individual should also document the turn down by submitting a SAFENET (ground hazard) or SAFECOM (aviation hazard) form in a timely manner.

These actions do not stop an operation from being carried out. This protocol is integral to the effective management of risk as it provides timely identification of hazards to the chain of command, raises risk awareness for both leaders and subordinates, and promotes accountability.

Completion Standards:

The lesson is complete when the student can demonstrate that safety is the highest priority and will not be in question in a training environment for Phase 1 and in a fire environment for Phase 2.

.

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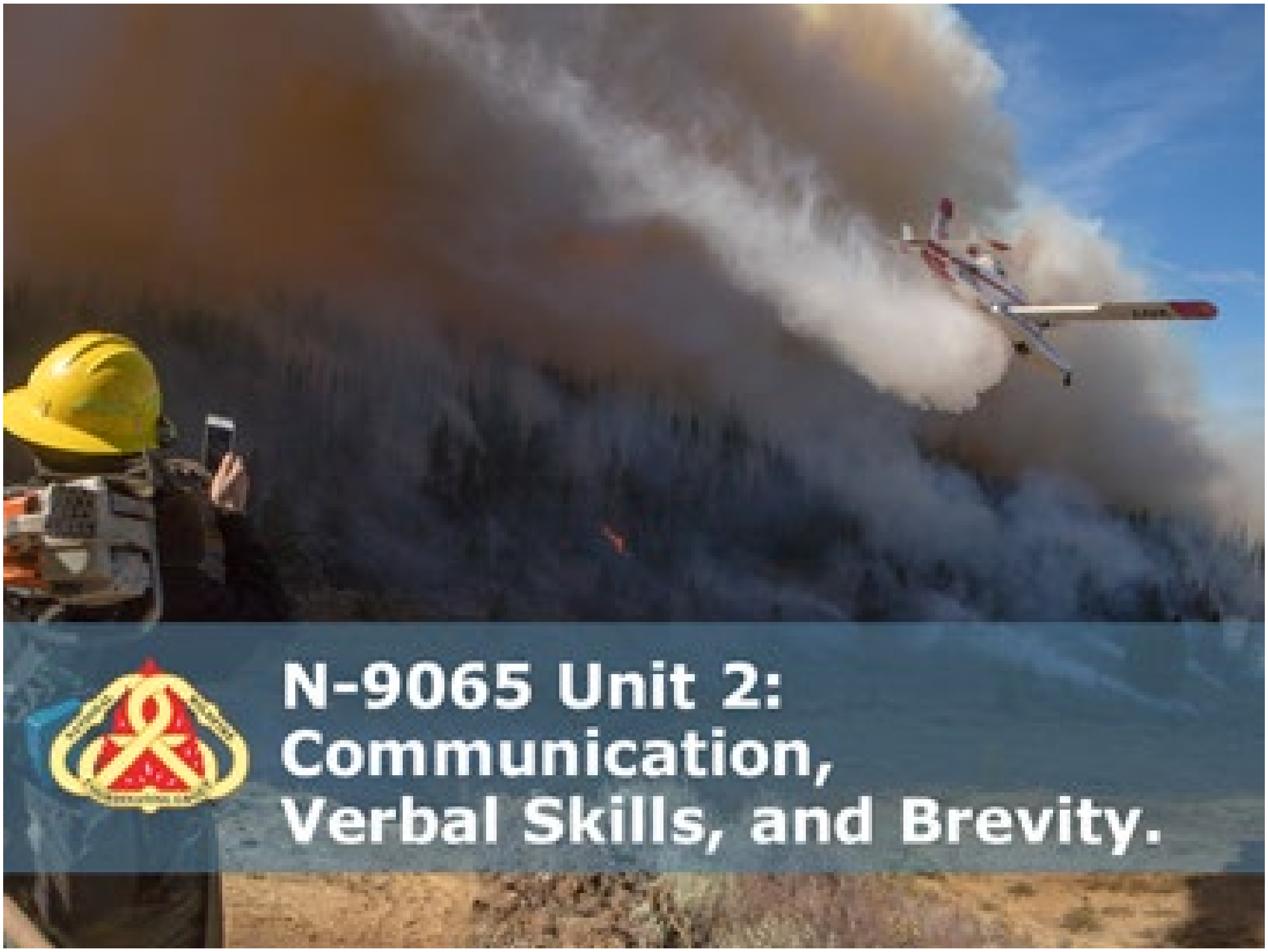


UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 2 – Communications, Verbal Skills and Brevity.

Time 1.5 Hours.

Objectives

1. To familiarize the student with flight following procedures.
2. To familiarize the student with the initial briefing script.
3. To familiarize the student with the tactical briefing script.
4. To familiarize the student with the departure briefing script.
5. To familiarize the student with the transition briefing.
6. To familiarize the student with the FM radio setup.
7. To familiarize the student with target descriptions.

Strategy

The goal of this unit is to introduce the student to the communications and verbal skills needed during the leadplane mission. The information will be used to build a foundation for the communications and verbal skills used during the leadplane flight training. Brevity will be introduced and critiqued so that brevity can be practiced.

Instructional Methods

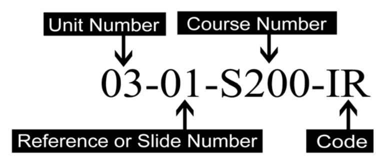
- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Computer with LCD projector and presentation software.
- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.

Outline

I. Scripts.
II. Verbal Skills.
III. Target Descriptions.
IV. Flight Following.
V. FM Radio.



Aids and Cues Codes:

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	SW – Student Workbook
IR – Instructor Reference	SR – Student Reference
HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 2 – Communications, Verbal Skills and Brevity.

OUTLINE	**AIDS & CUES**
Hand Outs	
Review Objectives	
I. Scripts.	NWCG SAS 02-01-N9065-HO 02-02-N9065-HO 02-03-N9065-HO
a. Cover and explain the standard briefing scripts listed in the standard briefing scripts appendix in the NWCG SAS. b. Provide examples of how each script is performed. c. Cover the importance of each scripts content and order.	
II. Verbal Skills. a. Cover the verbal skills information listed in the Verbal Skills Lesson Plan.	02-04-N9065-HO
III. Target Descriptions.	02-05-N9065-HO 02-01-N9065-PPT 02-02-N9065-PPT
a. Cover the target descriptions information listed in the Leadplane Target Descriptions Lesson Plan. b. Cover the target descriptions power point. c. Cover the communications within the pattern power point.	

IV. Flight Following. 02-06-N9065-HO

a. Cover the flight following information listed in the Leadplane Flight Following Lesson Plan.

V. FM Radio. 02-07-N9065-HO

a. Cover the FM radio information listed in the Leadplane FM Radio Lesson Plan.

Leadplane Training Lesson Plan

Initial Briefing

02-01-N9065-HO

Objective:

To familiarize the student with the initial briefing script (Phase 1).

To develop the student's proficiency in the use of the initial briefing (Phase 2).

Content:

The NWCG SAS table for initial briefings lists the content and order for the initial briefing. For standardization purposes the order of the content should be followed.

Initial Briefing

- Altimeter Setting – There is no reason to use the word "altimeter" or "in the window".
- Clearance Altitude – Altitude the tanker will enter the FTA.
- ATGS Altitude – Altitude of the ATGS.
- Other Aircraft Altitudes – To include fixed wing and rotor wing aircraft.
- In Route Hazards – Hazards the tanker may encounter between receiving the initial briefing and the operations area.

On larger fires an Initial Point (IP) may need to be given with the initial briefing.

Depending on the situation, the initial briefing can be broken up into multiple transitions. If the leadplane is flying a live run or show me run and a tanker calls in at 12 miles, the briefing can be temporarily abbreviated to the altimeter and clearance altitude. This way the inbound tanker can continue to the fire and the leadplane can focus on the show me run. The rest of the initial briefing can be given when the leadplane has finished the run.

Initial briefings should be practiced on the ground. This briefing should be memorized so that it takes very little effort while flying the aircraft.

The initial briefing should be given each time a tanker comes to the fire. Tankers may call at 12 miles and use the phrase "with the numbers". This term is nonstandard and has not been identified in the NWCG SAS. Its use should not be encouraged. Give each tanker an initial briefing. Tactics and altitudes can change while the tanker is away from the fire on a load and return.

Completion Standards:

The lesson is complete when the student can demonstrate the initial briefing in a training environment for Phase 1 and in a fire environment for Phase 2. The student will perform the briefing with minimal deficiencies noted and it will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Tactical Briefing

02-02-N9065-HO

Objective:

To familiarize the student with the tactical briefing script (Phase 1).

To develop the student's proficiency in the use of the tactical briefing (Phase 2).

Content:

The NWCG SAS table for tactical briefings lists the content and order for the tactical and clearance to maneuver briefings. For standardization purposes the order of the content should be followed.

It is acceptable to transmit a briefing script in multiple calls to meet the needs of the situation.

Tactical Briefing

> Orientation – describe the fire orientation.
>
> Specific Hazards – These hazards are specific to the operations area and include low level hazards.
>
> Objectives – Giving the objective of the retardant drop will help communicate the target description and help to explain why the retardant is being used.
>
> Target Description – The target description defines the location the retardant is to be placed on the ground.
>
> > Coverage Level – Give the coverage level needed.
> >
> > Load Portion– Percentage of the load or start stop.
> >
> > Exit Instructions – Describes the route the tanker will fly after the drop.
>
> Clearance to Maneuver – Lets the tanker know that it can descend from the maneuvering altitude and fly the briefed pattern and drop.
>
> Clearance to Drop – Lets the tanker know that it is cleared to drop and that the line is clear.

These briefings should be practiced on the ground. The briefings should be memorized so that it takes very little effort while flying the aircraft. The target description portion of the tactical briefing takes practice to be concise and accurate.

Completion Standards:

The lesson is complete when the student can demonstrate the clearance to enter briefing in a training environment for Phase 1 and in a fire environment for Phase 2. The student will perform the briefing with minimal deficiencies noted. Safety will never be in question and the briefing will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Departure Briefing

02-03-N9065-HO

Objective:

To familiarize the student with the departure briefing script (Phase 1).

To develop the student's proficiency in the use of the departure briefing (Phase 2).

Content:

The NWCG SAS table for departure briefings lists the content and order for the departure briefing. For standardization purposes the order of the content should be followed.

It is acceptable to transmit a briefing script in multiple calls to meet the needs of the situation.

Drop Evaluation

> Start – Describe the retardant start point relative to the requested start point. Use the length of the retardant line to describe a late or early start. "The start of the drop was a quarter of a load early or the start of the drop was half a load late".
>
> Line – Describe the retardant line relative to the requested placement of the line. Use the wingspan of the tanker to describe a drop that was offline. "The drop was half a wingspan to the left or a quarter of a wingspan to the right".
>
> End - Describe the retardant end point relative to the requested end point. This is used during a start stop drop. Use the length of the retardant line to describe a late or early start. "The end of the drop was a quarter of a load early or the end of the drop was half a load late".

Instructions

> Fuel/Load and Return/Hold – Tanker instructions to load and return or not.
>
> Location – Tanker base to be used after the retardant drop.
>
> Departure briefings should be practiced on the ground. This briefing should be memorized so that it takes very little effort while flying the aircraft.

Completion Standards:

The lesson is complete when the student can demonstrate the departure briefing in a training environment for Phase 1 and in a fire environment for Phase 2. The student will perform the briefing with minimal deficiencies noted. Safety will never be in question and the briefing will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Verbal Skills

02-04-N9065-HO

Objective:

To familiarize the student with the importance of verbal skills (Phase 1).

To develop the student's proficiency with verbal skills (Phase 2).

To develop the student's mastery of verbal skills in a fire environment (Phase 3).

Content:

Communications is one of the most difficult aspects of a leadplane pilot's job. Studies show that 70 to 90% of communication is non-verbal. A large part of a leadplane pilot's job is communicating over the radio without the aid of visuals. This creates a distinct disadvantage for having good communications. Because of these limitations, communications need to be concise and clear. Added words, words with unclear meaning and small talk all tie up the frequency and can lead to confusion as well as an unsafe and ineffective environment.

Leadplane pilots set the tone for the mission. Their inflection, tone, cadence, and timing can have a large influence on the smoothness and success of the mission. A sense of urgency and emergency can easily be inserted into a mission, when there is no need to rush.

Although most of the leadplane communications are dynamic, there are times where the communications have a consistent set of information. It is important to take advantage of these situations to minimize communications over the radio. This will allow the pilot to focus on flying the aircraft. These communications are listed in the NWCG Standards for Aerial Supervision as scripts.

Leadplanes do have an advantage over other aerial supervision aircraft over the fire. The leadplane is authorized to go below 500 feet AGL. Having this option, along with smoke, eliminates some of the non-verbal limitations. There is a need to have strong verbal communication skills and relying on smoke or low level show me runs is not always practical.

Use good radio etiquette:

- Think before transmitting to aid in concise transitions.
- Use standard terminology.
- Identify the radio to be used and make sure it is selected on the audio panel.
- Keep transmissions short so that the receiver has a chance to confirm receipt of info and/or ask questions.

Communication is one factor that can distract the pilot from flying the aircraft. Prioritize flying the aircraft over communications. Abbreviating some of the information in communications will allow the pilot to manage the communications workload while focusing on flying the aircraft. If a tanker calls in at 12 miles during a live run the leadplane pilot can temporarily abbreviate the initial briefing to the altimeter setting and altitude. This way the leadplane pilot can focus on flying the profile and the inbound tanker can continue to the fire. At times a transmission to "stand by" will allow the leadplane pilot to focus on flying but will still inform the inbound aircraft that their initial call was heard.

If the air to air gets congested during a run, use the term "stand by, live run" or "clear the frequency, live run." Guard frequency can be used to communicate the same message. If communications cannot be made, continue to fly the pattern and exit that was briefed. The tanker pilot is listening to the same radio traffic and will be aware of what is going on.

While in Phase 1 of training there will be a transition in the learning process where communications will improve. A basic understanding and use of the briefing scripts will be expected. A basic understanding and use of target descriptions will also be expected. The student should show a continued improvement in the use of briefing scripts and target descriptions throughout the phase 1 training. It is not expected that the standard scripts or target descriptions be perfect to complete Phase 1.

While in Phase 2, the student will be expected to have the scripts well-rehearsed and be able to modify them in order to fit the situation. During Phase 2 the student will continue to build experience with briefing scripts, target descriptions and more dynamic communications while flying the airplane.

When identifying hazards or points of interest, describe them in relation to the tanker. "The tower will be to your left on downwind" and <u>not</u> "We will be right of the tower."

Completion Standards:

The lesson is complete when the student can successfully communicate intentions with the ground and aerial resources in a training environment for Phase 1 and in a fire environment for Phase 2.

The lesson is complete when the student can demonstrate mastery of verbal skills in a fire environment for Phase 3. Safety will never be in question and the briefing will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Target Descriptions

02-05-N9065-HO

Objective:

To familiarize the student with target descriptions (Phase 1).

To develop the students proficiency in giving target descriptions (Phase 2).

Content:

Primarily a target description is used to describe where an airtanker is to place a load of retardant. Target description skills will also aid in communicating with helicopters, ground firefighters, ATGS', and dispatch.

Elements of a Target Description:

Drop objectives.
Target location.
Type of drop.
Hazards.
Start point or end point.

Describing the objective and the tactics will aid in communicating a target description to the airtanker. The objective will give the overall goal for the retardant and the tactics will give more specifics. Objectives will be suppression, contingency lines, etc. while tactics will be structure protection, indirect line, direct line, reinforcement, etc.

When giving target descriptions, start with a big picture and then get more specific. Focus the airtanker pilot's attention on an obvious landmark that is near where the retardant is needed. Example: "Do you have the heel of the fire at bottom of the slope?" After getting positive confirmation, try to narrow the airtanker's focus down to the drop area. Example: "If you come up the right flank there is a rock outcropping near the right shoulder." Break up the transmissions to some degree so feedback and confirmation can be given by the airtanker. "Tie into the rock outcropping and bring the retardant direct down the right flank towards the heal."

Establish the heel, flanks, and head of the fire to help communicate the retardant location.

Descriptors for fire anatomy:
Heel (tail in AK), flanks, head, shoulders, island, finger, spot fire, slop over.

Descriptors for line building:
Tag on and extend, building line backwards/roll the retardant up to the existing retardant line, indirect or direct, center your load where the fire is burning through the retardant line, anchor the retardant into the road/rocks/etc.

Descriptors for smaller fires:
V the head, box the fire in, side step the drops, center your load on the fire.

Communicate the start point or end point of the retardant drop as well as where the retardant is to go on the ground.

There are some words that need to be used judiciously, ie spot and here. “Spot” can carry very different meanings to people on the ground versus people in the air. There are also multiple words for similar things depending on different areas of the country. An example is a canyon can be described as a draw, holler, drainage, etc.

Be careful using the word “spot” over the radio. “We will put the next load of retardant on that active spot on the north side of the fire.” When the word spot is used to describe an active area of the main fire, firefighters on the ground may interpret this as there is an “active spot fire” outside the main fires perimeter. Spot fires can be dangerous to firefighters and hamper control efforts. Try to only use the word “spot” to describe an actual spot fire outside control lines or the main fire.

Limit the use of the word “here” to describing the retardant start point and only when the leadplane is over the start point.

Only use cardinal headings for large scale or strategic descriptions. “We will be working on the south side of the fire”, or “the helibase or the dip site is east of the fire.” If the fire line has several turns, it may be hard for the ground forces to get a good idea how the fire lays out. They will tend to use cardinal headings and because of their limited overall picture of an irregular fire perimeter, their descriptions may not make sense to someone in the air.

Gaps in the retardant line can be difficult to describe. If the gap needs to be filled, don’t try to describe a start point. Use a phrase like “center the load on the gap in the retardant line” or “center the load across the drainage with the heavier fuels.”

Giving good target descriptions is a learned skill and takes practice. Continually work on target descriptions. Practice target descriptions while over the fire and waiting for tankers. Think about what is going to be said as well as saying it out loud. Over long breaks, like winter, target description skills will get rusty.

Completion Standards:

The lesson is complete when the student can demonstrate clear and concise target description in a training environment for Phase 1 and in a fire environment for Phase 2. Safety will never be in question and the target descriptions will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Flight Following

02-06-N9065-HO

Objective:

To familiarize the student with flight following procedures (Phase 1).

To develop the student's proficiency in the use of flight following procedures (Phase 2).

Content:

There are two types of flights when determining flight following. Point to point flights and fire mission flights.

All flights require flight following and it is up to the pilot to initiate the flight following.

National flight following frequency, 168.650, transmit and receive, tone 110.9, transmit and receive, will be used for all flight following unless an alternate frequency has been assigned by dispatch.

Point to point flights:

Point to point flights include a fire dispatch where the aircraft is being prepositioned for a fire and not to a fire.

In these situations, the pilot usually has time to fill out an Aircraft Flight Request 9400-1a form and send it to dispatch prior to the flight. The 9400-1a serves as a manifest for the flight.

The pilot sends the 9400-1a to the local dispatch who forwards it to the GACC. If GACC boundaries are crossed, the GACC forwards the 9400-1a to NICC who forwards it to the receiving GACC and then it is sent to the receiving local dispatch. It is prudent to call the receiving GACC or local dispatch to let them know your itinerary. Some GACC's like to communicate directly with the leadplane pilot and some like to go through the local dispatch within the GACC. This preference can change with personnel changes and is determined by good communications and asking questions.

From the Interagency Standards for Fire and Aviation Operations (Red Book):

> "NICC, in conjunction with the GACCs, is responsible for ensuring a coordinated response to wildland fire incidents and/or all-hazard incidents under the National Response Framework or other appropriate authorities. NICC positions resources (personnel, aircraft, supplies, and equipment) to meet existing and anticipated incident, preparedness, severity, wildland, and prescribed fire needs regardless

> of geographic location or agency affiliation. NICC coordinates movement of resources across Geographic Area boundaries. NICC allocates resources according to National Multi-Agency Coordinating Group (NMAC) direction when competition for wildland fire resources occurs among Geographic Areas."

Fire dispatches where the aircraft is being prepositioned for a fire and not to a fire tend to be flown on an IFR flight plan. This causes a duplication of flight following with agency dispatch and ATC. The priority for calls, in this situation, is with ATC. As time allows the pilot should call agency dispatch to establish flight following and monitor national flight following in case dispatch diverts the aircraft inflight.

If flight following with agency dispatch, AFF or 15 minute radio calls will be used (30 minutes in Alaska). When AFF is used, the pilot will initiate flight following with a radio call to dispatch utilizing the standard script found in the NWCG SAS. Further radio communications are not necessary. If AFF is not used, the pilot is responsible for radio communications with dispatch every 15 minutes (30 minutes in Alaska) after initiating flight following. The pilot will give dispatch the aircraft call sign, latitude, longitude and heading.

It is the pilot's responsibility to close out a flight plan.

Mission flights:
Mission flights are direct to an incident. These flights do not require the pilot to fill out an Aircraft Flight Request form or 9400-1a.

The pilot will flight follow with agency dispatch. When AFF is used, the pilot will initiate flight following with a radio call to dispatch utilizing the standard script found in the NWCG SAS. Further radio communications is not necessary. If AFF is not used, the pilot is responsible for radio communications with dispatch every 15 minutes (30 minutes in Alaska) after initiating flight following. The pilot will give dispatch the aircraft call sign, latitude, longitude and heading.

Completion Standards:

The lesson is complete when the student can demonstrate flight following in a training environment for Phase 1 and in a fire environment for Phase 2. Flight following will be established within 10 minutes after departing the airport environment with minimal deficiencies noted, considering traffic and airspace. The communications will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

FM Radio Set Up

02-07-N9065-HO

Objective:

To familiarize the student with the FM radio setup (Phase 1).

To develop the student's proficiency with FM radio setup (Phase 2).

Content:

The pilot must be knowledgeable in the use of the FM radio. During the inflight environment, the pilot must be able to complete the following primary tasks without hesitation:

- Enter transmit and receive frequencies.
- Enter a tone.
- Change the frequency from narrow band, wide band or digital.

Determine the steps needed to enter transmit and receive frequencies, the steps needed to enter a tone, and the steps needed to change the frequency from narrow band, or digital.

Other FM radio tasks, such as naming a frequency, choosing a channel, scrolling through channels, etc. must be familiar to the student but are secondary to the above three steps. Memory aids and checklists can be used for these secondary steps.

Programing FM radio frequencies can be distracting to the pilot and create a situation where the pilot's attention is focused inside the aircraft. It is not recommended to program FM frequencies while in the low-level environment. If it is necessary to program an FM frequency during a leadplane mission, position the aircraft in an environment where controlled flight into terrain is mitigated.

Completion Standards:

The lesson is complete when the student can demonstrate the primary FM radio tasks within a one-minute time frame on the ground and a two minute time frame in the air. The tasks will be completed in a training environment during Phase 1 and in a fire environment for Phase 2. Safety will never be in question and the programing will be accomplished without the reliance on the evaluator.

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 3 – Mountain Flying and Weather.

Time 0.5 Hours.

Objectives

1. Introduce the student to mountain flying techniques related to the leadplane mission.
2. Introduce the student to weather related to the leadplane mission.
3. Explain the importance of mountain flying techniques and weather.

Strategy

The goal of this unit is to introduce the student to the techniques to be used while flying in mountainous terrain and the associated weather.

Instructional Methods

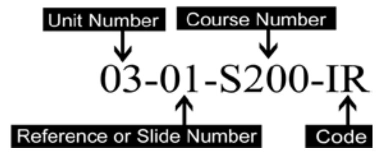
- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.
- Leadplane Lesson Plans.
- Internet access to cover weather related web sites.

Outline

I. Mountain Flying.
II. Weather.



Aids and Cues Codes:

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	SW – Student Workbook
IR – Instructor Reference	SR – Student Reference
HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 3 – Mountain Flying and Weather.

OUTLINE	**AIDS & CUES**
Hand Outs	
Review Objectives	
I. Mountain Flying.	03-01-N9065-HO
a. Cover the mountain flying techniques listed in the Leadplane Mountain Flying Lesson Plan. b. Provide examples of how each technique is performed and the importance of each technique.	
II. Weather.	03-01-N9065-HO
a. Cover the weather information listed in the Leadplane Weather Lesson Plan. b. Provide examples of how weather affects flying in mountainous terrain.	

Leadplane Training Lesson Plan

Mountain Flying and Weather

03-01-N9065-HO

Objective:

To familiarize the student with mountain flying (Phase I).

To develop the student's proficiency in mountain flying (Phase II).

To familiarize the student with weather sources, to include fire weather sources (Phase I).

To develop the student's proficiency in the use of weather sources and interpreting fire weather information (Phase II).

Content:

Leadplane pilots will be primarily flying in mountainous terrain. It is important to practice good mountain flying techniques and to stay heads up for changing weather.

Crossing ridges at a 45-degree angle is a standard practice when flying in the mountains. This is even more important when flying at the lower altitudes during a leadplane mission. Ridge crossing altitudes should be adjusted for the environment the aircraft is operating in. Adjust the pattern and or altitudes if there are any concerns with down air or turbulence.

Be very aware of flying on the lee side of terrain. The down drafts can create strong turbulence and down air situations. The turbulence will affect the aircraft flight profile as well as the outcome of the retardant drop.

Saddles can give the ability to fly at lower altitudes while flying leadplane patterns. Saddles will also funnel winds, creating up drafts and down drafts on either side of the saddle. Saddles will also adversely affect the aircraft flight profile as well as the outcome of the retardant drop.

Mountainous terrain can influence weather patterns and aid in creating weather that adversely affect flight conditions.

Leadplane patterns should be downhill, down canyon, down sun with the greatest degree of safety in mind. It is critical to plan for reduced performance or emergency situations. When planning patterns and exits in mountainous terrain, allow for reduced performance of the tanker aircraft and not just the lead aircraft. If the tanker or leadplane were to have an engine failure or other emergency that reduces performance, the aircraft must be able to fly the planned profile and exit.

Flying in higher temperatures, during the summer months, and over higher elevation terrain, creates a high-density altitude situation. Higher density altitude reduces engine performance, reduces propeller thrust and reduces lift created by the wing. These factors must be accounted for when planning leadplane profiles in mountainous terrain. Make the first low level passes at a higher altitude to gauge aircraft performance before committing to the normal leadplane flight profile. Evaluate performance changes throughout a leadplane shift as conditions change and affect density altitude.

In turbulent conditions, fly at speeds that are below Va for the aircrafts current weight. Maneuvering speed decreases as weight decreases. Maneuvering speed is only published for max gross weight. The formula for determining maneuvering speed at weights less than gross takeoff weight is:

$$\sqrt{\frac{Current\ Weight}{Max\ Gross\ Weight}} * \text{ V}_{\text{A}} \text{ at Max Gross Weight}$$

At the end of a fuel cycle, Va can decrease to a speed near that of the airtanker requested pattern speeds. This coupled with turbulent air and or poor pilot technique in avoiding asymmetrical G loading can result in aircraft damage.

If turbulence becomes heavy or severe the pilot should attempt to keep the wings of the aircraft near level. Attempting to hold airspeed or altitude creates additional stresses on the airframe. Variations in altitude should also be accepted to minimize stresses on the airframe but at the lower altitudes leadplanes operate at, altitude corrections may need to be made to avoid a CFIT situation.

Mountain waves generate widespread areas of rising and sinking air. The visual signatures of a mountain wave include lenticular clouds, cap clouds and rotor clouds. It is possible for a downdraft to exceed the climb capability of an aircraft at full power. It is also possible for rising air to make it impossible for an aircraft to keep from climbing. Areas of mountain waves must be avoided. If caught in this type of down air situation, turn toward lower terrain and execute a max performance climb. If caught in this type of up air situation, turn away from aircraft that may be above the leadplane and communicate with them.

While in level flight, it is possible to anticipate if the aircraft has enough altitude to clear the next ridge. This can be done by observing the nearest ridge relative to the next ridge beyond. If the next ridge beyond is being obscured more and more as the aircraft is flown towards the nearest ridge, the first ridge will not be cleared at the aircraft’s altitude. If more and more of the next ridge beyond can be seen as the aircraft is flown towards the nearest ridge, the first ridge will be cleared at the aircraft’s altitude.

Microbursts have caused several accidents in general aviation and can cause the same situations, to a greater degree, in the fire environment.

The wet microburst is found in the middle of an active thunderstorm or intense rain shower and avoiding the strong downdraft is relatively easy. The dry microburst, however, is somewhat more deceptive because it occurs with little or no warning in the clear air beneath virga. Dry microbursts are common in and near mountainous areas of the western U.S. in the summer. The formation of the dry microburst is possible with any thunderstorm. If dust is blowing underneath one of these thunderstorms, stay clear until the event passes which can be less than a half an hour in duration. Because down drafts from microbursts can exceed the climb capability of most aircraft, they should be avoided at all cost.

The majority of missions are operated in high density altitude situations and can drastically reduce aircraft performance. It is important to remember that horsepower output is reduced, propeller efficiency is reduced, and a higher true airspeed is required to sustain the airplane throughout its operating range.

A clear understanding of how weather can affect fire behavior and mountain flying is important in the leadplane mission. Knowing current weather in addition to weather outlooks will give a pilot the best overall understanding of conditions. Uses of this weather knowledge include:

- Adjusting tactics to anticipated fire weather and conditions i.e. direct attack, indirect attack, resources needs, etc.
- Choosing correct coverage levels.
- Anticipating factors that will affect density altitude.
- Anticipating winds, thunderstorms, rain, etc.

Completion Standards:

The lesson is complete when the student can demonstrate mountain flying that does not put the safety of flight in question in a training environment for Phase 1 and in a fire environment for Phase 2.

The lesson is complete when the student can demonstrate the use of fire weather sources and apply the information to firefighting activities in Phase 2.

Safety will never be in question and the flying will be accomplished without the reliance on the evaluator.

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 4 – Checklists and Single Pilot Resource Management.

Time 0.5 Hours.

Objectives

1. To familiarize the student with the use of checklists.
2. To familiarize the student with single pilot resource management.

Strategy

The goal of this unit is to introduce the student to the techniques in the use of checklists and single pilot resource management.

Instructional Methods

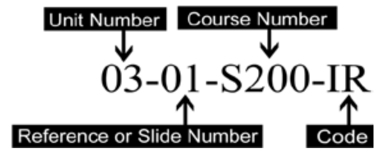
- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.

Outline

I. Checklist Use.
II. Single Pilot Recourse Management.
III. Aircraft Preflight and Aircraft Set Up.
IV. GPS Set Up.



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UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 4 – Checklists and Single Pilot Resource Management.

OUTLINE	**AIDS & CUES**
Hand Outs	
Review Objectives	
I. Checklist Use. a. Cover the checklist use techniques listed in the Leadplane Use of Checklists Lesson Plan. b. Cover the importance of checklist use in single pilot operations.	04-01-N9065-HO
II. Single Pilot Recourse Management. a. Cover the 5P approach. b. Cover the I'M SAFE Checklist. c. Cover mission recommendations.	04-02-N9065-HO
III. Aircraft Preflight and Aircraft Set Up. a. Cover the importance of aircraft preflight. b. Cover the techniques used in an aircraft set up.	04-03-N9065-HO
IV. GPS Set Up. a. Cover the importance of GPS familiarization. b. Cover the techniques in the use of a GPS.	04-04-N9065-HO

Leadplane Training Lesson Plan

Checklists

04-01-N9065-HO

Objective:

To familiarize the student with the use of checklists (Phase 1).

To develop the student's proficiency with the use of checklists (Phase 2).

Content:

The use of checklists is a vital component of single pilot resource management. The single pilot leadplane mission puts a heavy workload on the pilot and proper use of checklists is important.

The improper use, or the non-use, of checklists by pilots is often cited as a major contributing factor to aircraft accidents and incidents.

The various ways of conducting a checklist are influenced not only by the checklist device and the method of using it, but also by its "philosophy of use." The first is the redundancy between configuring the aircraft from memory and only then using the checklist procedure to verify that all items have been accomplished properly (set-up redundancy). The second is the redundancy between two crew members monitoring each other while conducting the checklist procedure (mutual redundancy).

Using a checklist as a do list can be slow and there is no redundancy to catch items that are inadvertently skipped. These items can go unnoticed after the checklist is thought to be completed. Using a flow to set up an aircraft from memory and then using the checklist to confirm the items have been addressed sets up redundancy in a single pilot situation.

Challenge and response is another way of running checklists in a two crewmember environment. Challenge and response also uses a flow to set up an aircraft from memory and then uses the checklist and second crewmember to confirm the items have been addressed. This is not recommended in a student and evaluator situation so as to prepare the student for single pilot operations. Challenge and response can be incorporated later during ASM operations as needed.

Many pilots use internal as well as external cues to aid in the initiating of checklists. This has disadvantages in that the pilot is relying on the cues to start the checklist. If the cues are removed or are missed due to distractions, a checklist item could be omitted.

There have been instances where experienced pilots have memorized flows and didn’t back the flow up with a checklist. Pilots also have been observed completing memorized flows and then picking up the physical checklist but not reading it. This removes the redundancy and increases the chance of an accident or incident.

The proper use of checklists is vital to the continued success and historic high level of safety in the leadplane mission.

Completion Standards:

The lesson is complete when the student can demonstrate the use of checklists with minimal deficiencies noted in a training environment for Phase 1 and in a fire environment for Phase 2. Safety will never be in question and the checklist use will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Single Pilot Resource Management

04-02-N9065-HO

Objective:

To familiarize the student with single pilot resource management (Phase 1).

To develop the student's proficiency with single pilot resource management (Phase 2).

Content:

The FAA uses the 5P approach to single pilot CRM or single pilot resource management (SRM).

Single-pilot resource management is the art of managing all onboard and outside resources available to a pilot before and during a flight to help ensure a safe and successful outcome.

To get the greatest benefit from SRM, the pilot needs a practical framework for application in day-to-day flying. One such approach, the 5P's, involves regular evaluation of: Plan, Plane, Pilot, Passengers, and Programming.

Plan

The plan includes the basic elements of cross-country planning: weather, route, fuel, current publications, etc. The plan also includes all the events that surround the flight and allow the pilot to accomplish the mission. The pilot should review and update the plan at regular intervals in the flight, bearing in mind that any of the factors in the original plan can change at any time.

Plane

The plane includes the airframe, systems, and equipment, including avionics. The pilot should be proficient in the use of all installed equipment as well as familiar with the aircraft/equipment's performance characteristics and limitations.

Pilot

The pilot needs to pass the traditional "IMSAFE" checklist (see below). This part of the 5P process helps a pilot identify and mitigate physiological hazards at all stages of the flight.

Passengers

Normally there will not be a passenger during leadplane operations. At times there have been waivers for passengers to observe leadplane operations. There can be approved personnel during refresher training, and there are evaluators during initial training. Passenger needs — e.g., physiological discomfort, anxiety about the flight, or desire to reach the destination — can create potentially dangerous distractions. If the passenger is a pilot, it is also important to establish who is doing what.

Programming

The programming can refer to both panel-mounted and hand-held equipment. Today's electronic instrument displays, moving map navigators, and autopilots can reduce pilot workload and increase pilot situational awareness. However, the task of programming or operating both installed and handheld equipment (e.g., tablets) can create a serious distraction from other flight duties. This part of the 5P approach reminds the pilot to mitigate this risk by having a thorough understanding of the equipment long before takeoff, and by planning in advance when and where the programming for approaches, route changes, and airport information gathering should be accomplished, as well as times it should not be attempted.

I'M SAFE Checklist

Illness: Do I have any symptoms?

Medication: Have I been taking prescription or over-the-counter drugs?

Stress: Am I under psychological pressure from the job? Am I worried about financial matters, health problems, or family discord?

Alcohol: Have I been drinking within 8 hours?

Fatigue: Am I tired and not adequately rested?

Emotion: Am I emotionally upset?

During leadplane operations there is a high work load placed upon the pilot. Having an intimate understanding of the tasks associated with the leadplane mission is critical to reducing work load and the successful outcome of the mission. Like in all flying, it is imperative that the pilot think ahead of where the aircraft is presently and project into the future for possible upcoming tasks. It is easy for the pilot to get overloaded with tasks if the tasks are not taken care of in a timely manner.

The following are mission recommendations for SRM and reducing time on any one task.

Be able to program an FM radio frequency, tone, and band with no hesitation.

Know the checklists and perform them as early as practical.

Know the communication scripts, found in the NWCG SAS, and be able to perform them with no hesitation.

Be intimately knowledgeable in the use of the TCAS and GPS.

Practice brevity at all times. Communications is a large distractor from flying the aircraft and increases work load.

An organized knee board will aid in keeping track of resources.

Keep additional documentation within reach of the cockpit.

Completion Standards:

The lesson is complete when the student can demonstrate single pilot resource management in a training environment for Phase 1 and in a fire environment for Phase 2. Safety will never be in question and the SRM will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Aircraft Preflight and Set Up

04-03-N9065-HO

Objective:

To familiarize the student with the aircraft preflight as it pertains to the leadplane mission and the aircraft set up for the leadplane mission (Phase 1).

To develop the student's proficiency with the aircraft preflight as it pertains to the leadplane mission and the aircraft set up for the leadplane mission (Phase 2).

Content:

An aircraft preflight will be done at the beginning of each shift. The preflight will follow the manufacturer's recommendations and the aircraft flight manual.

The goal of an aircraft set up is to have the aircraft mission ready, after the preflight, so as to minimize response times.

After the aircraft preflight has been done the following items should be considered:

- Any aircraft checks that can be done prior to engine start should be completed.
- Travel bags and other items in the aircraft should be secured.
- Knee board and headset should be ready for the next mission.
- Tie downs and plugs should be removed and stowed or appropriate for the weather conditions.
- Paper work should be up to date.
- Mission PPE should be readily accessible.
- Daily briefings should be completed.
- Any appropriate mission documents should be on board.
- Smoke Oil Filled.

Completion Standards:

The lesson is complete when the student can demonstrate aircraft preflight and set up for the leadplane mission and all items are completed prior to operational availability. Safety will never be in question and the preflight will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

GPS Setup

04-04-N9065-HO

Objective:

To familiarize the student with the GPS setup (Phase 1).

To develop the student's proficiency with GPS setup (Phase 2).

Content:

The pilot must be knowledgeable in the use of the GPS as the PIC and as it relates to fire dispatches.

For fires the pilot must be able to perform the following primary tasks:

- Enter a lat long and go direct to the point.
- Enter a lat long and go direct to the point in flight in the event the aircraft is diverted.
- Determine the lat long of a point the aircraft is over while in flight.

Determine the steps needed to enter a lat long as a part of a flight plan as well as a user way point.

Generally, a GPS will not let the pilot alter an active way point. In case the aircraft is diverted with a new lat long, the new lat long should be entered as a new way point.

Determine the steps needed to capture the lat long as the aircraft flies over a point on the ground.

Completion Standards:

The lesson is complete when the student can demonstrate the primary GPS setup tasks within a two minute time frame on the ground and a three minute time frame in the air. The tasks will be completed in a training environment during Phase 1 and in a fire environment for Phase 2. The GPS setup will be accomplished without the reliance on the evaluator.

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 5 – In Route and Time Management.

Time 0.5 Hours.

Objectives

1. Introduce the student with in route procedures related to the leadplane mission.
2. Explain the importance of time management and how it affects workload during the leadplane mission.

Strategy

The goal of this unit is to introduce the student to the tasks that need to be considered during the in route phase of flight and the importance of time management in the leadplane mission.

Instructional Methods

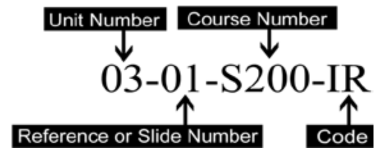
- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.

Outline

I. In Route to an Incident.
II. Time Management.



Aids and Cues Codes:

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	SW – Student Workbook
IR – Instructor Reference	SR – Student Reference
HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 5 – In Route and Time Management.

OUTLINE	**AIDS & CUES**
Hand Out	
Review Objectives	
I. In Route to an Incident.	05-01-N9065-HO
a. Cover the tasks listed in the Leadplane In Route and Time Management Lesson Plan. b. Provide examples of how each task is performed and the importance of each task.	
II. Time Management.	05-01-N9065-HO
a. Cover the time management information listed in the Leadplane In Route and Time Management Lesson Plan. b. Describe how pilot workload increases with poor time management and how this can create distractions.	

Leadplane Training Lesson Plan

In Route and Time Management

05-01-N9065-HO

Objective:

To familiarize the student within route procedures and time management (Phase 1).

To develop the student's proficiency in the use of in route procedures and time management (Phase 2).

Content:

There are multiple tasks that can be addressed while flying between the departure airport and the FTA. Completing these tasks during the in route phase of flight will allow the tasks to be completed during a lower workload time period. By completing these tasks, the pilot will have more time during higher work load times, have greater situational awareness and will demonstrate good single pilot resource management.

In Route

Going to a fire:

- Establish flight following.
- Plot the lat long on a sectional or iPad.
- Look at airspace in route to the fire and around the fire.
- Look at the elevation of the fire. Knowing the fire elevation will help plan the descent.
- Know what direction lower terrain lies from the fire.
- Check for hazards that might impact flight operations over the fire or in route to the fire.
- Program radio frequencies and monitor them.
- Determine where the closest or most practical fuel is.
- Determine where the closest emergency airport is, considering terrain.
- Consider possible destinations after being released or relieved.
- Determine what reload bases the tankers will use.
- Figure out when relief might be needed and write it down. If operations dictate that relief needs to ordered, the time will have been determined.
- Be aware of time zone changes.
- Consider calling dispatch and find out what resources have been dispatched to the fire or are over the fire.
- Call the ATGS or IC if there is radio traffic concerning the leadplane arrival time.

Leaving a fire:

- Check out with ATGS, IC, or the relief leadplane.
- Flight follow with dispatch or ATC.
- Listen to tanker base ramp frequency, order fuel if needed.
- Exit at an altitude that will not impact the tankers in route to the FTA.

Time Management

It is important for leadplane pilots to exercise efficient time management. This is especially true during the flight portion of the mission. Poor time management can create a high workload environment that leads to distractions during critical phases of flight.

The leadplane mission can be dynamic and difficult to predict upcoming tasks or workloads. Leadplane pilots need to look for situations where the work load is predictable and less dynamic. Having these predictable tasks memorized and being proficient with them will minimize the time devoted to the tasks and will lower the workload.

- Being familiar with aircraft checklists and procedures.
- Being proficient with standard scripts.
- Being proficient with FM radio programing.
- Being proficient with the aircraft GPS.
- Being proficient with ForeFlight or navigation/chart aids.

Completion Standards:

The lesson is complete when the student can demonstrate the in route and time management items in a training environment for Phase 1 and in a fire environment for Phase 2. Items will be completed or considered and briefed to the evaluator prior to entry into the FTA or exiting the FTA with minimal deficiencies noted. Safety will never be in question and the tasks will be accomplished without the reliance on the evaluator.

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 6 – FTA Review and High/Low Recon.

Time 0.5 Hours.

Objectives

1. To review the FTA and FTA protocols.
2. To familiarize the student with the high and low recon.

Strategy

The goal of this unit is to review FTA and FTA protocols and introduce the student to the leadplane high and low recon information. The information will be used to build a foundation to develop skills used during the leadplane flight training.

Instructional Methods

- Informal lecture.
- Facilitated interactive group discussion.

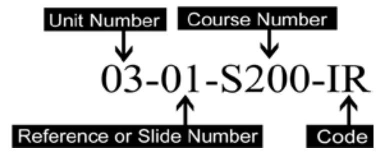
Instructional Aids

- Computer with LCD projector and presentation software.
- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.
- FTA card.

Outline

I. FTA Review.

II. High/Low Recon.



Aids and Cues Codes:

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PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 6 – FTA Review and High/Low Recon.

OUTLINE	**AIDS & CUES**
Hand Outs	
Review Objectives	
I. FTA Review.	06-01-N9065-HO
a. Review the FTA protocols listed in the Leadplane Fire Traffic Area (FTA) Lesson Plan.	
II. High/Low Recon.	06-02-N9065-HO
a. Cover the high and low recon techniques listed in the Leadplane High/Low Recon Lesson Plan.	

A publication of the
National Wildfire
Coordinating Group

Fire Traffic Area Diagram

PMS 505d JANUARY 2020

This document supplements the *NWCG Standards for Aerial Supervision*, PMS 505, https://www.nwcg.gov/publications/505.

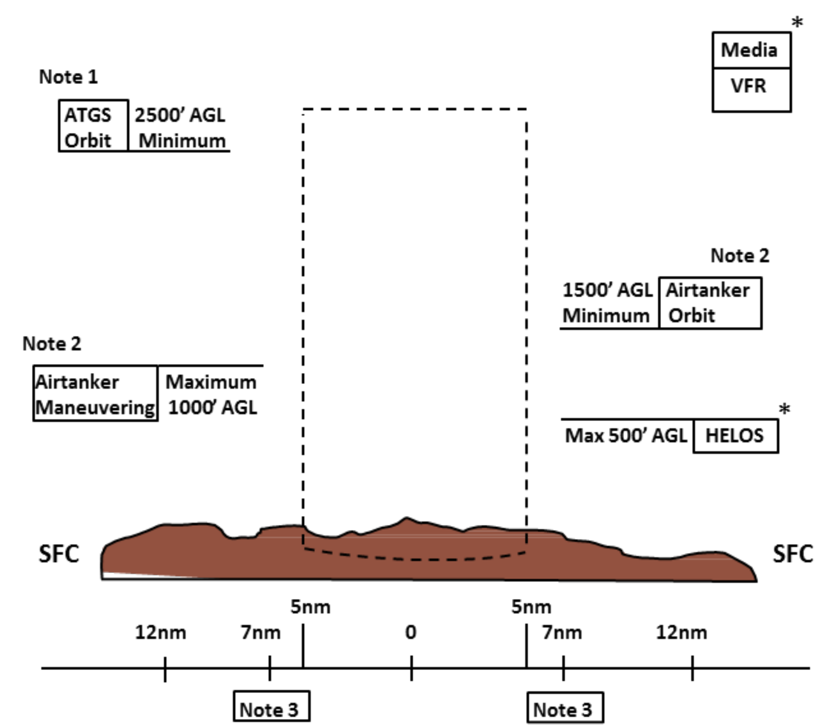
Fire Traffic Area (FTA) Dec 2020

National Interagency Airspace: http://airspacecoordination.org

*****Clearance is required to enter the FTA*****

Initial Radio Contact: 12 nm on assigned air tactical frequency.
No Radio Contact: Hold a minimum of 7 nm from the incident.

Note: Airtanker maneuvering altitude determines minimum airtanker and ATGS orbit altitudes. Assigned altitudes may be higher and will be stated as MSL.



Note 1	1000' min. separation between ATGS orbit and airtanker orbit altitude.
Note 2	500' min. separation between airtanker orbit and maneuvering altitude.
Note 3	On arrival reduce speed to cross 7 nm at assigned altitude and 150 KIAS or less.

* **Helicopters:** Fly assigned altitudes and routes.

* **Media:** Maintain VFR separation above highest incident aircraft or position and altitude as assigned by controlling aircraft.

Airtanker Base As Assigned	Air Guard 168.625 Tx Tone 110.9	Air to Air As Assigned	National Flight Following 168.650 Tone 110.9 TX and RX

National Interagency Airspace: http://airspacecoordination.org

Incident Airspace Reminders

Fire Traffic Area (FTA)

- The FTA is a communication protocol for firefighting agencies. It does not pertain to other aircraft that have legal access granted by the FAA within a specific TFR.
- The FTA should not be confused with a TFR, which is a legal restriction established by the Federal Aviation Administration to restrict aviation traffic while the FTA is a communication tool establishing protocol within firefighting agencies.
  - Participating aircraft must adhere to TFR policies as established by the FAA.
  - For example, if the TFR boundary of a polygon exceeds the 12-mile initial contact ring, clearance will still be required in order to enter the TFR.
  - If the TFR boundary is within the 12-mile ring, proceed with standard FTA communication procedures.

Temporary Flight Restriction (TFR)

All assigned/ordered aircraft must obtain clearance into the incident TFR by the on scene aerial supervisor or the official in charge of the on scene emergency response activities.

- **A ROSS order or Aircraft Dispatch Form is not a clearance into a TFR.**
- The first responding aircraft, typically on extended attack incidents, must have reasonable assurance that there are no other aircraft in the TFR by making blind calls on the TFR frequency, other assigned air-to-air frequencies, and double checking with ground personnel (IC, OPS, or Helibase).
- There may be multiple aircraft operations areas within a TFR.
- Remember: Non-Incident aircraft may enter the TFR under the following conditions:
  - The aircraft is carrying a **law enforcement official**.
  - The aircraft is on a flight plan and carrying **properly accredited news representatives.**
  - The aircraft is operating under the ATC approved IFR flight plan.
  - The operation is conducted directly to or from an airport within the area, or is necessitated by the impracticability of VFR flight above or around the area due to weather, or terrain; notification is given to the Flight Service Station (FSS) or ATC facility specified in the NOTAM to receive advisories concerning disaster relief aircraft operations; and the operation does not hamper or endanger relief activities and is not conducted for observing the disaster.

Further Information: *NWCG Standards for Aerial Supervision*, PMS 505, https://www.nwcg.gov/publications/505

Leadplane Training Lesson Plan

Fire Traffic Area

06-01-N9065-HO

Objective:

To familiarize the student with the FTA procedures (Phase 1).

To develop the student's proficiency in FTA procedures (Phase 2).

Content:

Refer to the Fire Traffic Area card in the NWCG SAS.

The airspace surrounding an incident is managed by the aerial supervisor who must implement Fire Traffic Area (FTA) procedures. All wildland incidents, regardless of aircraft on scene, have an FTA. If an incident has an active TFR in place FTA rules apply to the TFR and clearance from the controlling aircraft is required prior to TFR entry. If aerial supervision is not on scene, the first aircraft on scene will establish the FTA protocol.

The FTA is a communication protocol for firefighting agencies. It does not pertain to other aircraft that have legal access within a TFR (Medevac, Law Enforcement, Media, VFR airport traffic, IFR traffic cleared by the FAA).

The fire dispatch or IROC order is not a clearance into a TFR.

ATGS Orbit Altitude

The ATGS orbit altitude is initially established at 2500 feet AGL and is flown in a right-hand pattern. If the fire progresses into higher terrain the ATGS will need to fly at higher altitudes to maintain separation above the inbound tankers and the air tanker orbit altitude. The minimum altitude above the airtanker orbit altitude should be 1000 feet. If tankers need a higher altitude to cross terrain prior to entering the FTA, the ATGS altitude will need to be flown at a higher altitude to accommodate the inbound tankers altitude needs. Clouds or smoke may impact the ATGS orbit altitude.

Airtanker Orbit Altitude

The inbound air tankers will be brought into the FTA at the airtanker orbit altitude. The airtanker orbit altitude is initially established at 1500 feet AGL and is flown in a left-hand pattern. The left-hand pattern will allow for greater visibility for the captain of larger airtankers even when the drop will be flown in a right-hand pattern. The altitude is based on the elevation of the operations area for the tanker.

Airtanker Maneuvering Altitude

Once the airtanker understands the objective/target description of the drop they can be cleared down from the airtanker orbit altitude to the airtanker maneuvering altitude. This will be the pattern altitude that the drop will be flown from. The airtanker will descend to the airtanker maneuvering altitude prior to establishing a right-hand turn if the drop is going to be out of a right-hand pattern. The airtanker maneuvering altitude is initially established at 1000 feet AGL and is usually flown in left-hand pattern. Right-hand patterns are nonstandard and must be briefed before flown. Terrain and smoke sometimes dictate that the pattern be flown in a right hand pattern. Leadplanes operate at the airtanker maneuvering altitude during join ups and prior to a show me.

Three (3) C's of initial contact – Communication requirements and related actions to be undertaken by the pilot of the inbound aircraft:

Communication – Establish communications with the controlling aerial supervision resource over the incident (ATGS, LPIL, ASM, HLCO).

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.

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.

Departing Aircraft – Aircraft departing incident airspace must follow assigned departure route and altitude. Aerial Supervisors must establish/deconflict routes for departing aircraft through or away from other incident aircraft operations.

Holding in the event of no communications by the 7-mile ring.

If communications have not been established prior to 7 miles the aircraft will hold outside 7 miles. Where to hold will be dictated by unique factors associated with each individual environment. Aircraft can hold off to one side of the FTA or on smaller FTA's can orbit outside 7 miles. Smoke and wind may be a factor that makes it impractical to orbit the FTA and may dictate which side of the FTA an aircraft holds. Terrain may also dictate where an aircraft holds due to the terrains physical location as well as its effects on winds. The route other aircraft take to and from the fire should be avoided.

Note the difference between an FTA and a TFR.

There are not multiple FTA's within a TFR. There may be multiple operations areas.

Completion Standards:

The lesson is complete when the student can demonstrate proper FTA procedures in a training environment for Phase 1 and in a fire environment for Phase 2. The student will adhere to all FTA card content, with minimal deficiencies noted. Safety will never be in question and FTA procedures will be accomplished without the reliance on the evaluator.-

Leadplane Training Lesson Plan

High and Low Recons

06-02-N9065-HO

Objective:

To familiarize the student with the high and low recons (Phase 1).

To develop the student's proficiency with the high and low recons (Phase 2).

Content:

The high-level recon is done prior to low level flight to analyze terrain for potential approach and exit paths and to detect hazards. A quick size up can be done and any strategies or tactics can start to be developed. Once the operations area is known, the leadplane pilot will fly a 360-degree pattern to observe the fall of terrain, potential flight patterns, and any hazards in the operations area.

Consider the following items:

- Analyze terrain for downhill exit.
- Look for hazards such as wires, towers, other aircraft, etc.
- Determine a quick fire size up and suppression strategy.
- Determine flight patterns to meet the strategy.
- Analyze winds, turbulence, and any other weather.

Once a high-level recon is complete and the pilot has a preliminary plan for flight paths and has identified and mitigated any hazards, a low-level recon can be done. The leadplane must obtain a low-level clearance prior to descending. A low-level recon is done to check for physical and environmental hazards while flying the approach and exit paths. The pilot will also use this time to identify heading, altitude, and target identification features.

Consider the following items:

- Confirm terrain for downhill exit.
- Continue to scan for hazards.
- Continue to analyze the flight environment with the tanker's performance and possible reduced performance in mind.
- Consider downhill terrain in the operations area as compared to terrain further away from the operations area. Terrain on the drop maybe downhill only to fly towards higher terrain for the exit.

Completion Standards:

The lesson is complete when the student can demonstrate the high and low recons in a training environment for Phase 1 and in a fire environment for Phase 2. Items will be completed or considered and briefed to the evaluator prior to low level flight and after low level flight with minimal deficiencies noted. Safety will never be in question and the recon will be accomplished without the reliance on the evaluator.

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 7 – Leadplane Profile, Exit Maneuver, Exit Route, and Emergency Procedures.

Time 1.0 Hours.

Objectives

1. To familiarize the student with factors affecting altitude control during the leadplane profile.
2. To familiarize the student with factors affecting airspeed control during the leadplane profile.
3. To familiarize the student with factors affecting bank angle during the leadplane profile.
4. To familiarize the student with the leadplane profile and exit maneuver.
5. To familiarize the student with simulated emergency procedures.

Strategy

The goal of this unit is to introduce the student to the leadplane profile, exit maneuver, exit route and emergency procedures information. The information will be used to build a foundation to develop skills used during the leadplane flight training.

Instructional Methods

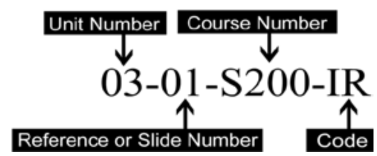
- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Computer with LCD projector and presentation software.
- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.

Outline

I. Altitude Control.
II. Airspeed Control.
III. Bank Angle.
IV. Leadplane Flight Profile and Exit Maneuver.
V. Emergency Procedures.
VI. Exit Routes.



Aids and Cues Codes:

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PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 7 – Leadplane Profile, Exit Maneuver and Exit Route, and Emergency Procedures.

OUTLINE	**AIDS & CUES**
Hand Outs	
Review Objectives	
I. Altitude Control.	07-01-N9065-HO
a. Cover the altitude control techniques listed in the Leadplane Altitude Control Lesson Plan.	
II. Airspeed Control.	07-02-N9065-HO
a. Cover the airspeed control techniques listed in the Leadplane Airspeed Control Lesson Plan.	
III. Bank Angle.	07-03-N9065-HO
a. Cover the bank angle control techniques listed in the Leadplane Bank Angle Lesson Plan.	
IV. Leadplane Flight Profile and Exit Maneuver.	07-04-N9065-HO 07-01-N9065-PPT
a. Cover the leadplane flight profile techniques listed in the Leadplane Flight Profile and Exit maneuver Lesson Plan. b. Cover the leadplane Exit maneuver techniques listed in the Leadplane Flight Profile and Exit maneuver Lesson Plan.	

V. Emergency Procedures. 07-05-N9065-HO

a. Cover emergency procedures listed in the Leadplane Emergency Procedures Lesson Plan.

VI. Exit Routes. 07-06-N9065-HO

a. Cover exit routes listed in the Exit Routes Lesson Plan.

Leadplane Training Lesson Plan

Altitude Control

07-01-N9065-HO

Objective:

To familiarize the student with factors affecting altitude control during the leadplane profile (Phase 1).

To develop the students proficiency in altitude control in a training environment (Phase 2).

Content:

Altitude control is important with regards to maintaining a constant altitude and proper target altitudes during the profile descent.

Altitude control is critical due to the close proximity of other aircraft in the fire traffic area. Altitude separation between aircraft in the FTA is generally 500 to 1000 feet. There is not much room for error considering possible deviations due to turbulence, pilot work load and distractions.

When determining a leadplane profile it is important to start from the planned altitude to minimize corrections during the maneuver. Poor pilot technique in maintaining altitude or the descent will affect the final altitude of the aircraft when over the start point for the retardant drop.

Maintaining a proper drop altitude is important for aircraft separation from the fuels. Proper drop altitude also allows for a uniform coverage level of the retardant on the fuels.

Turbulence can affect changes in altitude. The pilot must determine the importance of maintaining altitude while maneuvering in the FTA in turbulence. At times it may be prudent to accept deviations in altitude due to environmental factors. Altitude deviations due to outside influences like winds and turbulence are normal. The leadplane pilot needs to maintain positive aircraft control and continuously adjust for these deviations.

Omitting the altimeter from the pilots scan is a common error leading to poor altitude control.

Pilots should manage work load and distractions so they do not adversely affect altitude control.

Completion Standards:

The lesson is complete when the student can demonstrate altitude control, within the phase altitude limitations.

For Phase I (training environment): Altitude control of ±200 feet during FTA orbit, +200/-0 feet during the leadplane profile.

For Phase II (fire environment): Altitude control of ±100 feet during FTA orbit, +100/-0 feet during the leadplane profile.

Safety will never be in question and altitude control will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Airspeed Control

07-02-N9065-HO

Objective:

To familiarize the student with factors affecting airspeed control during the leadplane profile (Phase 1).

To develop the students proficiency in airspeed control in a training environment (Phase 2).

Content:

Why does an airplane stall? The maximum angle of attack has been exceeded. Technically, it does not matter whether the airspeed is high or low, or whether the bank angle is zero or 90 degrees. However, practically speaking, airspeed and bank angle have a lot to do with stalling an airplane.

With the wide variety of airtankers in use, there can be a wide range of requested airspeeds. Each individual airtanker can also have variations in airspeeds based on pilot preference, aircraft weight, flight pattern, exit, full or partial load, and environmental factors.

Airspeed control can be a difficult task during leadplane training. Aircraft configuration, requested airspeed, changing airspeeds throughout the profile, environmental factors, pilot workload and distractions can make holding a target airspeed difficult.

The application of power will be one of the biggest factors in airspeed control. It is important to make power changes at the appropriate time, so the power setting does not negatively affect airspeed. One common mistake is not reducing power prior to initiating a decent. Not reducing power prior to lowering the pitch attitude will cause the aircraft to accelerate. This seems like common sense, but it is missed mainly due to high workload and distractions. A similar mistake is made during the exit maneuver. Due to the workload of flying a precise flight path and the distraction of terrain, power is not always increased appropriately during the climb.

Forgetting to use flaps will also be a contributing factor to high airspeeds during the leadplane profile. Forgetting to raise the flaps during the exit maneuver will cause a lower than normal airspeed or a lower than normal climb rate.

Aircraft pitch will also affect airspeed. While the evaluator is flying a mission or demonstrating a flight profile, the student should pay attention to the sight picture and how pitch changes throughout the maneuver.

Completion Standards:

The lesson is complete when the student can demonstrate airspeed control, within the phase airspeed limitations.

For Phase I (training environment): Target airspeed no slower than Vyse, deviations within ±15 knots in the FTA orbit, and deviations +15/-5 knots during the leadplane profile.

For Phase II (fire environment): Target airspeed deviations within ±10 knots in the FTA orbit, and deviations +10/-5 knots during the leadplane profile.

Safety will never be in question and airspeed control will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Bank Angle

07-03-N9065-HO

Objective:

To familiarize the student with factors affecting bank angle during the leadplane profile (Phase 1).

To develop the students proficiency in bank angle control in a training environment (Phase 2).

Content:

Why does an airplane stall? The maximum angle of attack has been exceeded. Technically, it doesn't matter whether the airspeed is high or low, or whether the bank angle is zero or 90 degrees. However, practically speaking, airspeed and bank angle have a lot to do with stalling an airplane.

As bank angles increases the load factor will increase on the aircraft and thus the stall speed is increased. Bank angles of 60 degrees produce a 2 G load factor.

All turns must be coordinated. If the bank angle used during the leadplane profile produces a condition where the aircraft will over shoot final, the run should be discontinued. Trying to salvage a run by over banking or using excessive rudder in the direction of the turn is unacceptable. These situations could cause the aircraft to stall/spin at a low altitude and be unrecoverable.

When leading airtankers, shallow to medium banked turns no greater than 30 degrees should be used. On occasion, the possibility may exist where terrain or conditions dictate maneuvering with bank angles greater than the standard 30 degrees. In such circumstances, angles of bank up to, but not exceeding, 45 degrees are acceptable. Inform the airtanker pilot ahead of time if bank angles in excess of 30 degrees are anticipated.

When leading tankers, slow to moderate roll rates should be used. Larger aircraft tend to have slower roll rates than the leadplane aircraft.

If able, patterns should be planned so that a constant bank angle can be held from downwind to final.

Caution should be used to avoid asymmetrical G loading. When an aircraft is maneuvered in two plains simultaneously, the aircraft is subjected to asymmetrical G loading. Asymmetrical G loading creates a differential in the loading of one wing relative to the other. The wing on the outside of the turn is subjected to greater G forces then the wing on the inside of the turn. This can result in structural damage to the aircraft.

An airplane’s asymmetrical G limit for any given weight is 2/3 of the symmetrical G load limit at the same weight for the same aircraft. Therefore an aircraft can be damaged when flying with asymmetrical G loads even if the aircraft is flown below the Va speed for a given weight.

The primary goal of maneuvering the aircraft about one axis prior to another is to avoid asymmetrical G loading.

Completion Standards:

The lesson is complete when the student can demonstrate bank angle control, within the phase bank angle limitations. Standard bank angles will be 30 degrees unless briefed and then up to 45 degrees.

For Phase 1 (training environment): Target bank angle within ±15 degrees in the FTA orbit, and within ±15 degrees during the leadplane profile.

For Phase 2 (fire environment): Target bank angle within ±10 degrees in the FTA orbit, and within ±5 degrees during the leadplane profile.

Safety will never be in question and bank angle control will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Leadplane Profile and Exit Maneuver

07-04-N9065-HO

Objective:

To familiarize the student with the Leadplane profile and exit maneuver (Phase 1).

To develop the student's proficiency with flying the leadplane profile and exit maneuver (Phase 2).

Content:

The standard leadplane profile is like a standard traffic pattern at an airport. Terrain will be the most prevalent factor that will force an adjustment to the pattern. Winds, other aircraft, smoke and visibly issues will also cause an adjustment in the pattern flown.

To have a basic starting place to adjust from, consider flying a pattern over flat terrain where a downwind, base, and final leg turns are perpendicular to each other. The pattern altitude will be from 800 to 1000 feet above the drop height.

Configure flaps and power setting to maintain target airspeed on downwind. Start a descent on downwind once past the retardant start point and lose approximately 200 feet prior to base turn. Start the base turn after a point where the aircraft will be wings level on final. With a 500 foot per minute descent rate and a standard rate turn, the aircraft will lose approximately 500 feet on base. There will be approximately 200 feet to lose on final.

Start adding power and accelerating prior to the start point. This will provide additional energy for the exit maneuver and allow the leadplane to get out of the tanker's way sooner. Do not start adding power too early or the leadplane will get too far ahead of the tanker.

The minimum drop height above the vegetation is 60 feet for SEATs, 150 feet for LATs and 200 feet for VLATs. These drop heights are based on a coverage level 4. It is important for the retardant to "rain" vertically with little or no forward movement. The airtanker pilot is responsible for maintaining safe drop heights. As coverage level increases, the mass of the retardant is greater and takes longer to stop its forward movement and rain vertically down on the fuels. As coverage level increases so does minimum drop height. See the SEAT, LAT, VLAT and MAFFS lesson plans for drop heights at higher coverage levels.

When the leadplane is over the start point, identify the start point with a verbal, start “here." When the word “here” is broadcasted, the smoke system should simultaneously be started.

During the exit maneuver smoothly roll in to a 30-degree bank and then initiate a climb. The flaps, if they were used, can be raised and the power adjusted. The objective of the exit maneuver is to get out of the tankers way and to climb away from the terrain. The climb can be initiated first and then the bank if terrain dictates.

Avoid the desire to look back at the retardant drop. Seeing the drop will not affect the outcome. It is critical that the pilot’s attention is focused on managing the aircraft while climbing away from the ground and accelerating. The environment in front of the leadplane is far more important to pay attention to than the environment that is behind the aircraft.

In the event of a split drop where the second half of the load will be tied into the end of the first half of the drop, but at a different angle, there is a decision to be made. It must be determined if flying a pattern to evaluate the drop is more important than continuing to fly the exit so that the tanker can follow the leadplane back to a downwind to make the second drop. It is usually better to stay with the tanker and evaluate the first half of the drop from the downwind position rather than disengaging from the tanker to fly over the drop to evaluate it. Rejoining with the tanker takes much more time and air space as well as disrupting the sequencing of aircraft. Asking the ATGS, other tankers or ground forces to evaluate the drop are other options.

Caution should be used to avoid asymmetrical G loading. When an aircraft is maneuvered in two plains simultaneously, the aircraft is subjected to asymmetrical G loading. Asymmetrical G loading creates a differential in the loading of one wing relative to the other. The wing on the outside of the turn is subjected to greater G forces then the wing on the inside of the turn. This can result in structural damage to the aircraft.

An airplane’s asymmetrical G limit for any given weight is 2/3 of the symmetrical G load limit at the same weight for the same aircraft. Therefore, an aircraft can be damaged when flying with asymmetrical G loads even if the aircraft is flown below the Va speed for a given weight.

The primary goal of maneuvering the aircraft about one axis prior to another is to avoid asymmetrical G loading.

Leadplane patterns should be downhill, down canyon, down sun with the greatest degree of safety in mind. Maintain the agreed upon airspeed to maintain separation between the leadplane and airtanker. A descending approach with a constant rate of descent is desired, terrain permitting. Brief the airtanker pilot ahead of time if special maneuvering is anticipated. Advise the airtanker of hazards (i.e. turbulence, down air, restrictions to visibility, obstacles, etc.).

3 Basic Leadplane Profiles

Lead Profile

In a lead profile the leadplane will be in front of the tanker. The tanker will have the responsibility for separation between the two aircraft once the aircraft are joined up.

Chase Profile

In a chase profile the leadplane will be behind the tanker. It is best to stay slightly above the tankers flight path, to stay out of the wake turbulence, and slightly outside the tankers turn. The leadplane has responsibility for separation. The leadplane can verbally confirm or adjust the position of the tanker when on final. The leadplane adjusts airspeed and pattern to match the tankers.

Show Me Profile

In a show me profile the tanker will stay at altitude while the leadplane descends and fly's the pattern as briefed. The tanker will position itself so it can see the leadplane. The tanker will adjust its pattern so when the leadplane finishes the show me run, and is climbing up to pattern altitude, the tanker can maneuver in behind the leadplane as it turns to downwind.

Aircraft Configuration

Depending on the leadplane aircraft, a higher prop RPM setting will be used to maximize thrust. Flaps can be used to help control airspeed while descending during the lead profile.

Profile Illusions

Flight profile over higher terrain than the drop: The visual illusion will be that the leadplane is low during the maneuver which will create a higher than normal altitude on final.

Flight profile over lower terrain than the drop: The visual illusion will be that the leadplane is high during the maneuver which will create a lower than normal altitude on final.

Flight profile over flat terrain: The visual illusion will be that the leadplane is high during the maneuver, especially with short vegetation, which will create a lower than normal altitude on final.

To minimize profile illusions, determine pattern altitudes and fly the altitudes prior to a retardant drop.

Completion Standards:

The lesson is complete when the student can demonstrate the leadplane profile and exit maneuver in a training environment for Phase I and in a fire environment for Phase II. When the student performs the leadplane profile and exit maneuver, the safety of flight will never be in question. The maneuvers will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Leadplane Mission Emergency Procedures

07-05-N9065-HO

Objective:

To familiarize the student with simulated emergency procedures (Phase 1).

To develop the student's proficiency with managing simulated emergency procedures (Phase 2).

Content:

Overruns

In the event of an overrun of the leadplane by the airtanker, the airtanker crew will attempt to communicate the overrun and utilize the following standard overrun procedures unless otherwise briefed:

1. Straight out flight paths: Pass the leadplane on the right.
2. Left or right turn flight paths: Pass the leadplane outside the turn.
3. Terrain or visibility limitations: When terrain or visibility prevents utilizing 1 or 2, pass above the leadplane.

An over run should not happen without the call out "pick it up" from the airtanker first. The call out "pick it up" should be interpreted as a precursor to an emergency situation by the leadplane. The leadplane will lower the nose of the aircraft and add power to accelerate away from the tanker. The tanker will communicate to the leadplane when a normal airspeed can be resumed.

In the event of an overrun, the leadplane will accelerate and descend if terrain allows. The leadplane and the tanker will communicate their location and altitude when able.

Leadplane Engine Failure

During a run with an aircraft in tow, if the leadplane has an engine failure, follow the aircrafts emergency procedures. As soon as practical, communicate the situation to the aircraft in tow because the closure rate of the two aircraft could be rapid. Fly the briefed exit route.

Due to the high-density altitude environments firefighting takes place in, the leadplane pilot should expect poor performance in a single engine situation. Due to the low AGL altitudes that the leadplane operates in, proper single engine emergency procedures are paramount. Planning runs so they are flown downhill and down canyon will give pilots more time to address the engine failure.

The leadplane pilots should also expect some difficulty in directional control if there is a single engine situation. This is especially true during the exit maneuver. During the exit maneuver the aircraft is at lower airspeeds and higher power settings which may make directional control more difficult. If the exit requires a turn, it may be more difficult to execute the turn if the out-board engine has failed, yawing and banking the aircraft away from the required turn.

Tanker or Other Aircraft Emergency

In the event of another aircraft with an emergency, assist the other aircraft as needed. The emergency aircraft has priority over other aircraft. If it is a tanker, transmit the phrase “consider the load” to remind the pilot to jettison the load if need be. Give the pilot of the emergency aircraft time to run the necessary checklists and then ask if they need any assistance. Consider the need for aerial supervision over the fire before leaving the fire to assist the aircraft in distress. Discontinue flight operations over the fire if need be. Notify dispatch of the situation so appropriate emergency procedures can be initiated. Be careful not to transmit sensitive information over the radio.

Incident Within an Incident (IWI)

An incident within an incident is any accident or medical emergency during an incident directly involving Incident Management Team personnel or assigned resources. There can be a wide range to the level of severity associated with an IWI. The level of attention that must be given to the IWI by the leadplane pilot will depend on their ability to affect the outcome of the IWI and whether the leadplane is directed to engage in the IWI. An IWI can distract crews from their primary task over the incident. The safety of the primary task resources must be managed, and resources may possibly be disengaged depending on the severity of the IWI. If priority is to be given to the IWI, primary task resources must be given direction for disengaging from the primary task or direction in their reassignment to the IWI. Changing priorities can cause confusing situations and can increase the possibility of miscommunications. The pace of operations should be slowed down to a pace where the aerial supervisors’ tasks can be managed safely.

Completion Standards:

The lesson is complete when the student can demonstrate the management of simulated emergency procedures in a training environment for Phase 1 and in a fire environment for Phase 2. Safety will never be in question and the procedures will be accomplished without the reliance on the evaluator.

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Leadplane Training Lesson Plan

Exit Routes

07-06-N9065-HO

Objective:

To familiarize the student with exit routes (Phase 1).

To develop the student's proficiency in determining exit routes (Phase 2).

Content:

When determining an exit route, the primary concern will be the safety of the tanker while flying the route.

Exit routes need to be identified during the high recon and then evaluated as the leadplane is flown at lower altitudes.

When considering exit routes, take into consideration that the aircraft flying the exit route may have reduced performance in the case of an engine failure or emergency situation.

Exit routes will be downhill and down canyon. Down terrain must be considered not only in the tactical drop area but in a larger overall area, too.

The exit route must be free of hazards such as cables, wires, and towers. The exit route must also have good visibility and easy for the aircraft to follow. Winds and turbulence must also be taken into account.

After the exit route is identified at altitude, the leadplane must fly the exit route to ensure the exit is free of hazards and does not end in a box or dead end canyon.

The exit route should be flown a distance that is representative of the distance needed to climb to a safe altitude by a tanker in an emergency situation.

The exit route must take into consideration helicopter routes and any other aircraft that may conflict with the exit route.

If there is terrain that must be crossed when flying the exit route, the leadplane must determine a safe crossing altitude for the tanker.

Completion Standards:

The lesson is complete when the student can determine a safe exit route in a training environment for Phase 1 and in a fire environment for Phase 2. Safety will never be in question and the maneuvers will be accomplished without the reliance on the evaluator.

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 8 – Situational Awareness and Judgement.

Time 0.5 Hours.

Objectives

1. To familiarize the student with situational awareness.
2. To familiarize the student with the process that leads to safe judgement in the fire environment.

Strategy

The goal of this unit is to introduce the student to situational awareness and judgement as they relate to the leadplane mission.

Instructional Methods

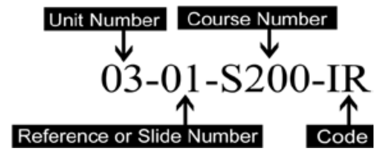
- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Computer with LCD projector and presentation software.
- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.

Outline

I. Situational Awareness.
II. Judgement.



Aids and Cues Codes:

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HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 8 – Situational Awareness and Judgement.

OUTLINE	**AIDS & CUES**
Hand Outs	
Review Objectives	
I. Situational Awareness.	08-01-N9065-HO
a. Cover situational awareness listed in the Leadplane Situational Awareness Lesson Plan.	
II. Judgement.	08-02-N9065-HO
a. Cover judgement listed in the Leadplane Judgement Lesson Plan.	

Leadplane Training Lesson Plan

Situational Awareness

08-01-N9065-HO

Objective:

To familiarize the student with situational awareness in a training environment (Phase 1).

To develop the student's proficiency in situational awareness in the fire environment (Phase 2).

To develop the student's mastery of situational awareness in a fire environment (Phase 3).

Content:

Situational awareness (SA) is a term used to describe a person's awareness of their surroundings, the meaning of these surroundings, a prediction of what these surroundings may look like in the future, and then using this information to act.

Leadplane situational awareness can be broken down into ground and flight situational awareness.

Ground situational awareness mainly involves information gathering prior to a mission. Consider the following:

- Look at AFF each morning to see where the tankers and leadplane/ASM aircraft are. This will help in anticipating resources responding to an incident or availability of resources when requested.
- Review the leadplane and tanker status sheets sent out by the leadplane/airtanker coordinator. This will help with SA with regards to days off and maintenance. Keep the leadplane coordinator informed of your status.
- Review current and forecasted weather.
- Review airspace in the current geographic area and surrounding geographic areas.
- Review aircraft performance for the current and anticipated conditions.

Flight situational awareness is a learned skill that will improve as it is practiced. Flight situational awareness is the ability to keep a mental picture of where the leadplane is in the FTA and above the fire and terrain while also keeping a mental picture of other resources relative to the leadplanes position.

This can be difficult due to the constant movement of the leadplane and other resources. Most of the resources will be moving at different speeds within the mental picture. Some of the resources, like firefighters and helicopters, can stop or change direction abruptly. This is one reason it is important to manage and perceive the flow of resources within the FTA and strive for predictability. Clear and concise communications are the key to maintaining this mental picture.

- Be clear on fire anatomy and division breaks. Know where individual contacts are on the ground.
- Insure the use of proper direction descriptors. Say “left” when you mean left. Say “nine o’clock” when you mean nine o’clock.
- Keep track of where the leadplane is relative to the surrounding terrain.
- When flying a high recon, pick out major landmarks to keep orientated once the leadplane is at lower altitudes.
- Know what direction the tankers will be coming from when entering the FTA.
- Establish reporting points for helicopters.
- Periodically check in with resources that stay within the FTA.
- Establish routes when needed.
- Monitor as many radios/frequencies as safely possible to maximize understanding of resource movements and locations.
- Maintain eyes outside the aircraft as much as practical and scan for other aircraft.
- Use the TCAS.

Initially it is easy to lose track of the mental picture due to workload and the distraction of flying the aircraft. Practicing an accurate mental picture is the only way to improve this skill. When time allows, compare the student’s mental picture with that of the evaluators and the actual environment. This will help to learn time frames for different resources.

Completion Standards:

The lesson is complete when the student can maintain situational awareness of the aircraft over terrain and other training aircraft while in a training environment for Phase 1. The lesson is complete when the student can maintain situational awareness of changes in the fire and resources assigned to the fire throughout the mission while in a fire environment for Phase 2.

The lesson is complete when the student can demonstrate mastery of situational awareness in a fire environment for Phase 3. Safety will never be in question and maintaining situational awareness will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Judgement

08-02-N9065-HO

Objective:

To familiarize the student with judgment in a training environment (Phase 1).

To develop the student’s proficiency with judgment in a fire environment (Phase 2).

To develop the student’s mastery of judgment in a fire environment (Phase 3).

Content:

FAA manuals define pilot judgment as the mental process by which pilots recognize, analyze and evaluate information regarding themselves, the aircraft and the external environment. So how do we teach good judgment? Judgment goes hand in hand with decision-making and experience. The key to teaching judgment is to give students the necessary tools and skills so that they demonstrate 'good' decision-making skills, and through their good decision-making skills they will gain experience at their own comfort level. Pilots can relate to real-life stories or experiences from other pilots. There is nothing better than to learn from others' mistakes. Share experiences.

To develop judgment, instructors must allow students to take an active role in aeronautical decision-making whilst preflight planning, during flight and post flight, from the beginning of the training. Instructors may not be able to teach judgement directly. However, we teach decision-making and we can give our students tools to assist them in their decision making process, and thus they will be gaining experience. It is their experience that will give them good judgment.

Understanding how pilots make decisions, and teaching students how to modify their behavior, is teaching judgment.

Explaining the 'what' *and* the 'why' when instructing also results in greater knowledge and understanding by the student, which in turn leads to greater situational awareness. Use scenario-based training from your own experiences.

The fire environment is unique and presents the new leadplane student with a constant barrage of new information and experiences. As the student progresses through the Phases of training, they will be expected to continually improve in the following areas:

- Making timely decisions.
- Discontinuing operations when safety issues arise.
- Being open to suggestions.
- Prioritizing targets.
- Making decisions based on safety, the needs of the organization, the firefighters on the ground, and the resources at risk.
- Prioritizing flying the aircraft over other distractions.
- CRM.

Scenario Based Discussion Examples:

Fuel Management: After the request for relief leadplane was unable to be filled, the determination was made that I had enough fuel to complete the mission to the end of the last shift of the day. After leading the last tanker and returning to the airport I found a large cell over the airport. Going to another airport was not practical due to fuel reserves and daylight. I decided to hold out away from the airport until the cell passed. I landed with just over 30 minutes reserve fuel.

- Was it necessary to stay over the fire till the end of the shift?
- Was leaving the fire to fuel and return an option?
- Was terminating the retardant operation an option?
- Was there an ATGS that could provide aerial supervision?

Visibility: After flying a fire, for two hours, where the visibility was degrading, I realized that visibility probably did not meet VFR minimums. I had become comfortable with the surrounding terrain in the area and did not realize the degrading conditions.

- How do we evaluate visibility?
- When should we evaluate visibility?
- Who can we rely on to help evaluate visibility?
- How do we gauge changing visibility?

Winds: The winds on the fire were getting stronger and making it difficult to tag onto the existing retardant lines. The retardant pattern on the ground was starting to have a noticeable cross wind effect. Turbulence was increasing but not to a level that it was uncomfortable or affecting the controllability of the aircraft.

- How do we evaluate winds?
- Do the 10 principles of retardant application address winds?

Mission Focus: There were several homes that were being threatened by the wildfire. As the fire got closer to the homes, the smoke started dictating the pattern that was being flown. Exit visibility was poor and degrading.

- What are the 12 factors in aviation operations that shout watch out that may lead to mission focus?

Completion Standards:

The lesson is complete when the student can demonstrate judgement that at no time puts the safety of the flight or personnel in question while in a training environment for Phase 1 and in a fire environment for Phase 2.

The lesson is complete when the student can demonstrate mastery of judgement in a fire environment for Phase 3. Safety will never be in question and judgement related decisions will be accomplished without the reliance on the evaluator.

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 9 – Responsibility for Separation and Join Ups.

Time 0.5 Hours.

Objectives

1. To familiarize the student with the responsibility for separation procedures.
2. To familiarize the student with the join up procedure.

Strategy

The goal of this unit is to introduce the student to the concept of responsibility for separation and the procedures associated with responsibility for separation. Once the student understands responsibility for separation, the join up procedure will be introduced and explained.

Instructional Methods

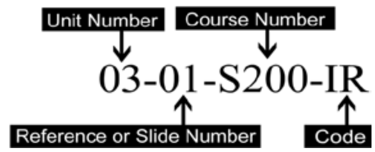
- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Computer with LCD projector and presentation software.
- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.

Outline

I. Responsibility for Separation.
II. Join Up.



Aids and Cues Codes:

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IG – Instructor Guide	SW – Student Workbook
IR – Instructor Reference	SR – Student Reference
HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 9 – Responsibility for Separation and Join Ups.

OUTLINE	**AIDS & CUES**
Hand Outs	
Review Objectives	
I. Responsibility for Separation.	09-01-N9065-HO
a. Cover the responsibility for separation listed in the Leadplane Responsibility for Separation Lesson Plan.	
II. Join Up.	09-02-N9065-HO
a. Cover the join up techniques listed in the Leadplane Join Up Lesson Plan.	

Leadplane Training Lesson Plan

Responsibility for Separation

09-01-N9065-HO

Objective:

To familiarize the student with the responsibility for separation procedures (Phase 1).

To develop the student's proficiency with the responsibility for separation procedures (Phase 2).

Content:

In the absence of an ATGS or when aircraft separation duties are delegated to the leadplane, the leadplane is responsible for assigned aircraft separation.

The leadplane will be at the maneuvering altitude and the tanker will be at the orbit altitude. The orbit altitude is 500 feet above the maneuvering altitude which will allow for vertical separation. Both aircraft have an active role in acquiring the other aircraft visually.

Once the leadplane has the tanker visually, the leadplane describes their position relative to the tanker. If the tanker has the leadplane visually, the tanker describes their position relative to the leadplane.

Once the tanker verbally communicates that they have the leadplane in sight, the responsibility for separation transfers to the tanker and the leadplane completes the join up maneuver. It is then the tankers responsibility to maintain visual separation with the leadplane.

- During a show me profile the tanker remains at the assigned altitude until the leadplane completes the show me and the leadplane and tanker join up at the maneuvering altitude for a live drop.
- If there is no show me, once cleared down by the leadplane, the tanker can descend to the maneuvering altitude behind the leadplane for a lead profile and a live drop.
- If the tanker is IA rated, the leadplane can clear the tanker to maneuver for a live drop without a lead profile. The responsibility for separation will transfer to the leadplane and the leadplane will fly a chase profile.

If the tanker loses sight of the leadplane, they must verbalize that they have lost sight of the leadplane and state their altitude. The responsibility for separation then transfers back to the leadplane. The leadplane must establish deconfliction to gain vertical and/or horizontal separation. Both aircraft again have an active role in acquiring the other aircraft visually. The join up procedure must then be initiated again once the aircraft have each other in sight.

After the tanker has made the drop, the responsibility for separation returns to the leadplane. Tankers must see and avoid and maintain visual separation with other aircraft.

If there is more than one tanker over the fire, the number two tanker in the orbit is responsible for separation with the number one tanker. If a tanker loses sight of the tanker they are following, they must communicate they have lost sight of the tanker they are following, state their altitude and maneuver to gain separation.

When tankers are being held over an IP away from the area the leadplane is operating over, the tankers are responsible for their own separation. The number two tanker is responsible for separation from the number one tanker. The number three tanker is responsible for separation from the number two tanker, and so forth.

At times, helicopters working in the same area as tanker operations may be given the responsibility for separation with the tanker and the leadplane. This usually happens when the helicopter would be cleared into the same drop area after a tanker drop. If the helicopter can remain clear of the tanker, the leadplane can transfer the responsibility for separation to the helicopter. After the helicopter has left the drop area the responsibility for separation returns to the leadplane.

If a helicopter is given responsibility for separation from a tanker and the tanker does not drop, the helicopter is still cleared to the drop area after the tanker exits the drop area. The leadplane must manage their assigned aircraft and airspace while the helicopter is inbound for the drop.

Helicopters have responsibility for separation with other helicopters when working near other helicopters.

Completion Standards:

The lesson is complete when the student can demonstrate the responsibility for separation procedures in a training environment for Phase 1 and in a fire environment for Phase 2. Safety will never be in question and responsibility for separation will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Join Up

09-02-N9065-HO

Objective:

To familiarize the student with the join up procedure (Phase 1).

To develop the student's proficiency in flying the join up maneuver (Phase 2).

Content:

The join up maneuver is used to position the tanker or inbound aircraft behind the leadplane.

The leadplane will fly towards the inbound tanker in an attempt to acquire the tanker visually. The leadplane will be 500 feet below the inbound tanker altitude for vertical separation. Notify the tanker of the leadplanes altitude.

Once the leadplane has the tanker visually, the leadplane describes their position relative to the tanker. If the tanker has the leadplane visually, the tanker describes their position relative to the leadplane.

Once the tanker verbally communicates that they have the leadplane in sight, the responsibility for separation transfers to the tanker and the leadplane initiates a turn back towards the operations area. The goal is to finish the turn back towards the operations area and be positioned at the tankers 11 to 12 o'clock position. The distance between the two aircraft should be ½ mile to 1 mile.

There is a visual illusion affecting the perceived distance from an inbound tanker due to the large difference in size between tankers. Initiating the turn back towards the fire when the tanker is at the 2-mile ring on the TCAS will help to estimate the proper distance to start the turn. The 2-mile rule of thumb is based on both aircraft being at proper FTA airspeeds.

The leadplane will then return to the operations area so a show me run or a live run can be made. Responsibility for separation is critical during the join up maneuver. See the responsibility for separation lesson plan.

Developing a visual sight picture, for determining when to turn back towards the fire, will be important with varying closure rates and angles.

The head on join up is most difficult due to fast closure rates. Joining up with the tanker from the side will have slower closure rates and does not require as large a turn back towards the operations area.

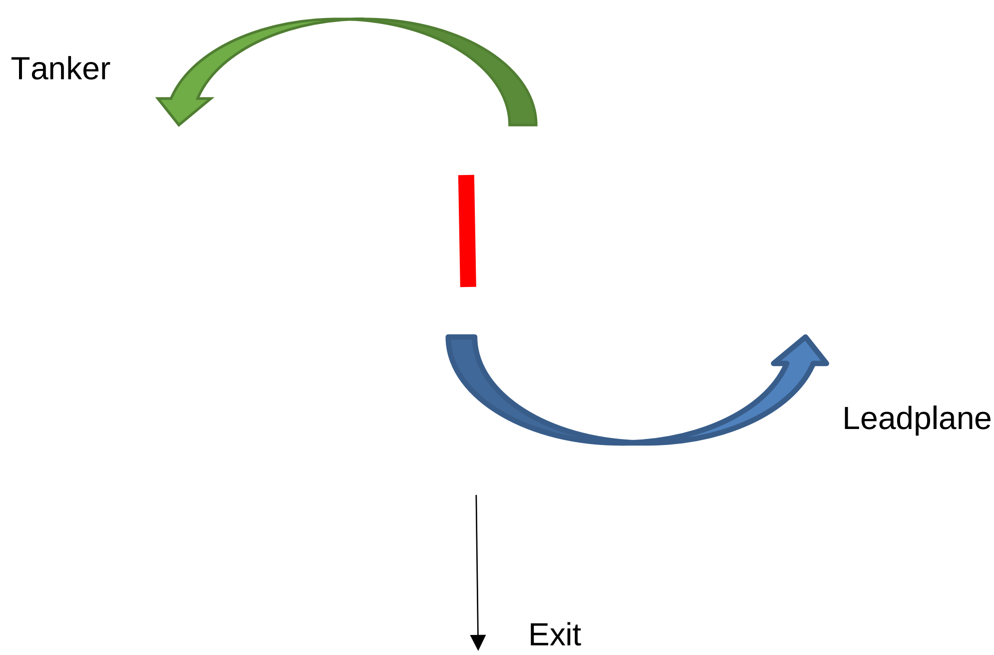
When able, fly out and join up with the inbound tanker and don't make the tanker come and find the leadplane. If the leadplane is over a fire and working with tankers when another tanker calls, it is not feasible to go out and join up with the inbound tanker.

After a show me profile, the leadplane climbs and turns toward the downwind, the tanker or other aircraft will maneuver in behind the leadplane.

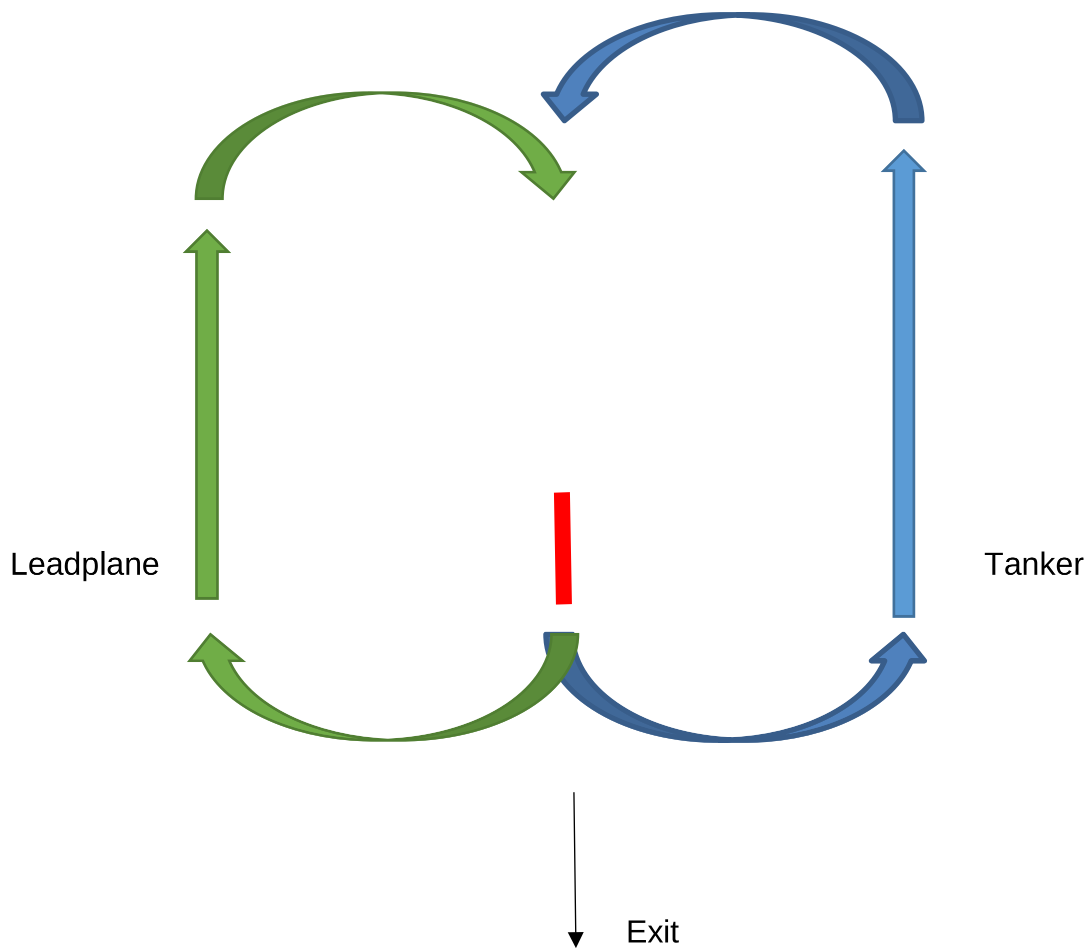
Atypical join ups:

At times the tanker may be out of position to maneuver behind the leadplane after a show me which will require another join up.

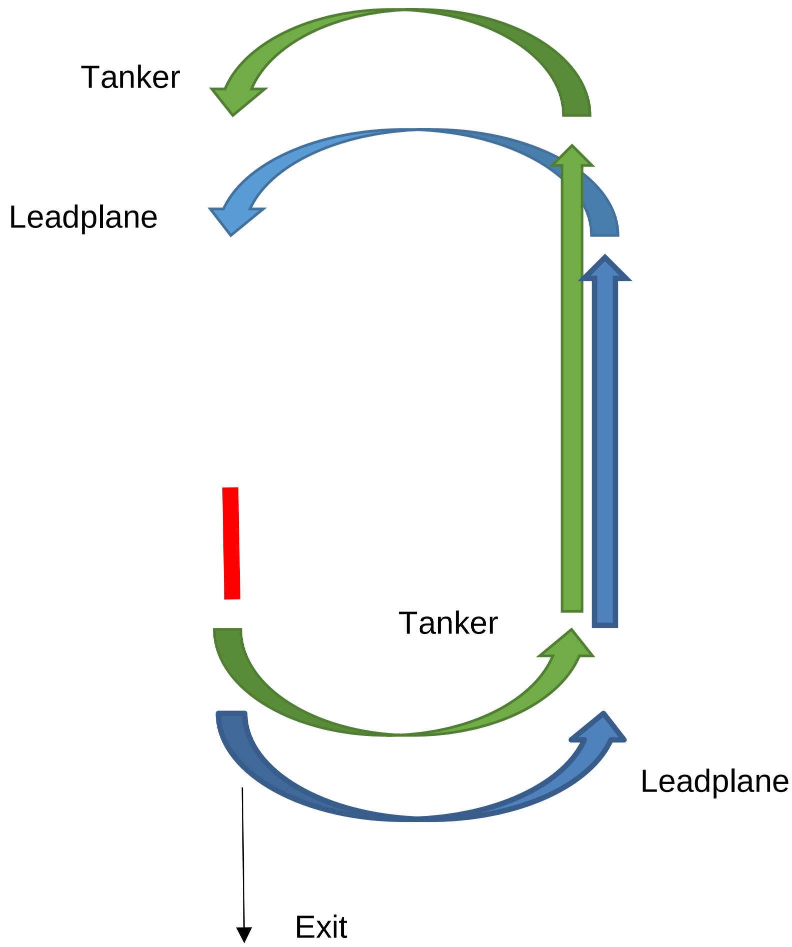
If the tanker is on the opposite side of the orbit from the leadplane, it is difficult to join up with both aircraft maneuvering to rejoin. In this situation it is helpful for one aircraft, usually the tanker, to go wings level while the leadplane maneuvers to rejoin. Consider terrain and smoke before requesting the tanker fly straight and level.



Join ups can be difficult when the tanker is in a left-hand pattern watching a right-hand pattern show me profile. This can lead to a situation where the leadplane is in a right-hand downwind and the tanker is in a left-hand downwind. In this situation the join up can take place near the base to final turn. Prior to the turn to final, the tanker must see the leadplane and accept the responsibility for separation. The leadplane can then continue a turn to final for the lead profile.



Another atypical join up is created when the leadplane climbs and turns to a downwind and ends up behind the tanker. To accommodate this situation the leadplane can fly in trail of the tanker on downwind. When the tanker turns base the leadplane can lead the tankers turn inside the tankers ground track. The tanker must see the leadplane on base and accept responsibility for separation before the leadplane can then continue to final for the lead profile.



Lead, Lag and Pure

When trying to join with another aircraft it is not always prudent to use power and airspeed to reduce the distance between the aircraft. By altering the path of the leadplane with reference to the tanker, closure rates can be adjusted. When the leadplane's longitudinal axis is pointed in front of the tankers nose, the distance between the two aircraft will be reduced (lead). When the leadplane's longitudinal axis is pointed behind the tankers tail, the distance between the two aircraft will be increased (lag). When the leadplane's longitudinal axis is pointed at the tanker, the distance between the two aircraft will remain the same (pure). This technique is very helpful in join ups especially when used in conjunction with power and airspeed if needed.

The amount of lead or lag will depend on the size of the pattern and how quickly the leadplane needs to join up with the tanker. With larger patterns it is helpful to try and predict where the tanker will be in a certain amount of time and try to lead the tanker to that point in time and space. With smaller patterns the lead will be less when maneuvering in front of the tanker.

Completion Standards:

The lesson is complete when the student can demonstrate the join up maneuver in a training environment for Phase 1 and in a fire environment for Phase 2. When the student performs the join up maneuver, safety will never be in question and the join up will be accomplished without the reliance on the evaluator.

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 10 – Strategy and Tactics.

Time 0.5 Hours.

Objectives

To familiarize the student with operational firefighting and retardant strategy and tactics.

Strategy

The goal of this unit is to introduce the student to operational firefighting and retardant tactics as they relate to the leadplane mission. The information will be used to build a foundation for the student's proficiency with operational use of retardant.

Instructional Methods

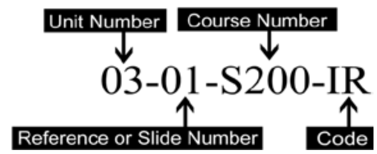
- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Computer with LCD projector and presentation software.
- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.

Outline

I. Operational Tactics.



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UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 10 – Strategy and Tactics.

OUTLINE	**AIDS & CUES**
Hand Outs	
Review Objectives	
I. Operational Tactics.	10-01-N9065-HO

a. 10 Principles of Retardant Application.
   i. Provide examples of each principle.
b. Fire Behavior Factors.
   i. Review and provide examples of each factor.
c. Introduce the concept of defendable terrain.

Leadplane Training Lesson Plan

Operational Tactics

10-01-N9065-HO

Objective:

To develop the student’s proficiency with operational firefighting and retardant tactics in a fire environment (Phase 2).

To develop the student's mastery of operational firefighting and retardant tactics in a fire environment (Phase 3).

Content:

10 Principles of Retardant Application

1. Determine direct or indirect tactics based on fire size up and resources available.
2. Establish an anchor point and work from it.
3. Use the proper drop height.
4. Apply proper coverage levels.
5. Drop downhill and down sun when feasible.
6. Drop into the wind for best accuracy.
7. Maintain honest evaluation and effective communication between the ground and air.
8. Use direct attack only when ground support is available, or extinguishment is feasible.
9. Plan drops so that they can be extended or intersected effectively.
10. Monitor retardant effectiveness and adjust its use accordingly.

There are certain factors that influence fire behavior that can be observed from the air. By observing these factors, a good idea what the fire behavior and rates of spread will be like can be determined. This will help in adjusting tactics for retardant application. Each factor, listed below, should be considered individually to understand how it affects fire behavior and rate of spread.

When flying over a fire and trying to anticipate how the fire will change over time, look to see how many of these factors cause the fire to trend towards higher rates of spread and more active fire behavior. The more factors there are, the greater chance of a fire with higher rates of spread and more active fire behavior.

Fire Behavior Factors

Time of Day

In the continental US, fire behavior and rate of spread generally peak in the midafternoon. To get a better gauge of how time of day affects a fire, look at the aspect of the slope the fire is burning on. Eastern aspects will peak during mid to late morning. Northern aspects will peak late morning. Southern aspects will peak early afternoon. Western aspects will peak late afternoon.

Aspect

The Southern and Eastern aspects will tend to be dryer and have flashier fuels. The Northern and Western aspects will tend to have higher moisture levels and heavier fuel loading. Fire behavior peaks during different parts of the day depending on aspect.

Fuel Type

Lighter fuels, like grass, tend to be flashier fuels and can have a high rate of spread but do not burn for long periods of time. Heavier fuels, like timber, tend to have slower rates of spread but can burn for longer periods.

Fuel Continuity

Fuels that are spread out will tend to have slower rates of spread and lower fire behavior, while continuous fuels have a greater ability for higher rates of spread and more active fire behavior.

Fire Location on the Slope

Fires that are burning at the bottom of a slope have a greater chance for higher rates of spread while fires burning at the top of a slope will more likely have lower rates of spread.

Degree of Slope

The steeper the slope, the greater chance for higher a rate of spread. Rates of spread tend to be higher when the fire is burning up slope and are lower when the fire is backing down slope.

Terrain

Steep canyons and saddles tend to funnel hot air from a fire and winds. Because of this, the fire will have higher rates of spread and more active fire behavior through canyons and saddles.

Wind

The stronger the wind speed the greater chance the fire will have higher rates of spread and more active fire behavior.

The following factors that influence fire behavior are not as visual as the previous and tend to be more difficult to determine from the air.

Temperature

There is not an accurate gauge of the temperature changes on the ground. A rough idea from the outside air temperature gauge can be used. Higher temperatures tend to cause higher rates of spread and more active fire behavior.

Humidity

Humidity tends to decrease in the afternoon and lower humidity's tend to cause higher rates of spread and more active fire behavior.

Fuel Moisture

Lower fuel moistures tend to cause higher rates of spread and more active fire behavior. Fuel moistures can change by the hour in lighter fuels and take days to make noticeable changes in heavier fuels. Fuel moistures in riparian areas tends to be much higher and will affect rates of spread but should not be relied on to stop the spread of the fire.

When it comes to tactics, anchor, flank, and pinch is the standard. An anchor is something the retardant line can be tied into giving a relatively good chance that that fire won't burn around the start of the retardant line. Examples of anchors are roads, rock outcroppings, scree slopes, areas with no vegetation and cold black parts of the fire. As the fire line progresses up the flanks and the fire behavior decreases, energy from the flanks that was feeding the head of the fire is removed and the intensity at the head will decrease. Once the fire line gets up to the shoulders of the fire, the fire line can be directed in front of the head or pinch off the head.

If there are long spans of time between tanker drops, angle the retardant line away from the fires edge. The fire will burn up to the retardant line by the time the next load of retardant arrives. If the retardant is not angled away from the fires edge, there is a good chance the fire will burn around the end or tail of the retardant line before the next retardant line can be dropped.

It is best to try and have the next several drops planned out ahead. Have a secondary use for the retardant just in case it cannot be dropped for the intended use. Coordinate the priorities with the ATGS or IC as appropriate.

On a turning drop the retardant will sling to the outside of the turn. Adjust the leadplanes flight path for the added “drift.” Depending on how coordinated the turn is, the retardant may have a heavier or lighter coverage level. The difference in coverage level is usually minimal and not much of a concern.

During a go around or a split load, where the tanker is going to follow the leadplane around, don’t turn too sharply or accelerate away from the tanker too much. Remember that the climb rate on some of the tankers is slow with a retardant load on board.

Ground forces should always back up the use of retardant. Consider placement of retardant based on whether or not ground resources will be willing to go into the area to reinforce the retardant. Retardant by itself should not be counted on to stop a fire, especially in heavier fuel types. A fire with a slow to moderate rate of spread burning in light fuels may stop at the retardant line but it is poor planning to rely on this tactic. Generally, retardant and gels can be used for direct or indirect line construction. Foam and water are used for direct suppression. Half in half out is a good use of the retardant when trying to reduce the chance of spotting by taking the heat out of the fire or cooling the fire down so crews can dig direct fire line.

If ground forces will not be able to back up the retardant within one shift period, consideration should be made to the effectiveness of the retardant. Reevaluate the strategies and tactics for a possible better use of the retardant.

Completion Standards:

The lesson is complete when the student can demonstrate operational tactics that support the fire management or ATGS objectives in a fire environment for Phase 2.

The lesson is complete when the student can demonstrate mastery of operational tactics in a fire environment for Phase 3. Safety will never be in question while determining or implementing operational tactics and will be done without the reliance on the evaluator.

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 11 – Post Flight and Non Mission Topics.

Time 0.5 Hours.

Objectives

1. To familiarize the student with the post-flight inspection in preparation for future fire suppression activities.
2. To familiarize the student with non-mission topics that assist in becoming a successful leadplane pilot.

Strategy

The goal of this unit is to introduce the student to the post flight inspections after a leadplane mission. The information will be used to build a foundation for the aircraft post flight as well as communications used in the post mission.

Instructional Methods

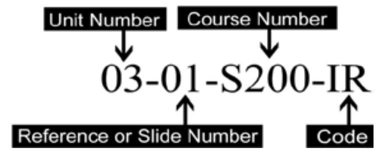
- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Computer with LCD projector and presentation software.
- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.

Outline

I. Post Flight.
II. Post Mission Communications.
III. Logistics.



Aids and Cues Codes:

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide
IR – Instructor Reference
HO – Handout
SW – Student Workbook
SR – Student Reference
PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 11 – Post Flight and Non Mission Topics.

OUTLINE	**AIDS & CUES**
Hand Outs	
Review Objectives	
I. Post Flight.	11-01-N9065-HO
a. Conducting an aircraft post flight inspection per the manufacturer's recommendations.	
b. Preparing the aircraft so it is mission ready.	
c. Address any aircraft airworthiness or safety of flight concerns.	
II. Post Mission Communications.	11-01-N9065-HO
a. Fuel – Tanker Base/FBO.	
b. Tanker Base Manager.	
c. Dispatch.	
d. Debrief with other resources.	
III. Logistics.	11-02-N9065-HO

Leadplane Training Lesson Plan

Post-flight Inspection

11-01-N9065-HO

Objective:

To familiarize the student with the post-flight inspection in preparation for fire suppression activities (Phase 1).

To develop the student's proficiency with the post-flight inspection in preparation for fire suppression activities (Phase 2).

Content:

An aircraft post flight inspection should be done after each flight. For the aircraft post flight, the following items should be considered:

- Airworthiness of the aircraft.
- Aircraft should be fueled for the next mission.
- Windows should be cleaned.
- Knee board and headset should be readied for the next mission.
- Paper work should be up to date.
- Mission personal protective equipment should be readily accessible.
- Check in with dispatch and/or tanker base.
- Debrief with tanker pilots, ATGS, and helicopter pilots as able.
- Refill Smoke Oil.

Completion Standards:

The lesson is complete when the student can demonstrate a post flight inspection in preparation for fire suppression activities. The post flight will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Logistics

11-02-N9065-HO

Objective:

To familiarize the student with logistics associated with the leadplane mission (Phase 1).

To develop the student's proficiency with logistics associated with the leadplane mission (Phase 2).

Content:

Transportation

This includes rental cars, tanker base government rigs and FBO curtesy cars. Rental cars can cause additional logistics when there is not time to return the car prior to being dispatched to a fire. This can include rental cars not being full of fuel, location of the keys (do not put them in a pocket) and collecting a receipt.

Lodging

It is a judgement call as to when a hotel room reservation should be made. Considerations should include the probability of being dispatched late in the day, availability of rooms due to local events, hotel cancelation policy, etc.

Start Times

It is important to check with the tanker base or dispatch as to the requested start time for the next day. Consider duty day and rest limitations and the travel time to and from the airport and hotel.

Dispatch

Some GACC's like the leadplane pilot to communicate directly with the GACC aircraft dispatcher and some like the leadplane pilot to communicate directly with the local dispatch. Contact dispatch to determine who the best contact will be.

Leadplane Coordinator

It is important to keep in contact with the leadplane coordinator at NICC. The primary form of communication is through the leadplane daily status web site. Keep the coordinator informed of upcoming days off, training needs, aircraft maintenance, and any other requests.

Aircraft Maintenance

It is important to notify the local GACC or local dispatch and the leadplane coordinator of any upcoming aircraft maintenance. This will allow dispatch to plan for additional leadplane coverage.

It is also important to notify local GACC or local/dispatch and the leadplane coordinator of unscheduled maintenance and unavailability

Days Off
Days off are reported through the leadplane daily status web site but it is also important to communicate upcoming days off to the local unit. This will include travel days as well as days off.

Flight Hour Limitations
Flight times that could possibly exceed 6 and 36 are reported through the leadplane daily status web site but should also be communicated to the local unit.

Duty Day Hour Limitations
Operations or dispatches that may affect duty day hours and could possibly exceed 14 hours must be communicated to dispatch. Coordinate with dispatch to find options that do not exceed the 14 hour duty day.

Completion Standards:

The lesson is complete when the student can demonstrate logistics associated with the leadplane mission. Logistical matters will be accomplished without the reliance on the evaluator.

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UNIT OVERVIEW

Course Leadplane Pilot Training N-9065.

Unit 12 – Phase 2, 3, and Sign Off Lesson Plans.

Time 0.5 Hours.

Objectives

1. Review task lesson plans that will be covered after Leadplane Pilot Training.
2. Review sign offs and endorsments.

Strategy

The goal of this unit is to introduce the student to the lesson plans and sign offs that will be used in the students training after Leadplane Initial.

Instructional Methods

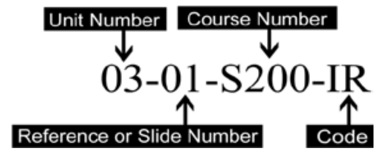
- Informal lecture.
- Facilitated interactive group discussion.

Instructional Aids

- Computer with LCD projector and presentation software.
- Flip charts and markers or dry erase board.
- NWCG Standards for Aerial Supervision.

Outline

I. Additional Hand Outs.
II. Aircraft Sequencing.



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UNIT PRESENTATION

Course Leadplane Pilot Training N-9065.

Unit 12 – Phase 2, 3, and Sign Offs Lesson Plans.

OUTLINE	**AIDS & CUES**
Hand Outs	
Review Objectives	
I. Additional Hand Outs.	
Incident Command System.	12-01-N9065-HO
TAWS.	12-02-N9065-HO
Fire Size Up.	12-03-N9065-HO
IP’s.	12-04-N9065-HO
Fire Order Information.	12-05-N9065-HO
Leadplane Transition.	12-06-N9065-HO
TCAS.	12-07-N9065-HO
Southern California Endorsement.	12-08-N9065-HO
Retardant Foam and Water Enhancers.	12-09-N9065-HO
Aircraft Sequencing.	12-10-N9065-HO
Leadplane Triangle.	12-11-N9065-HO
LAT Operations.	12-12-N9065-HO
VLAT Operations.	12-13-N9065-HO

SEAT Operations. 12-14-N9065-HO

Scooper Operations. 12-15-N9065-HO

MAFFS Endorsement. 12-16-N9065-HO

a. Cover the topics of each lesson plan. Evaluators will go into greater detail after Leadplane Pilot Ground Training.

II. Aircraft Sequencing. 12-01-N9065-PPT

Leadplane Training Lesson Plan

Incident Command System

12-01-N9065-HO

Objective:

To develop the student's proficiency in the use of the incident command system (Phase 2).

Content:

It is worthwhile to cover the Incident Command System (ICS) so that the chain of command is understood under the varying layers of command and control that leadplane pilots will encounter on incidents. ICS is a system designed to manage all types of incidents regardless of type and complexity. ICS expands and contracts based on the needs and complexity of the incident.

Unity of Command

Unity of command is a concept used by ICS where positions will only have one supervisor. Two questions to ask are who do you work for and who am I taking direction from? In most situations the answer to these questions will be the same person or position. At times the leadplane may be working for one person and taking directions from another. This in itself should not raise too much concern but the leadplane will need to be aware that this situation could provide an opportunity for conflicting direction.

Leadplane Example:

When there is an ATGS over a fire, the leadplane works directly for the ATGS. At times the ATGS will have the leadplane communicate directly with a Division Supervisor for direction with regard to retardant use on that division. The leadplane pilot can find themselves in a situation where they are receiving conflicting orders from the ATGS and the Division Supervisor.

Recon Helicopter Example:

The recon helicopter pilot can find themselves in a situation where the IC, onboard the helicopter, is giving them conflicting orders with that of aerial supervision.

Span of Control

Span of control is another concept used by ICS where any one position will have a limited number of resources to supervise. When the number of resources supervised exceeds an individual's span of control, ICS provides a way to insert positions into the management structure to reduce span of control to a manageable level. The expansion and contraction of the ICS is based on span of control.

Factors that influence a leadplane pilot's span of control are experience, dissimilar resources, size of the incident, visibility, and terrain.

The primary ICS positions a leadplane will interact with are:

- Dispatch, Geographic Area Coordination Center (Great Basin Coordination Center).
- Dispatch, Local Dispatch (Boise Dispatch).
- ATGS, Air Tactical Group Supervisor (Pioneer Air Attack).
- IC, Incident Commander (Pioneer IC).
- Operations Section Chief (Pioneer Ops).
- Division Supervisor (Division Bravo).
- Strike Team Leader (Strike Team Leader Smith).
- Crew Boss/Engine Captain (Pleasant Valley Hot Shots or Engine 451).
- Firefighter (identified by last name).

Basic Chain of Command

Initial Attack

Incident Commander (IC).

Division Group Supervisor.

Crew Boss, Engine Captain, Firefighter.

Extended Attack

Incident Commander.

Air Tactical Group Supervisor (ATGS).

Division Group Supervisor.

Crew Boss, Engine Captain, Firefighter.

Completion Standards:

The lesson is complete when the student can demonstrate the use of and understands the chain of command in the incident command system in a fire environment. Safety will never be in question and use of the ICS will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

TAWS

12-02-N9065-HO

Objective:

To develop the student’s proficiency in the use of terrain awareness and warning system (TAWS) (Phase 2).

Content:

Terrain awareness and warning system (TAWS) aims to prevent "controlled flight into terrain" (CFIT) accidents. TAWS works by using digital elevation data and airplane instrumental values to predict if a likely future position of the aircraft intersects with the ground. The flight crew is thus provided with earlier aural and visual warning of impending terrain, forward looking capability, and continued operation in the landing configuration.

Outside of the leadplane mission this is a helpful tool in avoiding CFIT accidents. During the leadplane mission the TAWS would be a distraction and would be alerting the pilot to possible CFIT situations continuously.

Leadplane pilots need to disable the TAWS prior to going low level for mission operations. It is important for the pilot to enable the TAWS after climbing to altitude after a mission.

Pilots should avoid becoming desensitized to TAWS. At no time should a TAWS warning be disregarded.

Completion Standards:

The lesson is complete when the student can demonstrate the use of TAWS in a fire environment. Safety will never be in question and the use of the TAWS will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Fire Size Up

12-03-N9065-HO

Objective:

To develop the student's proficiency in the fire size up (Phase 2).

Content:

The main objective of a fire size up is to relay to dispatch and fire managers what the incident is like and information for sound decision making. A fire size up is a list of items that describe the fire behavior, where it is burning, and what the fire is burning in. A good fire size up can determine what resources are needed and dictate strategy and tactics. Every dispatch, district, and geographic area has a slightly different list of items for a fire size up. Here is a list of the items that will be very helpful to dispatch or the firefighters on the ground. Like giving a target description, know what information will be conveyed before the transmission is started. Be concise, accurate and to the point.

It is helpful to be proficient in fire size ups. During the high recon, a quick fire size up will help to determine tactics.

Fire Size

This is a learned skill and takes practice. A football field is approximately one acre.

Fuel Type

Describe the fuel type that the fire is burning in. Keep it simple and use grass, brush, timber, or a mix of the three.

Character of the Fire

Describe the fire as actively burning or smoldering. Are trees and brush torching, is there spotting, and what percentage of the fire is active.

Position on Slope

Describe as the upper third, middle third, or lower third if there is terrain. Position can also be described as ridge top, hill top or flat terrain.

Aspect

Give the cardinal direction of the slope the fire is burning on.

Spread Potential

Look at the factors that influence fire behavior and gauge the spread potential. These are listed on the operational tactics lesson plan. Keep it simple as in low, moderate, or high spread potential.

Hazards

These could be hazards to aircraft as well as firefighters. High tension power lines, cliffs, towers, inaccessible terrain, etc.

Winds

Estimate the wind speed in miles per hour. Not that there is a big difference between knots and mph at the low wind speeds but use the receivers terminology.

Weather

Communicate any winds that might hinder aircraft operations as well as firefighting operations. Thunderstorms and lighting are always important weather factors to pass on.

Road Access

This is important to pass on because it will influence what resources are sent to the fire. Aerial delivered resources vs. ground transported resources.

Values at Risk

This would include mainly structures, but could also be historical or cultural resources, agriculture, animals, etc. This detail will influence what resources will be made available to the fire.

Completion Standards:

The lesson is complete when the student can demonstrate a fire size up with minimal deficiencies noted. The fire size up will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Initial Position (IP)

12-04-N9065-HO

Objective:

To develop the student's proficiency with IP's (Phase 2).

Content:

The IP is a location that tankers initially fly to when coming to the fire. It can be identified by a latitude and longitude, a geographic location, or even a distance and direction from the fire. On smaller fires the tanker will come directly to the fire, which will be the IP.

If it is difficult to join up because of visibility, fly out in the clear and determine a latitude and longitude that is clear of hazards. Give the IP latitude and longitude, to the incoming tankers or call it in to the tanker base or dispatch. Have the tanker hold at the IP and come out to join up with one tanker at a time before leading them into the drop area.

IP's can also be used to help separate incoming and departing aircraft from the area of operations.

If several aircraft end up holding over the IP, the IP technically becomes a holding point. Use caution for having several pilots over the point maintaining separation for themselves. This can cause extra radio traffic. Dissimilar aircraft will have dissimilar pattern sizes and can also cause issues for the pilots holding over the point.

Completion Standards:

The lesson is complete when the student can demonstrate proper use of an IP in a fire environment without the reliance on the evaluator.

Leadplane Training Lesson Plan

Fire Order Information

12-05-N9065-HO

Objective:

To develop the student's proficiency in using the fire order information associated with the leadplane mission (Phase 2).

Content:

The National Interagency Resource Ordering and Status System (ROSS) operates in an estimated 400 interagency dispatch and coordination offices throughout the Nation. The ROSS tracks all tactical, logistical, service and support resources mobilized by the incident dispatch community.

Leadplane pilots will receive either an ROSS form or a local dispatch form where the information was copied from a ROSS form. It is a rare occurrence when an aircraft is dispatched to a fire without a paper or electronic copy of a dispatch form.

Important information on a dispatch form:

Financial Codes – Needed for personnel times and aircraft payment documents.

Airports – Airports being used to support fire operations.

Contacts – Include dispatch and fire management personnel.

Phone Numbers – Contacts phone numbers.

Resources – Resources assigned to the fire.

Incident Name – Used for radio calls and documentation.

Coordinates – Lat long for the fire location.

Radio Frequencies – Contact radio frequencies for aviation and ground fire resources.

Need Date/Time – Used for preposition and for relief over fires.

Reporting Instructions – Any additional information that may be pertinent to the dispatch.

At times the date needed and time is unrealistic due to travel times and time zone changes. If this is the case, notify dispatch of a realistic schedule for getting to the fire or the airport.

Completion Standards:

The lesson is complete when the student can demonstrate the use of fire order information associated with the leadplane mission. Interpretation of the information will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Leadplane Transition

12-06-N9065-HO

Objective:

To develop the student's proficiency in leadplane transitions (Phase 2).

Content:

When the need for a leadplane, over an incident, exceeds the endurance of the leadplane on scene, a relief leadplane in needed. When the relief leadplane is inbound the on scene leadplane must brief the inbound aircraft of any pertinent information about the mission. The briefing can be broken into two parts. The first is when the relief aircraft is still inbound to the FTA and the second is when the relief aircraft in over the fire and behind the on scene leadplane.

Items that can be briefed when inbound to the FTA:

- Tankers assigned to the fire
  - Reload Bases
  - IP's
- Helicopters assigned to the fire
- Frequencies

Items that should be briefed when over the fire:

- Hazards
- Strategies and Tactics
- Priorities
- Next Retardant Drop
  - Coverage Level
  - Headings
  - Altitudes
  - Exits

Helicopter Information

Helibase

Helispots

Fences/Reporting Points

Routes

Water Sources

Division Brakes and Contacts

Airspace Altitudes

Treat the incoming leadplane as a tanker and go out and join up with the inbound aircraft, if work load allows. Take the relief leadplane around the fire during the briefing. Flying the runs with the relief leadplane in trail can aid in the relief leadplane's situational awareness.

The above information is presented if the student was giving the transition information. The student must also be able to receive the transition information. When the student is on scene and receiving the transition information the student will be responsible for separation from the other leadplane. This will divide the student's attention between flying the aircraft, writing down pertinent information, and following along with the fire and ground descriptions being given. It is helpful to follow the on scene leadplane in a position of above and outside its flight path. This will allow, assuming a left hand pattern, the student to keep the lead aircraft in sight for separation purposes and see the ground references being described.

The leadplane on scene conducts the transition briefing and the relief leadplane waits for the transition to be complete to ask questions.

Completion Standards:

The lesson is complete when the student can demonstrate proper leadplane transition in a fire environment for Phase 2. The student will demonstrate a leadplane transition with minimal deficiencies noted. Safety will never be in question and the transition will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

TCAS

12-07-N9065-HO

Objective:

To familiarize the student with the use of the TCAS during the leadplane mission (Phase 1).

To develop the student's proficiency with the TCAS during the leadplane mission (Phase 2).

Content:

A traffic collision avoidance system or traffic alert and collision avoidance system (both abbreviated as TCAS) is an aircraft collision avoidance system designed to reduce the incidence of mid-air collisions between aircraft. It monitors the airspace around an aircraft for other aircraft equipped with a corresponding active transponder, independent of air traffic control, and warns pilots of the presence of other transponder-equipped aircraft which may present a threat of mid-air collision.

TCAS is a valuable tool during the leadplane mission and should be incorporated into a pilot scan. It should not replace heads out active scanning and see and avoid. TCAS can help to confirm the mental picture a leadplane pilot has of the aircraft within the FTA. The TCAS will not show aircraft without a transponder or aircraft that do not have their transponder on.

TCAS is helpful in confirming aircraft that are inbound to the FTA and is a valuable aid in determining distance during join ups. This is especially true when learning the sight picture for join ups. With the drastic size difference in tankers, determining distance can be deceiving.

During operations, a leadplane pilot should be familiar with zooming in and out on the TCAS and incorporating the TCAS into their scan.

Completion Standards:

The lesson is complete when the student can demonstrate proficiency with the TCAS during the leadplane mission. Safety will never be in question and the use of the TCAS will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Southern California Endorsement

12-08-N9065-HO

Objective:

To familiarize and develop the student's proficiency with the procedures and differences of Southern California operations and operations in similar environments.

Content:

Southern California can be a complex area to fight fire in but complexity is not a place on a map. Complex fires can happen in many locations where firefighting activities take place. The same fire behavior, urban interface, political considerations and resistance to control do occur in other geographic areas. However, complex fire situations tend to happen more frequently in Southern California and there are some unique differences that are important to note.

Radio Frequencies

Fixed wing air to air is identified as air tactics and is utilized on an FM radio.

Rotor wing air to air is identified as rotor air to air, or simply victor and is on a victor radio.

Victor frequency 122.925 is monitored continuously by all fixed wing and rotor wing assets.

Number of Aircraft

Generally there are going to be more aircraft assigned to a given fire.

The state of California has its own fleet of S2's and ATGS platforms.

Several of the county and local governments have helicopters that are used for fire suppression.

Tankers

LAT/VLAT

During the majority of fire season, the LAT/VLAT fleet is committed to multiple geographic areas. This tends to minimize the number of air tankers on any one incident. The height of fire season in Southern California tends to happen later in the year, after the fire danger has gone down in the rest of the country. More of the LAT/VLAT fleet can be consolidated for Southern California's fire season.

SEAT's

SEAT's are being used more in Southern California which can increase the aerial supervision workload due to the varying tanker airspeeds.

S2's

The state of California, CalFire, has a fleet of S2's that are highly utilized during initial attack. Although the S2's primary mission is initial attack, the aircraft are available for all fire assignments.

Scoopers

There are two CL-415's based in LA County. These aircraft can also increase the aerial supervision workload due to the different tanker airspeeds, patterns and quick turn arounds.

Helicopters

Many of the local governments have their own helicopters that are used for firefighting. The city of Los Angles as well as LA, Kern, Ventura, San Bernardino, Orange and San Diego Counties have helicopter programs and routinely interact on Federal and CalFire incidents. All of the county helicopters are tanked, and will often "ground fill" from fire engines, instead of a snorkel; especially where suitable snorkel sites are a distance away. This can lessen turnaround times considerably.

Law Enforcement

Law enforcement agencies have aviation programs that can and do impact firefighting operations. The FTA does not pertain to other aircraft that have legal access within a TFR (Medevac, Law Enforcement, Media, VFR airport traffic, IFR traffic cleared by the FAA).

News Agencies

News agencies utilize helicopters for reporting and are sent to fires routinely. Most of these aircraft have powerful camera lenses and are content to be cleared in above the FTA to collect video and audio footage of the fire activities. The FTA does not pertain to other aircraft that have legal access within a TFR (Medevac, Law Enforcement, Media, VFR airport traffic, IFR traffic cleared by the FAA).

Cooperator Aircraft
Local cooperators with aviation programs may initially be operating on incidents with their own agency frequencies while federal and state aircraft assigned to the same incident may be working on different frequencies. Although this situation is happening less frequently, it is important to note. It is essential for aerial supervision to have all incident aircraft operating on the appropriate frequencies.

Hazards
Due to the large population base, Southern California has a large concentration of high tension power lines.

With the costal and desert influence, there can be strong localized winds and turbulence. The canyons and passes can funnel very strong winds that create hazardous situations for aircraft.

There is a large concentration of military, airline and general aviation air traffic in Southern California. This makes it all the more important to stay heads out and see and avoid.

There can be localized visibility issues due to marine layers, haze, smog and smoke. It is not uncommon to have VFR conditions over the fire and IFR conditions coming back into the airport. It is important to consider these possible situations when planning for fuel reserves and which airport to recover at.

Human factors play a large role in wildfire suppression activities. There can be fundamental tactical differences between fire firefighting agencies as opposed to land management agencies. There are many places in Southern California where wildfires have enormous economic and political impacts as well as potential for injury, loss of property and loss of life.

Southern California experiences a localized weather phenomenon known as “Santa Ana” or “Sundowner” winds. These wind events tend to heighten fire potential and increase fire behavior. When these conditions occur, they create off shore winds that can be as strong as fifty to seventy five miles per hour. The relative humidity is substantially lower as well. With those wind velocities, there is strong potential for moderate to severe turbulence in valleys and on the lee side of ridges.

ATC and Airspace
It is common for fire operations to be conducted in and near controlled airspace in Southern California. KLAX and KSAN Class B airspace and multiple Class C airspace airports are in the wildland urban interface. These fires may require some negotiations

with ATC for aircraft routing. The FTA does not pertain to other aircraft that have legal access within a TFR (Medevac, Law Enforcement, Media, VFR airport traffic, IFR traffic cleared by the FAA).

SoCal, Bakersfield, Santa Barbara and Joshua approaches can provide VFR flight following as well as IFR routing, making it safer and more efficient getting to a fire. They can lower the pilots work load maneuvering around and getting cleared through airspace.

Air Tanker Base Proximity

It is quite common to have multiple airtanker bases' reloading airtankers for a single incident. This can minimize turnaround times by reducing congestion at the tanker bases. This will increase aerial supervision workload due to increased routing coordination.

Aerial Supervision

Helicopter coordinators are used much more frequently in Southern California. With the large number of helicopters used on Southern California incidents, HLCO's can be a valuable resource to aerial supervision, but can also contribute to complexity if a leadplane or ASM is unfamiliar working with them.

There are a large number of ATGS's in California and it is rare to not have an ATGS over an incident.

Any or all combination of these conditions can and will escalate the pace and workload for aerial supervision. It is incumbent on all aerial supervisors to maintain vigilant and constant situational awareness of the environment at the incident. It is possible and often likely that the pace of the operations may need to be adjusted or stopped entirely if conditions exceed your ability to maintain a safe and effective working environment. Aerial supervisors must maintain awareness of their individual capabilities and experience with regard to highly complex environments.

This information can be applied to many other areas outside of Southern California. The Oakland Hills in Northern California, the Sierra Front near Reno, NV, the Phoenix metropolitan area as well as other areas in the US can all have complex fire environments. This training can be applied in areas outside Southern California and documented to meet training needs. Incidents south of the Tehachapi Mountains and west of Palm Springs tend to meet the general complexity issues in this document.

Completion Standards:

The lesson is complete when the student can demonstrate proper operational knowledge of the procedures and differences of Southern California operations in a fire environment. Safety will never be in question and the operations will be accomplished without the reliance on the evaluator.

Leadplane Training Lesson Plan

Retardant, Foam and Water Enhancers

12-09-N9065-HO

Objective:

To familiarize the student with retardant, foam, and water enhancers**.**

Content:

Review the following documentation on retardant, foam, and water enhancers as they relate to aviation operations.

Long-Term Retardants

Fact Sheet

What is a Long-Term Retardant? Long-term retardants contain retardant salts - typically agricultural fertilizers – that alter the way the fire burns, decreases the fire intensity, and slows the advance of the fire, even after the water they originally contained has evaporated.

Long-term retardants are available as wet or dry concentrates that are mixed with water thereby improving water's effectiveness and ability to cling to fuels, over a long period of time.

All qualified long-term retardants are one-component products which means the color is a part of the concentrate. The concentrate, mixed with water, is ready to use.

Retardants may be colored with iron oxide (-R), fugitive pigment (-F), or remain uncolored (-W).

Iron oxide color remains visible until weathering removes it.

Fugitive color remains visible for several weeks or more until sunlight causes it to fade or weathering removes it.

Uncolored retardant may have a slight color due to the fertilizer base and/or other components, but it is generally not visible on the fuels.

Go to https://www.fs.fed.us/rm/fire/documents/qpl_ret.pdf for a list of qualified long-term retardants.

Water quality: Retardants are not generally affected by water quality i.e. hardness/softness, pH; however bacterial contamination of the mix water may, in some instances, reduce the viscosity of the mixed product.

Mixing outside of QPL listed mix ratios (either higher or lower): Concentrations lower than the approved concentration may not be effective. There is also an increased potential of corrosion, when the product is mixed outside the approved mix ratio.

Application:

Effective in both direct and indirect attack

These thickened products tend to cling to fuels due to their increased viscosity and may show reduced rate of evaporation over untreated water

All retardants are effective even after the water they contain has evaporated.

Training: Product coverage levels and observation times occurring during training and demonstrations often will not show the strengths of long-term retardants as coverage levels are frequently high and observation times low. Even fairly low coverage levels can remain effective after they dry and until they are removed from the fuel through weathering, rain, or other environmental factors.

Other considerations: Be aware of the potential for increased slipperiness on the ground or equipment where retardant was recently applied.

While retardant salts are fairly stable under a wide variety of water quality and contamination, the presence of retardant may have a significant effect on the performance of other fire chemicals.

Aircraft tanks and other equipment should be thoroughly rinsed before changing from one product type to another.

For more information on long-term retardants or program contacts, please visit our website: https://www.fs.fed.us/rm/fire/wfcs/index.htm

Class A Foam

Fact Sheet

What is a Class A Foam? A product that relies primarily on the water it contains for firefighting. These products contain foaming agents which create air bubbles when aerated and wetting agents which allow the fluid that drains from foam bubbles to be easily absorbed by fuel, soil, and other materials that it come into contact with.

Class A foams are one-component, wet concentrates that are mixed with water to improve the firefighting characteristics of water.

Go to https://www.fs.fed.us/rm/fire/documents/qpl_foam.pdf for a list of qualified Class A Foam products.

Water quality: Some products may be affected by water temperature or water quality, i.e. hardness/softness, pH. This may impact their foaming ability and longevity of the foam in particular.

Mixing outside of QPL listed mix ratios (either higher or lower): Mixing at higher mix ratios will not generally improve performance and MAY slow drain time while mixing at lower mix ratios may result in ineffective performance, such as lack of wetting. There is an increased potential for corrosion outside the approved mix ratio range.

Application:

Best in direct suppression efforts

Products are NOT effective when dry (water has evaporated)

Evaporation RATES are very similar to water; however, judging effectiveness by the presence of the foam bubbles may be misleading. The presence of bubbles suggests that the water remains entrapped in the bubble structure which may aid in keeping water on an inclined or vertical surface.

Assume a fairly short period of time, up to about 15 to 30 minutes of effectiveness in normal wildland conditions.

Class A Foams are approved for application from ground equipment and helicopter buckets. Some products also are approved for application from single-engine airtankers (SEATs) and/or fixed-tank helicopters. Some agencies may also apply foams from water-scooping aircraft.

Other considerations: Be aware of the potential degreasing action of Class A foams to aircraft and other equipment.

A heavy ground covering of foam may conceal hazards and increase the potential for tripping.

Class A foams may not be compatible with retardant salts, resulting in absence or poor quality and stability of bubbles.

Aircraft tanks and other equipment should be thoroughly rinsed before changing from one product to another.

For more information on Class A foams or program contacts, please visit our website: https://www.fs.fed.us/rm/fire/wfcs/index.htm

Water Enhancers

Fact Sheet

What is a Water Enhancer? A product that relies primarily on the water it contains for firefighting.

These products contain polymers or other thickeners to improve performance; a) aid in adherence to fuels, b) allow build-up of thick, protective wet layer, and c) minimize drift during aerial application.

These products are available as wet or dry concentrates that are mixed with water to improve its firefighting characteristics.

Water enhancers may be uncolored (whitish), colored concentrates that maintain color when mixed with water, or an uncolored concentrate that is mixed with water that has a color added. Go to https://www.fs.fed.us/rm/fire/wfcs/index.htm for a list of qualified products (QPL).

Water quality: Many products are affected by water quality, i.e. hardness/softness, pH. This can result in drastic changes to the product's consistency (making it either thicker or thinner). Some products, under some conditions, take longer to thicken or become less stable in the container as well as after application.

"Freshening up" (or re-hydrating): Adding additional water to a mixed water enhancer to freshen the application may or may not actually work. The Forest Service has not quantified the increase/decrease in effectiveness. There is a higher likelihood of washing the product off the material you're trying to protect. After drying, the product will never return to its original, freshly- mixed consistency.

Mixing outside of QPL listed mix ratios (either higher or lower): There is an increased potential for intergranular (IGA) corrosion outside the approved mix ratio range. IGA has been found in some types of water enhancers and is an invisible type of corrosion taking place between the grains of a metal alloy, weakening it. Only mix ratios listed on the QPL have been tested specifically for intergranular corrosion.

Application:

Best in direct suppression efforts

Products are NOT effective when dry (water has evaporated)

Evaporation RATES are very similar to water. In field situations, water enhancers appear to last longer because of the thickness of the water layer on the fuel

Assume approximately 30 minutes to 1 hour of effectiveness in normal wildland conditions

Forest Service does not allow application of water enhancers by large airtankers Field users: Generally have better results in lighter fuels vs. heavier fuels

Demonstrations: Product thickness on fuels during ground demonstrations nearly always significantly exceeds anything possible with aerially delivered products.

Other considerations: Be aware of the potential for increased slipperiness on the ground or equipment, and/or difficulty cleaning aircraft, other equipment or surfaces exposed to water enhancers.

Because many water enhancers are not compatible with retardant salts and may not be compatible with other water enhancers, aircraft tanks and other equipment should be thoroughly rinsed before changing from one product to another.

For more information on water enhancers or program contacts, please visit our website: https://www.fs.fed.us/rm/fire/wfcs/index.htm

Completion Standards:

The lesson is complete when the student can demonstrate an understanding of retardant, foam, and water enhancers during the leadplane mission without the reliance on the evaluator.

Leadplane Training Lesson Plan

Aircraft Sequencing

12-10-N9065-HO

Objective:

To develop the student's proficiency with aircraft sequencing (Phase 2).

To develop the students mastery of aircraft sequencing in a fire environment (Phase 3).

Content:

Safe aircraft sequencing is an essential skill. To be successful, the student needs to understand three principals of sequencing.

1. The leadplanes role in the FTA.

    Understanding the leadplanes roll as a facilitator.

    Understanding the roll of the other aircraft pilots.

2. Communications used in sequencing.

    Becoming an effective communicator to instill trust.

    Being predictable.

    Using clearances.

    Using comfort calls.

3. The mechanics of sequencing.

    Using the leadplane pattern as a timer.

    Creating a clearance transition point.

    Understanding factors that influence the "grey" zone.

    Using helicopter checkpoints and routing.

    Knowing the qualities of a good checkpoint.

The Leadplanes Roll in the FTA

The leadplane is a facilitator and provides situational awareness to aid in efficiency. The leadplane is not an air traffic controller and holds no such authority outside the FTA. It is important to note that a leadplane can hold all the authority over a fire but not get people to do what is needed if the resources don’t trust the leadplane. A climate of trust must be created to get buy in from the other aircraft. Position authority is important but a trust climate is needed to be fully successful.

It is expected that the leadplane will maintain a high level of situational awareness of other aircraft and missions within the FTA, and will coordinate aircraft by sharing information.

Air tanker pilots are exposed to the FTA for short periods of time. Most of their time is spent in between the FTA and the tanker base. The helicopter pilots become very familiar with their dip and target areas, but may not see the entire operation within the FTA. The leadplane must be predictable, maintain a high level of situational awareness, use good communications, and be trustworthy. By doing this, tanker pilots and helicopter pilots will look to the leadplane for guidance.

Communications Used in Sequencing

It is important to understand that how things are spoken is as important as what is said.

The Clearance

A standard clearance should be utilized. During exceptionally busy missions it is important that helicopter and tanker pilots have clear concise instructions. Leadplanes are usually joined up with tankers, or are in direct supervision of them. Helicopters will be sequenced in reference to the leadplane or tanker. This does not mean that tanker drops should be prioritized over helicopter operations.

All helicopter operations can be broken down into two missions. The first is the tactical mission. This includes everything having to do with suppressing the fire i.e. dropping water or retardant. The second is the logistical mission. This includes personnel transport, sling loads of supplies and recon missions. The standard clearance addresses each mission.

“Cleared to Target” will be utilized for tactical missions. This is used after the target area and route has been identified.

“Cleared to Transition/Destination” will be utilized for logistical missions. This is used after the transition area or destination has been identified.

Predictable verbiage used at the dip and at the checkpoint enables efficient sequencing. The standard is for the leadplane to ask the helicopter to “Call your dips, call your drops, and call for clearance at the checkpoint”.

Checkpoints will be discussed later.

The importance of “call your dips, call your drops” is that it enables the leadplane to passively flight follow and track the helicopter. It also creates timing that the leadplane can utilize during sequencing. An example might be where the helicopter and the tanker are dropping in the same area. The leadplane is downwind past abeam with a tanker in tow. The helicopter calls “off the drop.” The leadplane knows that when it is on base to final, the helicopter should be clear and also aids the leadplane in where to look to gain visual contact with the helicopter.

Comfort Calls and Position Calls

Any pilot within the FTA, focused on the mission can lose situational awareness. To aid in being predictable and developing trust, the leadplane should periodically reestablish or fine tune situational awarness for all pilots. This can be accomplished with comfort calls. The comfort call is a transmission in the blind, based on the leadplane location, which defines where all sequencing aircraft are. There are three methods for using comfort calls.

Transmitting where in the pattern the leadplane is.

“Bravo 9, downwind abeam with a tanker”. The helicopter will know where to look for the ASM and will have a sense of how much time it has before the ASM and tanker are low level over the drop.

Calling visual contact.

“Bravo 33 turning base with a tanker, has 1KA off the drop”. Helicopter knows the ASM has it in sight and is maintaining separation.

Call your timing strategy.

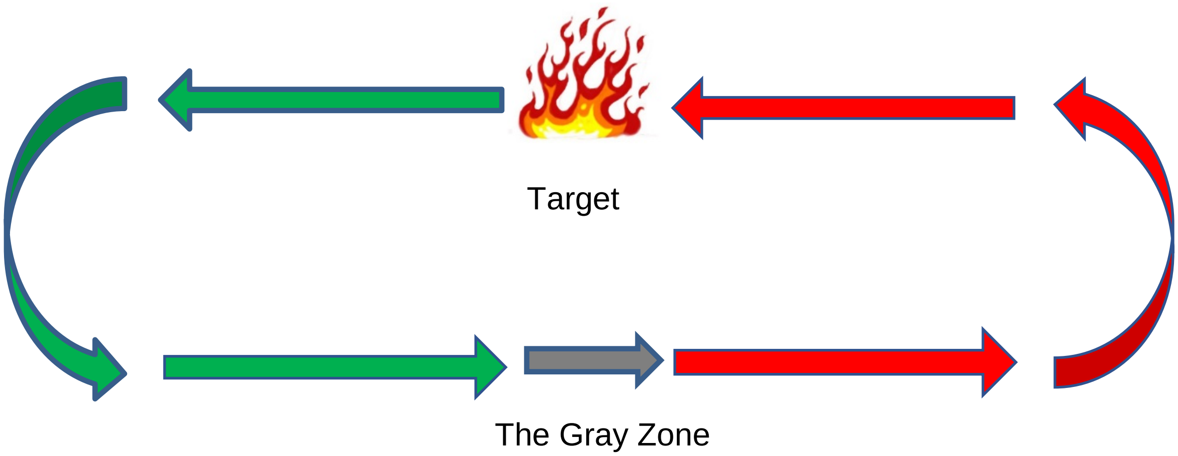
“Lead 4 with a tanker, number 2 behind 30B, extending the downwind”. Helicopter knows the leadplane has it in sight and giving it time to make its drop.

Use Comfort Calls in conjunction with the Clearance.

“30B cleared to target, Lead 2 downwind abeam with a tanker”. Helicopter is cleared to target and knows where to look in the pattern for the leadplane and tanker.

Mechanics of Sequencing

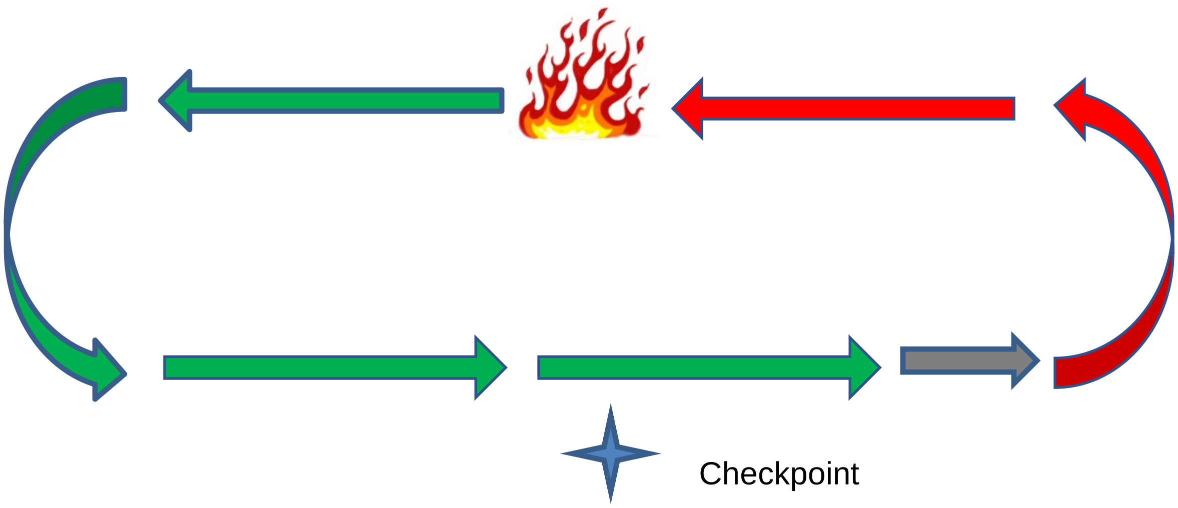
The leadplane pattern is the foundation of sequencing. If flown consistently, it will create timing that all other pilots involved in the sequencing can rely on.



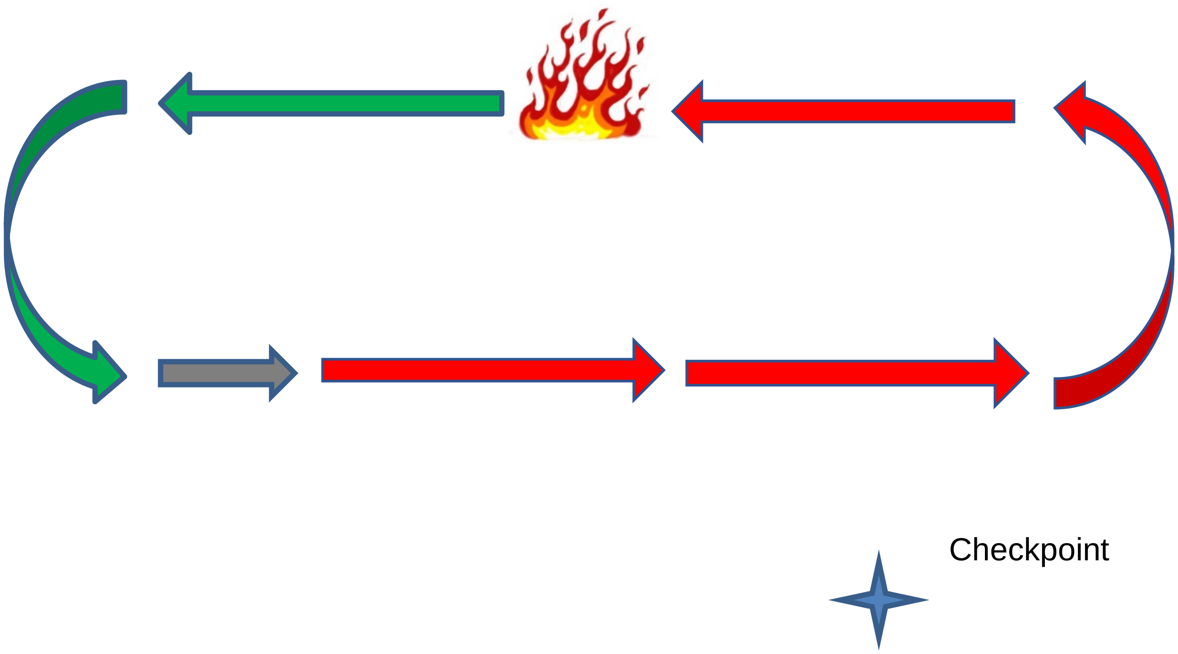
The diagram illustrates how the clearance is integrated with the lead plane pattern. In the example, the green pattern signifies it is safe to clear a helicopter from the checkpoint to target or to transition. The red pattern signifies that the leadplane and the tanker will be first and the helicopter will be “cleared to target number 2 behind the SEAT”.

The grey zone signifies the place in the leadplane pattern where the transition from the helicopter being cleared or the helicopter being cleared behind the tanker occurs. The grey zone is dynamic and moves around the leadplane pattern based on the established checkpoint. The checkpoint location must allow ample time for the helicopter to accomplish its mission before the leadplane and tanker are over the target. The closer the checkpoint is to the target the later in the leadplane pattern the grey zone can be. The further away the checkpoint is from the target the earlier the gray zone is in the pattern. The placement of the checkpoint will affect the efficiency of the aircraft operating in the FTA.

In this example, the checkpoint is closer to the target allowing the helicopter to be cleared to target later in the leadplane pattern.



In this example, the checkpoint is further from the target causing the helicopter to be held earlier in the leadplane pattern.

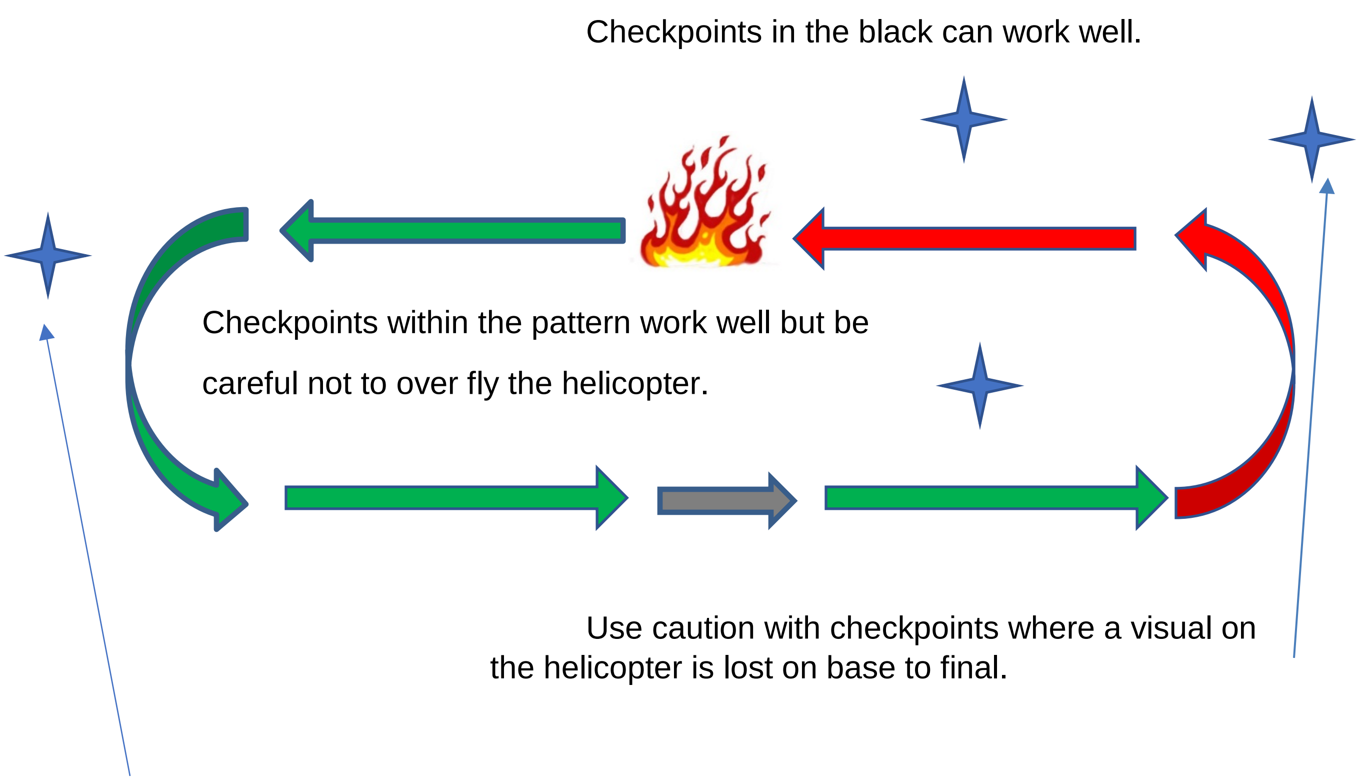


Qualities of a good checkpoint

Checkpoints should be an obvious feature easily identifiable. Obvious buildings, road bends, road intersections or other geographic features all work well. The dip, if close enough, can also be the checkpoint.

Checkpoints should be as close to the target as possible without causing airspace conflict or pilot discomfort. This will allow the shortest amount of time between the helicopter being cleared to target and the helicopter calling off the drop. A close checkpoint is safer and facilitates efficient sequencing.

To give the helicopter the best situational awareness, a checkpoint location should allow the helicopter to be able to see the retardant drop. This allows the leadplane to transfer the responsibility for separation to the helicopter by using the clearance “30B cleared to target, number 2 behind the SEAT”.



Use caution with checkpoints that align with the leadplane or tanker exit path. It is best to avoid this position for a checkpoint.

Routing
Helicopter routing from the dip to the checkpoint should be simple so as not to require supervision. Routes to the checkpoint under the downwind leg of the leadplane pattern provide for maximum vertical separation.

Helicopter routing should take into consideration terrain, roads (over flying people/vehicles), personnel, and helicopter pilot preference.

Completion Standards:

The lesson is complete when the student can demonstrate safe and efficient sequencing of multiple helicopters and fixed wing aircraft within the same target area in a fire environment for Phase 2. Safety will never be in question while sequencing aircraft.

The lesson is complete when the student can demonstrate mastery of sequencing in a fire environment for Phase 3. Safety will never be in question while sequencing aircraft without the reliance on the evaluator.

Leadplane Training Lesson Plan

Leadplane Triangle

12-11-N9065-HO

Objective:

To familiarize the student with the three basic areas of learning associated with leadplane training and how performance in these areas can improve and degrade throughout the training.

Content:

Leadplane training can be grouped into three basic areas.

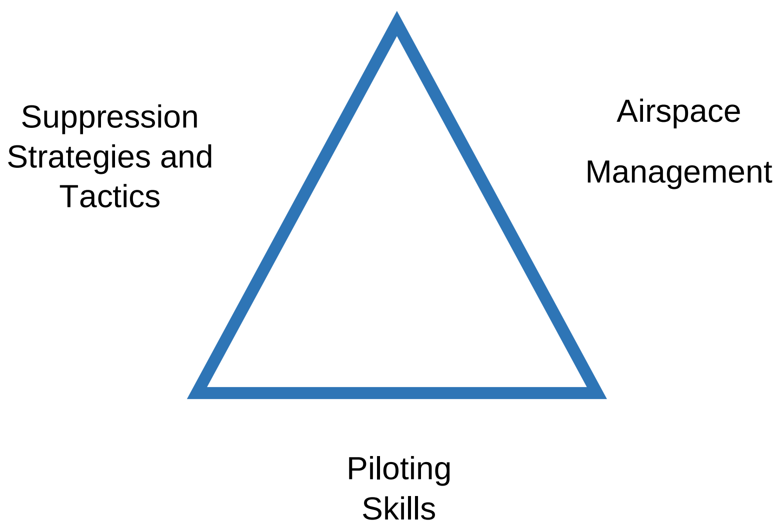
Suppression Strategies and Tactics.

Airspace Management.

Piloting Skills.

Each of these areas can be considered a leg of the Leadplane Triangle. The Leadplane Triangle is a graphical representation of the performance of a student during the training. It can be used by the student and evaluator to identify the student's improvements and degradation during training. A successful leadplane student must be knowledgeable and skillful in each of the three legs to be successful.

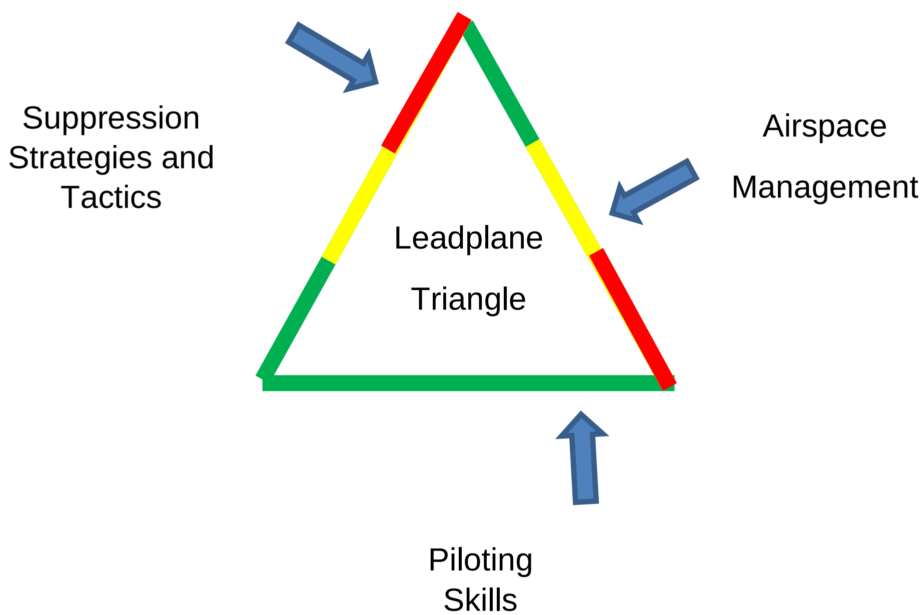
The Leadplane Triangle



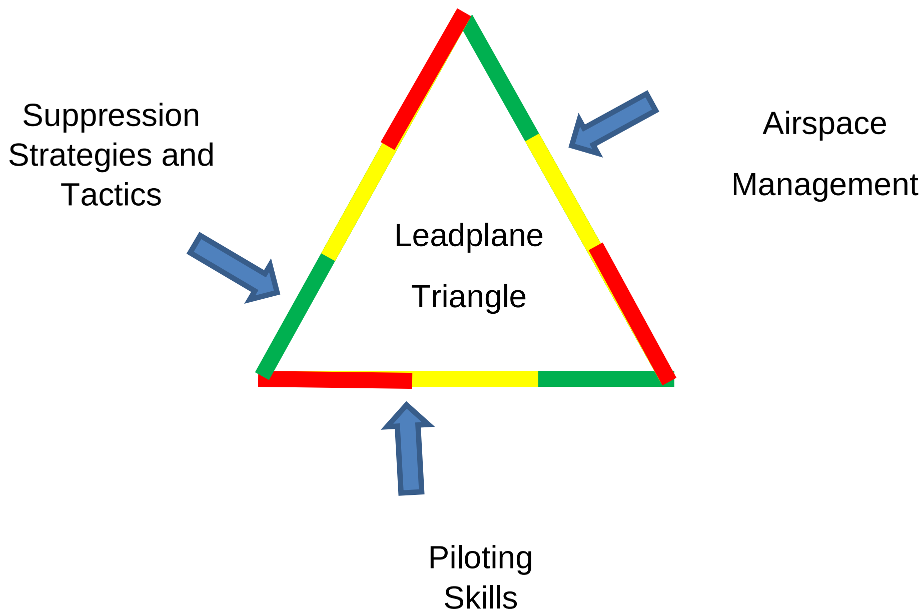
Thinking of the training in these three areas will make grouping specific tasks more manageable. Each leadplane student will come to the training with different experiences that will help them in each of the three areas.

Even though a student may have a strong knowledge base in one area, performance in that area may degrade due to the introduction of new tasks that may take much of the student's attention.

When a student is doing well with the tasks in one area it can be seen as green on the Leadplane Triangle leg. As the student's attention is concentrated on tasks associated with other legs of the triangle, legs that may have been green may slip into the yellow or red zones. Being able to point to a colored area of each leg will help the evaluator and student see how the training is progressing.



Pilots that come from a part 135 or similar background may come into the training with strong piloting skills. As an example, the task of airspeed control in the low level environment may be evaluated as in the green until other new tasks like airspace management are introduced. Many pilots find that airspeed control may degrade during high workload times in the earlier stages of training. This is normal. Evaluations of airspeed control may fluctuate up and down the scale during training but the goal is for these fluctuations to get smaller and smaller. Fluctuations in each area will always happen to some degree but the goal is that the pilot's changes will only fluctuate between the upper and lower area of green.



Pilots that come from a firefighting/ATGS background may come into the training with strong suppression strategies and tactics knowledge or airspace management skills. As an example, the task of suppression tactics may be evaluated as in the green until other new tasks like airspeed control in the low level environment are introduced. When this happens there is less time and attention that is available for developing tactics and it may be rated in the yellow. Many pilots find that airspeed control may degrade during high workload times in the earlier stages of training. This is normal. Evaluations of airspeed control may fluctuate up and down the scale during training but the goal is for these fluctuations to get smaller and smaller. Fluctuations in each area will always happen to some degree but the goal is that the changes will only fluctuate between the upper and lower area of green.

It is helpful to group the tasks associated with leadplane training into the three areas of the Leadplane Triangle. By looking at the tasks within a leg of the triangle it will give an overall representation of how the pilot is progressing in each of the areas of training. This representation is not meant to be measured specifically but to give an overall picture of the training.

Suppression Strategies and Tactics
Anchor, Flank and Pinch,

Direct Attack,

Indirect Attack,

Coverage Levels,

Fire Anatomy,

Values at Risk,

Fire Behavior,

Airtanker Type Use,

Effectiveness,

Structure Protection,

Coordination with the Ground,

Fire Size Up.

Airspace Management
Fire Traffic Area,

Initial Point,

Verbal Skills,

Brevity,

Briefings,

Horizontal Separation,

Vertical Separation,

Fences,

Holding Points,

Helicopter Sequencing,

Situational Awareness,

Target Descriptions,

Time Management,

Aircraft Sequencing.

Piloting Skills
Aircraft Proficiency,

Leadplane Profile,

Altitude Control,

Airspeed Control,

Angle of Bank,

Risk Management,

FM Radios,

Victor Radios,

Wind Corrections,

Mountain Flying,

Tanker Pilot Techniques,

Use of Checklists,

Single Pilot,

Resource Management,

Judgement,

Responsibility for Separation.

The Leadplane Triangle should be used as an evaluation tool to help the student and evaluator track progress through the training.

Completion Standards:

The lesson is complete when the student can demonstrate suppression strategies and tactics, airspace management and piloting skills to a level that is considered in the green area of each leg of the triangle.

Leadplane Training Lesson Plan

LAT Operations

12-12-N9065-HO

Objective:

To familiarize and develop the student's proficiency with large airtanker (LAT) operations.

Content:

There are eight LAT aircraft identified in the Interagency Airtanker Base Directory.

RJ85 3000 gallons

Bae-146 3000 gallons

C130 4000 gallons (not MAFFS)

MD87 3000 gallons

Convair 580 2000 gallons

P3 2550 gallons

737 4000 gallons

DC7 3000 gallons

The DC7 is not approved on federal fires without approval. The Convair 580's used in the lower 48 can be from Canada or Canadian aircraft on an Alaska contract. The 580's that come directly from Canada may have special aerial supervision constraints.

The gallons of retardant each aircraft can deliver will vary due to density altitude, fuel load, and departure airport. The gallons will vary from load to load but generally will be close to the maximum capacity. The download amounts don't usually affect the retardant tactics and are not usually a concern.

All of these aircraft can operate out of the non-SEAT airtanker bases listed in the Interagency Airtanker Base Directory except for the following six Cal Fire bases. Columbia, Grass Valley, Hemet, Hollister, Ramona and Ukiah. The tanker captains will know if they can use one base or another and should be consulted.

Due to the increased in route speeds of the jet powered tankers, the closest reload base may not be the best to use. Consider the tankers ability to take a full load of retardant and the time in route to tanker bases. A tanker base that is further away but allows a full load of retardant may be a better choice. Consult the tanker pilot and allow them to weigh in on these types of decisions. Similarly, if a tanker base is getting overloaded with reloads or fueling, consider sending the faster tankers to another tanker base that is further away to alleviate pressure on the closer tanker base.

All of these aircraft are maneuverable enough to fly in most terrain depending on pilot experience.

LAT's are a good aircraft to build retardant line with. Considering that fire line is rarely straight, this size load of retardant is very effective when building line or doing structure protection. Tie-in overlap needs to be considered since this is where thin areas of retardant may occur and will be susceptible to the fire burning through the retardant line. The LAT's can start and stop the retardant allowing for multiple passes when building retardant lines that change direction.

Minimum drop altitude is 150 feet above the fuels for LAT's. This altitude is based on a coverage level 4 and should be raised up as coverage level is increased. There are a variety of factors that influence the final coverage level on the ground (wind speed, aircraft drop speed, uneven terrain, fuel density, etc.) but the drop altitude should not need to be higher than 200 feet. Coverage levels lower than a 4 are not dropped below 150 feet.

There is no delay for wake turbulence after a LAT has dropped.

LAT aircraft generally are most comfortable in orbit at the same altitude. Stacking tankers is usually not done. If there is a situation that may warrant stacking tankers consider grouping tankers at an IP or holding point prior to coming into the operations area. Grouping like aircraft and then clearing them into the operations area is usually a best practice.

Completion Standards:

The lesson is complete when the student can explain the uses of LAT's during fire suppression activities and the best practices for integrating the LAT's into the FTA. The student must also be able to demonstrate the use of LAT's in a fire environment for Phase 2 without the reliance on the evaluator.

Drop Height Table

This table shows the minimum altitude above the height of the fuel to eliminate forward momentum of the retardant which eliminates retardant shadowing on the fuels.

Controller Setting	B747	DC10	CV580	S2	MAFFS2	RJ85	C130	BAe146	MD87	P3A
1	200	200	150	150	150	150	150	150	150	150
2	200	200	150	150	150	150	150	150	150	150
3	200	200	150	150	150	150	150	150	150	150
4	200	200	150	150	150	150	150	150	150	155
6	265	250	170	150	150	155	150	160	170	175
8	265	265	200	180	150	175	185	175	190	200

*737 data was not available at the time of writing.

Drop height may be affected by the ground speed of the aircraft, variations in the height of the terrain, variations in the height of the fuels, wind speed, wind direction, and the steepness of the terrain.

Leadplane Training Lesson Plan

VLAT Operations

12-13-N9065-HO

Objective:

To familiarize and develop the student's proficiency with very large airtanker (VLAT) operations.

Content:

There are two VLAT aircraft identified in the Interagency Airtanker Base Directory. The DC-10 which holds 9,400 gallons of retardant and the 747 which holds 19,200 gallons of retardant. An airtanker is considered a VLAT if it can hold 5000 gallons of retardant or more.

Both of these aircraft are jet powered and due to their size, have specific tanker bases that they operate out of. See the Interagency Airtanker Base Directory.

Due to their increased in route speeds, the limited reload bases are not much of a delay, but it should be noted that the VLAT aircraft do take longer to fill with retardant. Generally plan for longer turnaround times than the LAT and smaller airtankers.

The aircraft are maneuverable enough to fly in most terrain depending on pilot experience. Larger patterns should be planned for due to the 150 knot pattern speed.

VLAT crews are not initial attack rated and must be led by a leadplane or ASM.

Standard FTA procedures apply. Giving the VLAT a ¼ to ½ mile final with wings level is a best practice. This is a slightly longer final than the other tankers.

Due to the larger retardant load, VLAT's are a good aircraft to build retardant line with. With less tie-ins, there is less of a risk of thin areas in the retardant line between drops. The VLAT's can start and stop the retardant allowing for multiple passes when building retardant lines that change direction.

Minimum drop altitude is 250 feet above the fuels for VLAT aircraft. Drop testing was done before the 250 foot minimum drop altitude was adopted. The drop height table shows VLAT drop altitudes at 200 feet. Coverage levels lower than a 6 are not dropped below 250 feet. There are a variety of factors that influence the final coverage level on the ground (wind speed, aircraft drop speed, uneven terrain, fuel density, etc.) Steep downhill drops can be difficult for a VLAT while dropping a full load. Dropping part of the load and then starting a second drop at a lower altitude to tag and extend from the first drop will usually produce a better outcome.

There is a 3 to 5 minute delay for wake turbulence after a VLAT has dropped. The leadplane should fly the pattern to check for turbulence prior to allowing other aircraft in the area of the VLAT drop.

Clearing VLAT's in above other tankers should be done with caution since the wake turbulence can descend into other aircrafts orbit. Grouping like aircraft and then clearing them into the operations area is usually a best practice.

Completion Standards:

The lesson is complete when the student can explain the uses of VLAT's during fire suppression activities and the best practices for integrating the VLAT's into the FTA. The student must also be able to demonstrate the use of VLAT's in a fire environment for Phase 2 without the reliance on the evaluator.

Drop Height Table

This table shows the minimum altitude above the height of the fuel to eliminate forward momentum of the retardant which eliminates retardant shadowing on the fuels.

Controller Setting	B747	DC10	CV580	S2	MAFFS2	RJ85	C130	BAe146	MD87	P3A
1	200	200	150	150	150	150	150	150	150	150
2	200	200	150	150	150	150	150	150	150	150
3	200	200	150	150	150	150	150	150	150	150
4	200	200	150	150	150	150	150	150	150	155
6	265	250	170	150	150	155	150	160	170	175
8	265	265	200	180	150	175	185	175	190	200

*737 data was not available at the time of writing.

Drop height may be affected by the ground speed of the aircraft, variations in the height of the terrain, variations in the height of the fuels, wind speed, wind direction, and the steepness of the terrain.

Leadplane Training Lesson Plan

SEAT Operations

12-14-N9065-HO

Objective:

To familiarize and develop the student's proficiency with single engine airtanker (SEAT) operations.

Content:

The Air Tractor 802 is the primary aircraft used in SEAT operations. Other agriculture spray aircraft may be encountered from state contracts and will tend to carry less retardant and will have less performance.

SEAT's with an 800 series call sign will be a type 3 airtanker and can carry up to 800 gallons. SEAT's with a 400 series call sign will be a type 4 airtanker. Most SEAT retardant gates are now inline and are constant flow tanks. The tank systems can be selected to drop a coverage level 1 thru 6.

In route speeds will very but are generally 145 to 165 MPH (126 to 144 knots).

The gallons of retardant each aircraft can deliver will very due to density altitude, fuel load, and departure airport. The gallons will vary from load to load but generally will be close to the maximum capacity. The download amounts don't usually affect the retardant tactics and is not usually a concern.

Working SEAT's in twos or threes is very efficient for suppression activities and can increase efficiency while decreasing leadplane work load.

For sequencing efficiencies and aircraft flight patterns it is helpful to identify a lead SEAT. Identifying the number 2 aircraft, number 3 aircraft, and so on will clarify which aircraft has responsibility for separation from the other aircraft.

SEAT's are manufactured with an airspeed indicator in miles per hour. (Fire Bosses have airspeed indicators in knots per hour) When a SEAT asks for an airspeed it will need to be converted. KPH x 1.15 = MPH and MPH / 1.15 = KPH. If a SEAT asks for 120 on final it will need to be converted to KPH or 105 knots.

SEAT aircraft are very maneuverable and can fly in most terrain depending on pilot experience.

SEAT aircraft can be used to build retardant line but will have more tie-ins and will require more loads due to the lesser gallons carried. Considering that fire line is rarely straight, SEAT's can be effective when building direct line or doing structure protection. Tie-in overlaps need to be considered since this is where thin areas of retardant may occur and will be susceptible to the fire burning through the retardant line. SEAT's can start and stop the retardant but the second drop is usually an amount that is ineffective. The amount of time it takes to fly the pattern for the second part of the load is usually not worth the drop.

Minimum drop altitude is 60 feet above the fuels for SEAT aircraft. This altitude is based on a coverage level 4 and should be raised up as coverage level is increased. There are a variety of factors that influence the final coverage level on the ground (wind speed, aircraft drop speed, uneven terrain, fuel density, etc.) but the drop altitude should not need to be higher than 100 feet. Coverage levels lower than a 4 are not dropped below 60 feet.

There is no delay for wake turbulence after a SEAT has dropped.

SEAT aircraft generally are most comfortable in orbit at the same altitude. Stacking tankers is usually not done. If there is a situation that may warrant stacking tankers consider grouping tankers at an IP or holding point prior to coming into the operations area. Grouping like aircraft and then clearing them into the operations area is usually a best practice.

SEAT aircraft can operate out of all of the airtanker bases listed in the Interagency Airtanker Base Directory except for Fort Wainwright and Ukiah.

SEAT pilots are carded as a level 2 or level 1 pilot. Level 1 pilots will be more experienced. Level 2 pilots are limited to operations with one other aircraft in the FTA and no aerial supervision.

SEAT's are limited to daylight hours only and must be on the ground prior to 30 minutes past sunset.

For more information on SEAT operations consult the NWCG Standards for Single Engine Airtanker Operations.

There are several different tank and gate systems on the SEAT aircraft. This will be the main reason for differences in line length and the consistency of coverage level.

Completion Standards:

The lesson is complete when the student can explain the uses of SEAT's during fire suppression activities and the best practices for integrating the SEAT's into the FTA. The student must also be able to demonstrate the use of SEAT's in a fire environment for Phase 2 without the reliance on the evaluator.

Drop Height Table

This table shows the minimum altitude above the height of the fuel to eliminate forward momentum of the retardant which eliminates retardant shadowing on the fuels.

Controller Setting	B747	DC10	CV580	S2	MAFFS2	RJ85	C130	BAe146	MD87	P3A
1	200	200	150	150	150	150	150	150	150	150
2	200	200	150	150	150	150	150	150	150	150
3	200	200	150	150	150	150	150	150	150	150
4	200	200	150	150	150	150	150	150	150	155
6	265	250	170	150	150	155	150	160	170	175
8	265	265	200	180	150	175	185	175	190	200

*737 data was not available at the time of writing.

Drop height may be affected by the ground speed of the aircraft, variations in the height of the terrain, variations in the height of the fuels, wind speed, wind direction, and the steepness of the terrain.

Leadplane Training Lesson Plan

Scooper Operations

12-15-N9065-HO

Objective:

To familiarize and develop the student's proficiency with scooper operations.

Content:

The Air Tractor 802 Fire Boss and the Canadair CL-415 are the two types of scoopers that are used for firefighting.

It is helpful to give the scoopers an initial recon of the area they will be working in prior to starting water operations. Initially the scoopers may be brought in at the orbit altitude to recon the operations area. As the scoopers return from the scoop they will typically fly lower in route altitudes then the orbit or maneuvering altitudes. This will require sequencing the scoopers with tanker drops but also helicopter patterns and drops.

Working scoopers in twos or threes is very efficient for suppression activities. Working more aircraft into the pattern will depend on the pattern size, the scoop size and the approach/departure terrain around the scoop. Since companies train differently, pairing up company aircraft can also have an effect on operations.

The scoopers can generally fly steep descending drops due to the additional drag these aircraft have.

Scooper aircraft operate at similar altitudes as the helicopters.

When operating in conjunction with helicopters, improved communications can be achieved by putting the scoopers on the rotor victor.

Scoopers with water should not be used in conjunction with air tankers to build retardant line.

It is not necessary to lead scoopers on every run. Initially leading the scooper to identify the target is acceptable but it is best to coordinate with the scoopers to set up a route between the scoop and the drop after that.

It is not necessary to give an initial briefing or target description each time the scooper returns for the scoop. Even if the scoop is outside the FTA boundaries. As the scoopers objectives are met, verbalize or give a show me run to identify additional objectives.

Once the scoopers have integrated into the FTA they usually call off the scoop with a time to target. This will give the leadplane a sense of when to expect them and sequence them into the operation.

It is best not to call the pilot while they are scooping water. Save communications for once the aircraft is airborne again.

For sequencing efficiencies and aircraft flight patterns it is helpful to identify a lead scooper. Identifying the number 2 aircraft, number 3 aircraft, and so on will clarify which aircraft has responsibility for separation from the other aircraft.

Factors such as temperature, terrain around the water source, vegetation around the water source, wind speed and direction relative to the shape of the water source will affect the use of the water source. Fuel load may also affect the ability to take a full load of water. Always allow the scooper pilot to make the final determination as to if the water source is acceptable.

Scooper water techniques:

Direct attack on flare ups or active parts of the line.

Direct attack on active flames that are threatening retardant line, hand line or dozer line.

Direct attack ahead of crews or next to retardant line to reduce intensity or spotting potential.

Direct attack on spot fires.

Direct attack on fire line that is within 300 yards of a water source.

Air Tractor 802, Fire Boss

The Air Tractor 802 Fire Boss is the same aircraft as the wheeled SEAT but on amphibious floats. The hopper can hold up to 800 gallons and can be filled through a port at the back of the gate or by scooping from a water source.

The Fire Boss can drop water from a tanker base or water source, injected foams or gels, or retardant. It is important to know what the aircraft is carrying so that the tactical use of the suppressant or retardant can be determined.

The aircraft generally has a 140 knot enroute speed and depending on weight, pilot preference and environmental conditions and a 110 knot drop speed. External factors may change the speeds the pilot chooses to fly at. The wheeled aircraft have an airspeed indicator that read in miles per hour while the Fire Boss has an airspeed indicator that reads in knots.

Some of the Fire Bosses have infrared cameras.

The Fire Boss can be outfitted with the Fire Gate, Hydromax Gate, or the Hatfield gate.

The tank systems can be selected to drop a coverage level 1 thru 6. As with retardant, the water coverage level is based on the fuel type the fire is burning in.

Once the Fire Boss is on the water, the pilot lowers a probe on the bottom of each float. This directs the flow of water up a system of pipes and into the hopper. There is a visual gauge in the cockpit showing the load in the hopper. It takes about 15 seconds to fill the tank. The pilot retracts the probe when the tank is at the desired level.

Amphibious SEAT’s, Fire Boss’s, will have a 200 series call sign.

When a Fire Boss injects jell into the tank, it will need approximately two drops for a clean out. When this happens, expect the last two drops on the fire to be water.

Canadair CL-415

The Cadadair CL-415 is a turbine powered twin engine amphibious aircraft. It can scoop up to 1600 gallons of water.

The CL-415 can drop water from a tanker base or water source, and has the ability to inject foams. It is important to know what the aircraft is carrying so that the tactical use of the suppressant can be determined.

The tank system cannot select coverage levels. The normal drop is a salvo 4 door drop. The doors can be opened in sequence to spread the load over a longer distance.

415’s transit to and from the scoop at 180 knots and can over take a Fire Boss if the scoop is further out from the drop.

Some 415’s have infrared for finding hot areas on the fire line.

The 415’s also have 200 series call signs.

Completion Standards:

The lesson is complete when the student can explain the uses of scoopers during fire suppression activities and the best practices for integrating the scoopers into the FTA. The student must also be able to demonstrate the use of scoopers in a fire environment for Phase 2 without the reliance on the evaluator.

Leadplane Training Lesson Plan

MAFFS Operations and Interim Endorsement

12-16-N9065-HO

Objective:

To familiarize and develop the student’s proficiency with MAFFS operations.

Content:

The Modular Airborne Fire Fighting Systems are military C130 aircraft with a removable tank system. These aircraft hold 3000 gallons of retardant.

The gallons of retardant each aircraft can deliver will very due to density altitude, fuel load, and departure airport. The gallons will vary from load to load but generally will be close to the maximum capacity. The download amounts don’t usually affect the retardant tactics and is not usually a concern.

MAFFS must operate out of MAFFS approved tanker bases. Operations at any MAFFS approved base are contingent on having qualified MAFFS personnel, Airtanker Base Specialist (MABS) or MAFFS Airtanker Base Manager (MABM) and appropriate Airport Rescue & Firefighting (ARFF) on site. The tanker captains will know if they can use one base or another and should be consulted.

MAFFS aircraft are maneuverable enough to fly in most terrain depending on pilot experience. MAFFS can be used like other LAT’s but will have a narrower retardant line due to the delivery system.

MAFFS crews are not initial attack rated and must be led by a leadplane or ASM.

Minimum drop altitude is 150 feet above the fuels for MAFFS aircraft. This altitude is based on a coverage level 4 and should be raised up as coverage level is increased. There are a variety of factors that influence the final coverage level on the ground (wind speed, aircraft drop speed, uneven terrain, fuel density, etc.) but the drop altitude should not need to be higher than 200 feet. Coverage levels lower than a 4 are not dropped below 150 feet.

There is no delay for wake turbulence after a MAFFS has dropped.

MAFFS aircraft generally are most comfortable in orbit at the same altitude. Stacking tankers is usually not done. If there is a situation that may warrant stacking tankers consider grouping tankers at an IP or holding point prior to coming into the operations area. Grouping like aircraft and then clearing them into the operations area is usually a best practice.

When MAFFS operate out of tanker bases that do not have a ground compressor, the tank must be pressurized by the onboard compressor. The onboard compressor takes longer and may cause a delay if the in route time to the fire is less than 20 minutes.

Interim MAFFS Endorsement

If the leadplane student has sufficient exposure to working with the MAFFS prior to finishing the leadplane training, the evaluator can sign the pilot off for a MAFFS Interim Endorsement. This will allow the fully qualified leadplane pilot to lead MAFFS prior to attending one of the annual MAFFS training events.

Not receiving an interim MAFFS endorsement should not keep the leadplane student from passing a final leadplane pilot check ride and being designated as a leadplane pilot. The new leadplane pilot will have the limitation of not being able to lead MAFFS.

Completion Standards:

The lesson is complete when the student can explain the uses of MAFFS during fire suppression activities and the best practices for integrating the MAFFS into the FTA. The student must also be able to demonstrate the use of MAFFS in a fire environment to receive an interim MAFFS endorsement without the reliance on the evaluator.

Drop Height Table

This table shows the minimum altitude above the height of the fuel to eliminate forward momentum of the retardant which eliminates retardant shadowing on the fuels.

Controller Setting	B747	DC10	CV580	S2	MAFFS2	RJ85	C130	BAe146	MD87	P3A
1	200	200	150	150	150	150	150	150	150	150
2	200	200	150	150	150	150	150	150	150	150
3	200	200	150	150	150	150	150	150	150	150
4	200	200	150	150	150	150	150	150	150	155
6	265	250	170	150	150	155	150	160	170	175
8	265	265	200	180	150	175	185	175	190	200

*737 data was not available at the time of writing.

Drop height may be affected by the ground speed of the aircraft, variations in the height of the terrain, variations in the height of the fuels, wind speed, wind direction, and the steepness of the terrain.

Back to Table of Contents

UNIT OVERVIEW

Course Leadplane Pilot Training N-9065

Unit 13 – Flight Training

Time 2.0 Hours per flight

Objectives

1. Provide overall understanding of the environment a leadplane pilot operates within.
2. Provide overall understanding of the roles and responsibilities of a leadplane pilot.
3. Provide a safe learning environment while being introduced to the leadplane flight profiles.
4. Introduce and practice the different flight profiles needed for the delivery of retardant to the fire environment.

Strategy

The goal of this unit is to introduce leadplane mission flight profiles.

Instructional Methods

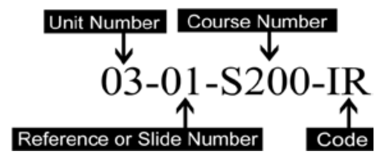
- Facilitated interactive group discussion
- Flight Training

Instructional Aids

- Flip charts and markers or dry erase board
- Approved aircraft for leadplane operations

Outline

I. Flight 1
II. Flight 2
III. Flight 3
IV. Flight 4



Aids and Cues Codes:

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	SW – Student Workbook
IR – Instructor Reference	SR – Student Reference
HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065

Unit 13 – Flight Training

OUTLINE	**AIDS & CUES**
Review Objectives	
I. Flight 1	13-01-N9065-HO
a. Brief flight 1 prior to flight, scenario 1 hand out.	
II. Flight 2	13-02-N9065-HO
a. Brief flight 2 prior to flight, scenario 2 hand out.	
III. Flight 3	13-03-N9065-HO
a. Brief flight 3 prior to flight, scenario 1 and 3 hand out.	
IV. Flight 4	13-04-N9065-HO
a. Brief flight 4 prior to flight, scenario 4 hand out.	

Leadplane Training Lesson Plan

Flight 1, Scenario 1a

13-01-N9065-HO

Objective:

Introduce the student to radio calls and communication procedures (Phase 1).

Introduce student to mountain flying and leadplane profiles (Phase 2).

Content:

Pre Flight Briefing (15 minutes)

- Flight 1 briefing
- Review flight scenario

Preflight (15 minutes)

Flight (1.0 hours)

Taxi

- GPS set up
- FM radio set up
- Tanker base operations

Airport Departure

- Dispatch

In Route

- In route procedures

FTA

- FTA radio calls and procedures
- Mountain flying techniques
  - Winds
  - Turbulence
  - Terrain

- Ridge crossings
- High and low recon
- Introduction to leadplane flight profiles
  - Visual effects over high or low terrain
  - Aircraft configuration
  - Pattern work – left hand
  - Airspeed control
  - Exit procedures
- Target descriptions

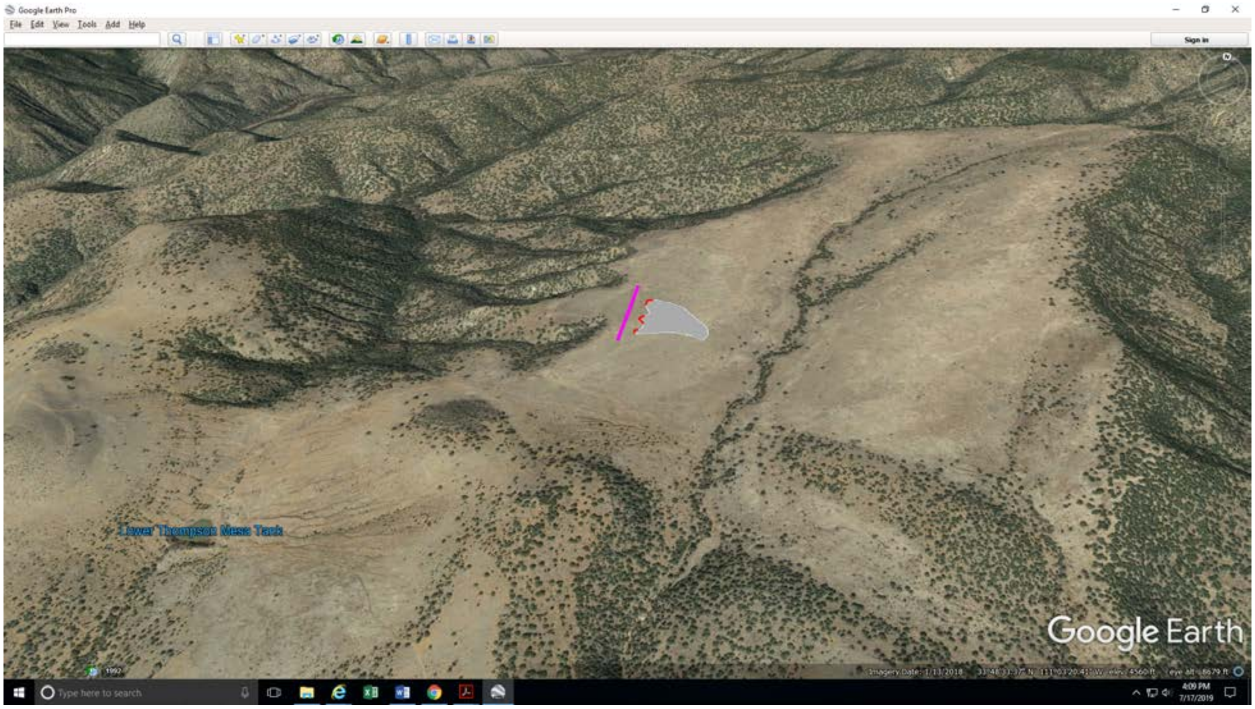
Departing the FTA
- Dispatch radio calls
- Tanker base radio calls
- Air Traffic Control

Post Flight
- Dispatch
- Fuel
- Preparing the aircraft for the next dispatch

Post Flight Briefing (30 minutes)
- Review flight 1

Armor Practice Area, Flight 1, Scenario 1a

N334915 / W1110306



Scenario photos are to aid in the communication between the evaluator and the student. Retardant objective, the red line, is shown in scenario 1 photo but not in subsequent scenario photos.

Mid-sized fire, flat to gently sloping terrain, low intensity, reinforce roads for fire line, keep the fire from crossing the road on the west side of the fire. The retardant objective will be to reinforce the green side of the dirt road starting at an intersection.

The goal of this scenario will be to fly a pattern along the dirt road across the head of a slow moving fire. The pattern should allow a tanker to drop from one shoulder to the other. The use of the roads should be addressed in controlling the spread of the fire and the benefit of dropping on the green side of the road. The accessibility for firefighters should be addressed and how it may affect the selection of coverage level.

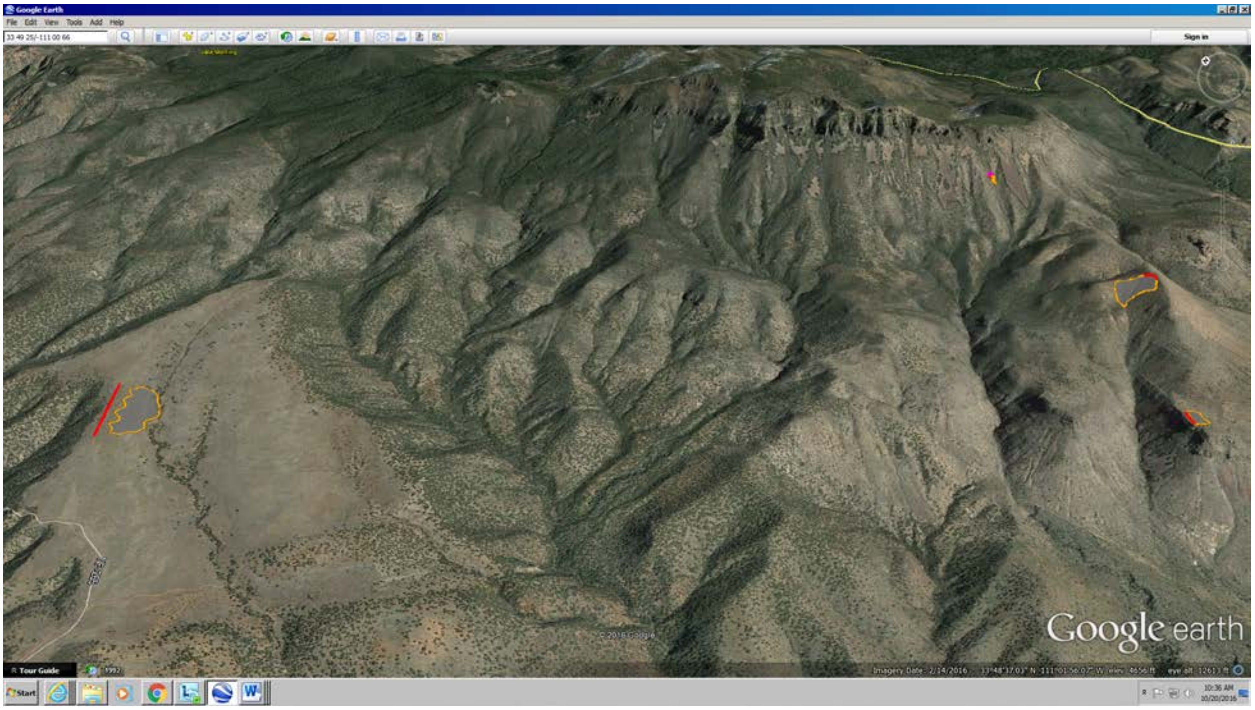
The position of this fire should allow the pilot great flexibility in flying the pattern. This scenario will provide a good opportunity for the first lead patterns to be flown where terrain is not a factor.

Completion Standards:

The lesson is complete when the student can demonstrate appropriate radio calls and communication procedures.

The lesson is complete when the student can demonstrate appropriate mountain flying and leadplane profiles.

Armor Practice Area, Scenarios 1 thru 4 Locations



Leadplane Training Lesson Plan

Flight 1, Scenario 1b

13-01-N9065-HO

Objective:

Introduce the student to radio calls and communication procedures (Phase 1).

Introduce student to mountain flying and leadplane profiles (Phase 2).

Content:

Pre Flight Briefing (15 minutes)

- Flight 1 briefing
- Review flight scenario

Preflight (15 minutes)

Flight (1.0 hours)

Taxi

- GPS set up
- FM radio set up
- Tanker base operations

Airport Departure

- Dispatch

In Route

- In route procedures

FTA

- FTA radio calls and procedures
- Mountain flying techniques
    - Winds
    - Turbulence
    - Terrain

- - Ridge crossings
- High and low recon
- Introduction to leadplane flight profiles
  - Visual effects over high or low terrain
  - Aircraft configuration
  - Pattern work – left hand
  - Airspeed control
  - Exit procedures
- Target descriptions

Departing the FTA

- Dispatch radio calls
- Tanker base radio calls
- Air Traffic Control

Post Flight

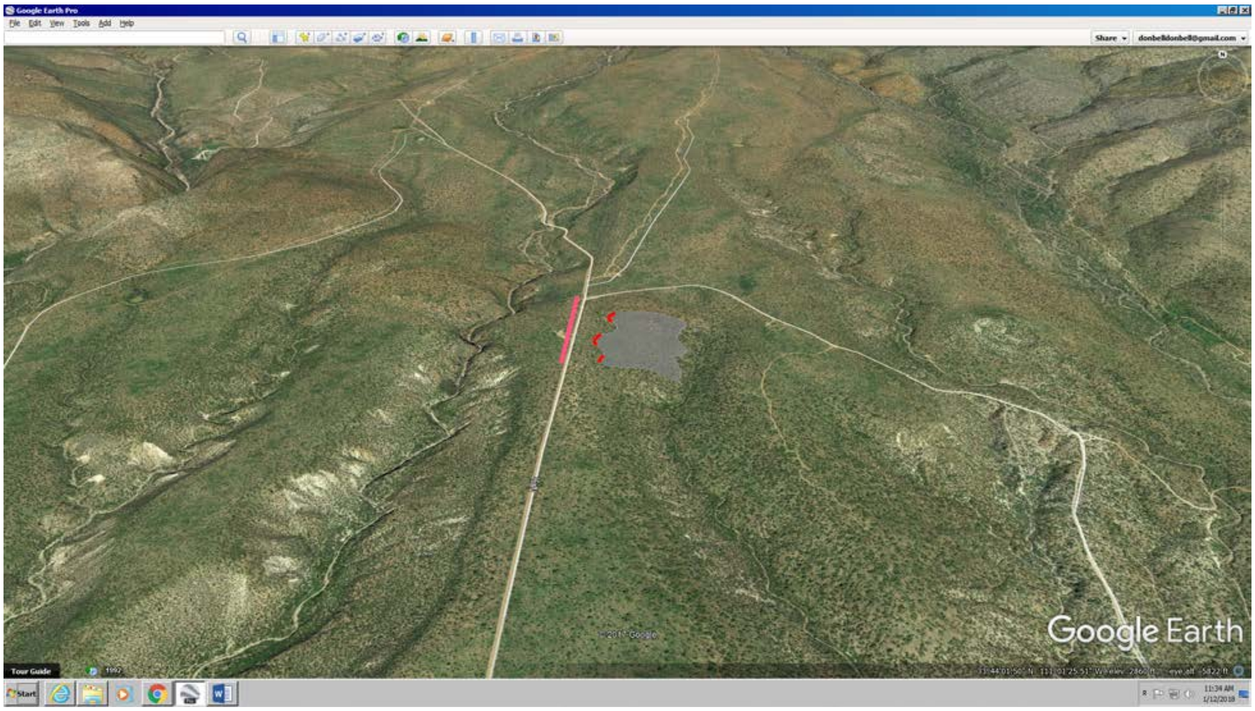
- Dispatch
- Fuel
- Preparing the aircraft for the next dispatch

Post Flight Briefing (30 minutes)

- Review flight 1

Armor Practice Area, Flight 1, Scenario 1b

N334406 / W1110129



Scenario photos are to aid in the communication between the evaluator and the student. Retardant objective, the red line, is shown in scenario 1 photo but not in subsequent scenario photos.

Mid-sized fire, flat to gently sloping terrain, low intensity, reinforce roads for fire line, keep the fire from crossing the road on the west side of the fire. The retardant objective will be to reinforce the green side of the dirt road starting at an intersection.

The goal of this scenario will be to fly a pattern along the dirt road across the head of a slow moving fire. The pattern should allow a tanker to drop from one shoulder to the other. The use of the roads should be addressed in controlling the spread of the fire and the benefit of dropping on the green side of the road. The accessibility for firefighters should be addressed and how it may affect the selection of coverage level.

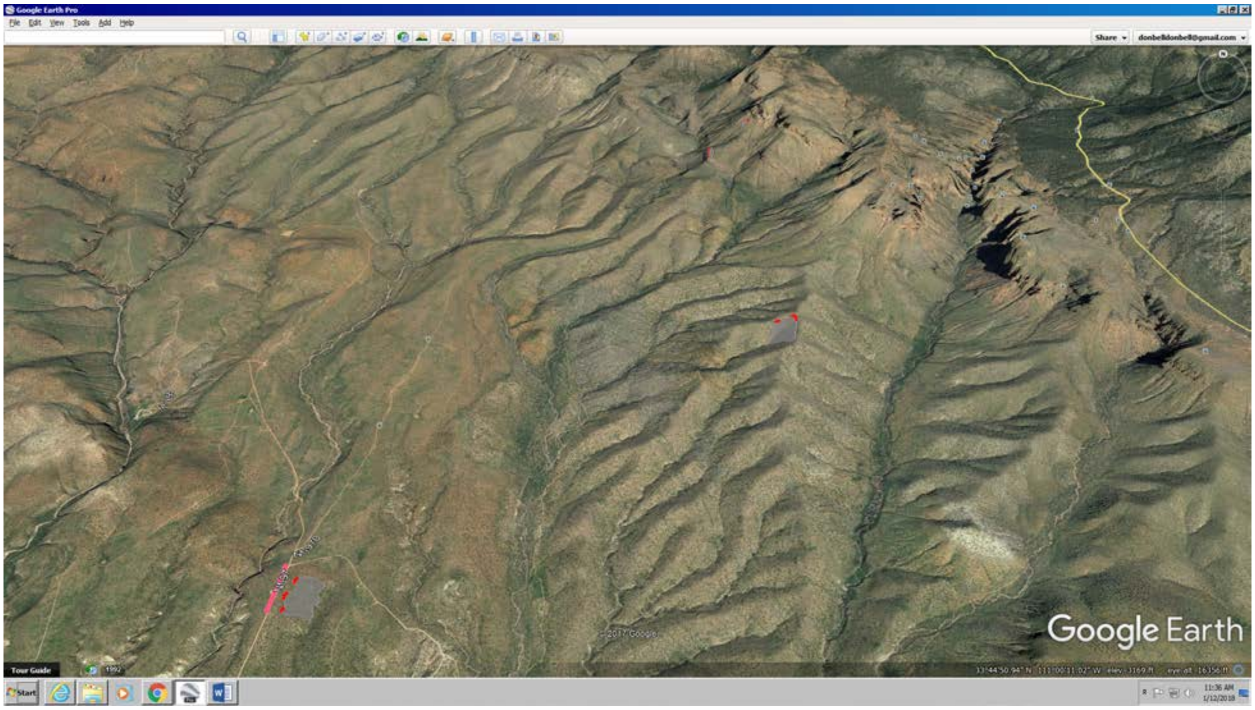
The position of this fire should allow the pilot great flexibility in flying the pattern. This scenario will provide a good opportunity for the first lead patterns to be flown where terrain is not a factor.

Completion Standards:

The lesson is complete when the student can demonstrate appropriate radio calls and communication procedures.

The lesson is complete when the student can demonstrate appropriate mountain flying and leadplane profiles.

Armor Practice Area, Scenarios 1 thru 4 Locations



Leadplane Training Lesson Plan

Flight 2, Scenario 2a

13-02-N9065-HO

Objective:

Practice radio calls and communication procedures (Phase 1).

Practice mountain flying and leadplane profiles (Phase 2).

Content:

Pre Flight Briefing (15 minutes)

- Flight 1 review
- Flight 2 briefing
- Review flight scenario

Preflight (15 minutes)

Flight (1.0 hours)

Taxi

- GPS set up
- FM radio set up
- Tanker base operations

Airport Departure

- Dispatch

In Route

- In route procedures

FTA

- FTA radio calls and procedures
- Mountain flying techniques
    - Winds
    - Turbulence

Terrain

Ridge crossings

High and low recon

Introduction to leadplane flight profiles

Visual effects over high or low terrain

Aircraft configuration

Pattern work – left hand

Airspeed control

Exit procedures

Target descriptions

Departing the FTA

Dispatch radio calls

Tanker base radio calls

Air Traffic Control

Post Flight

Dispatch

Fuel

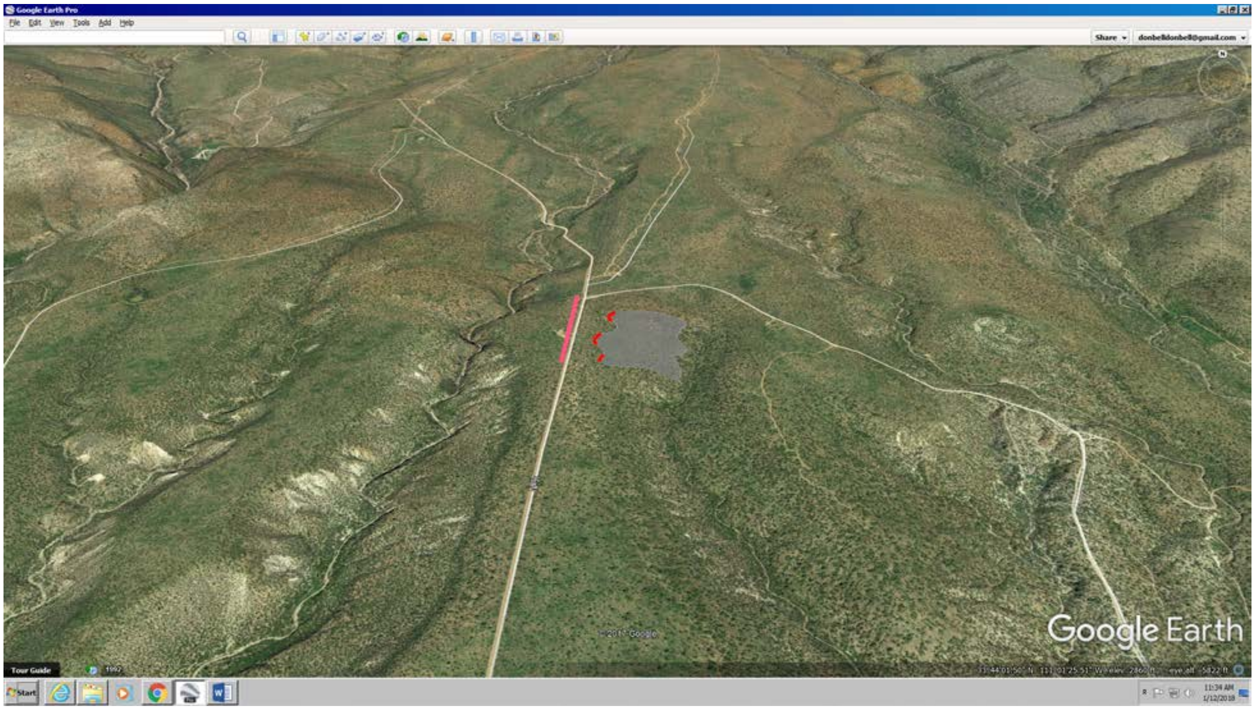
Preparing the aircraft for the next dispatch

Post Flight Briefing (30 minutes)

Review flight 2

Armor Practice Area, Flight 2, Scenario 2a

N334746 / 1110042



Scenario photos are to aid in the communication between the evaluator and the student.

Mid-sized fire, upper third of the slope, low intensity, direct attack, keep the fire from crossing the spur ridges. The retardant drop objective will be to minimize the fires spread.

The goal of this scenario is to fly a pattern along the spur ridges that defines the fires flanks. The pattern should allow a tanker to drop from the head down the flanks (V the head). The use of the ridges should be addressed in controlling the spread of the fire and the benefit of dropping on the green side of the ridge. The inaccessible terrain for firefighters should be addressed and how it may affect the selection of coverage level.

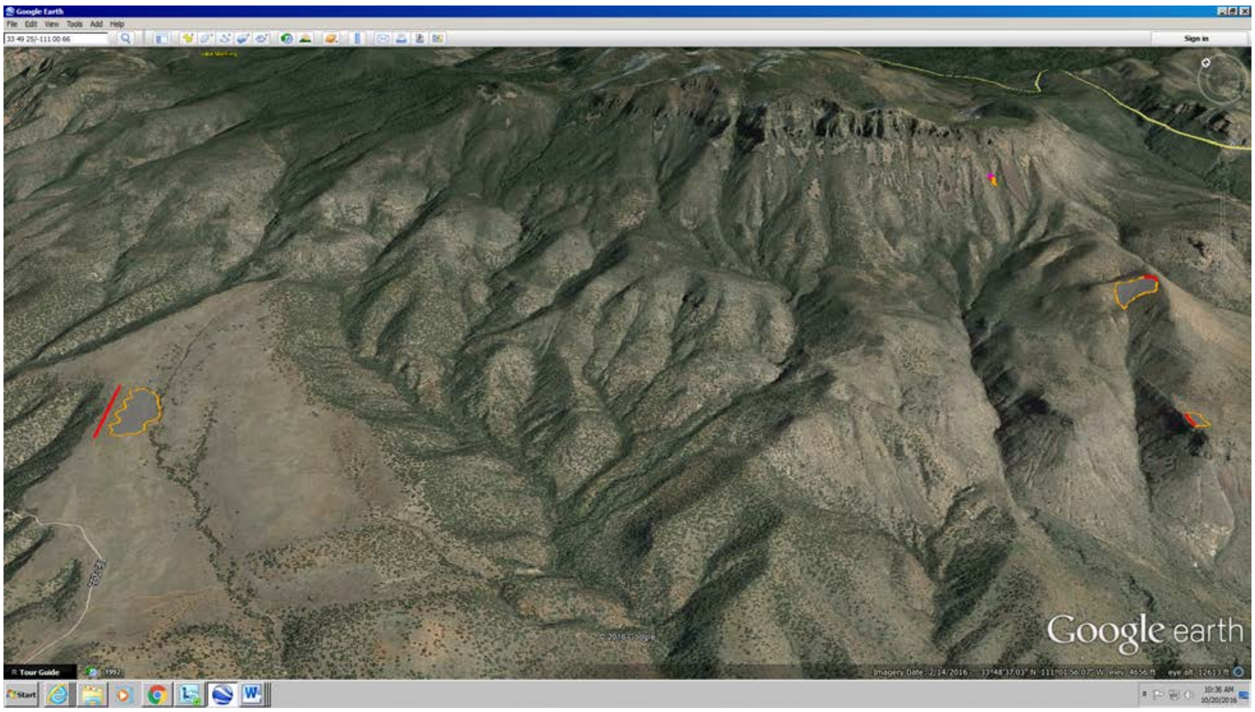
The position of this fire should allow the pilot great flexibility in flying the pattern. This scenario will provide a good opportunity for the first lead patterns to be flown where terrain is introduced to the leadplane flight profile.

Completion Standards:

The lesson is complete when the student can demonstrate appropriate radio calls and communication procedures.

The lesson is complete when the student can demonstrate appropriate mountain flying and leadplane profiles.

Armor Practice Area, Scenarios 1 thru 4 Locations



Leadplane Training Lesson Plan

Flight 2, Scenario 2b

13-02-N9065-HO

Objective:

Practice radio calls and communication procedures (Phase 1).

Practice mountain flying and leadplane profiles (Phase 2).

Content:

Pre Flight Briefing (15 minutes)

- Flight 1 review
- Flight 2 briefing
- Review flight scenario

Preflight (15 minutes)

Flight (1.0 hours)

Taxi

- GPS set up
- FM radio set up
- Tanker base operations

Airport Departure

- Dispatch

In Route

- In route procedures

FTA

- FTA radio calls and procedures
- Mountain flying techniques
  - Winds
  - Turbulence

Terrain

Ridge crossings

High and low recon

Introduction to leadplane flight profiles

Visual effects over high or low terrain

Aircraft configuration

Pattern work – left hand

Airspeed control

Exit procedures

Target descriptions

Departing the FTA

Dispatch radio calls

Tanker base radio calls

Air Traffic Control

Post Flight

Dispatch

Fuel

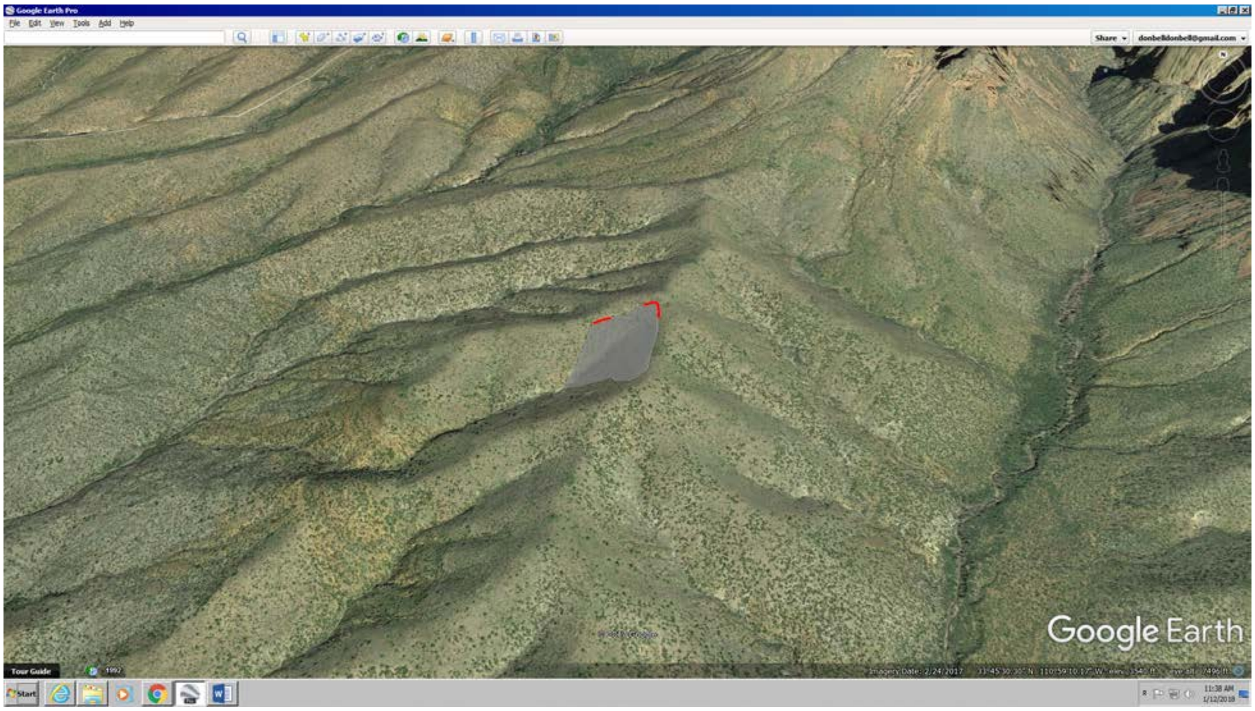
Preparing the aircraft for the next dispatch

Post Flight Briefing (30 minutes)

Review flight 2

Armor Practice Area, Flight 2, Scenario 2b

N334514 / W1105949



Scenario photos are to aid in the communication between the evaluator and the student.

Mid-sized fire, upper third of the slope, low intensity, direct attack, keep the fire from crossing the spur ridges. The retardant drop objective will be to minimize the fires spread.

The goal of this scenario is to fly a pattern along the spur ridges that defines the fires flanks. The pattern should allow a tanker to drop from the head down the flanks (V the head). The use of the ridges should be addressed in controlling the spread of the fire and the benefit of dropping on the green side of the ridge. The inaccessible terrain for firefighters should be addressed and how it may affect the selection of coverage level.

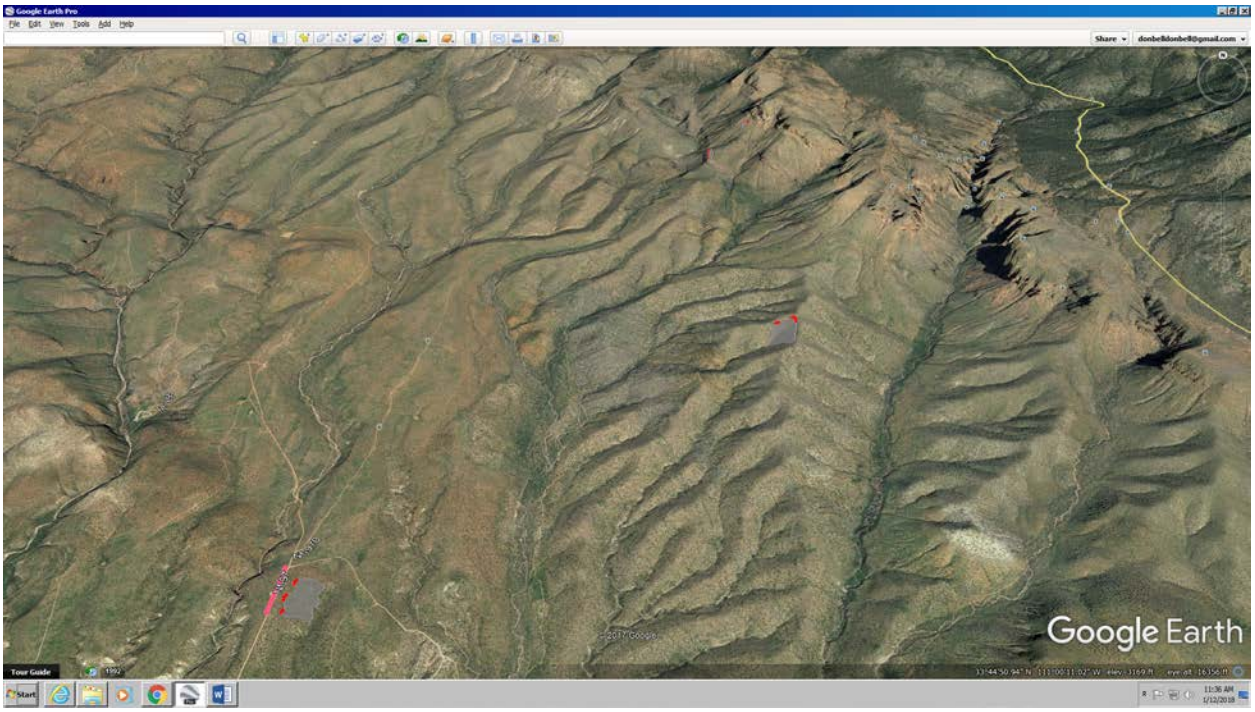
The position of this fire should allow the pilot great flexibility in flying the pattern. This scenario will provide a good opportunity for the first lead patterns to be flown where terrain is introduced to the leadplane flight profile.

Completion Standards:

The lesson is complete when the student can demonstrate appropriate radio calls and communication procedures.

The lesson is complete when the student can demonstrate appropriate mountain flying and leadplane profiles.

Armor Practice Area, Scenarios 1 thru 4 Locations



Leadplane Training Lesson Plan

Flight 3, Scenarios 1a and 3a

13-03-N9065-HO

Objective:

Demonstrate clear and concise radio calls and communication procedures.

Demonstrate good decision making while determining leadplane profiles.

Demonstrate positive aircraft control while flying leadplane profiles.

Content:

Pre Flight Briefing (15 minutes)

- Flight 1 review
- Flight 2 briefing
- Review flight scenario

Preflight (15 minutes)

Flight (1.0 hours)

Taxi

- GPS set up
- FM radio set up
- Tanker base operations

Airport Departure

- Dispatch

In Route

- In route procedures

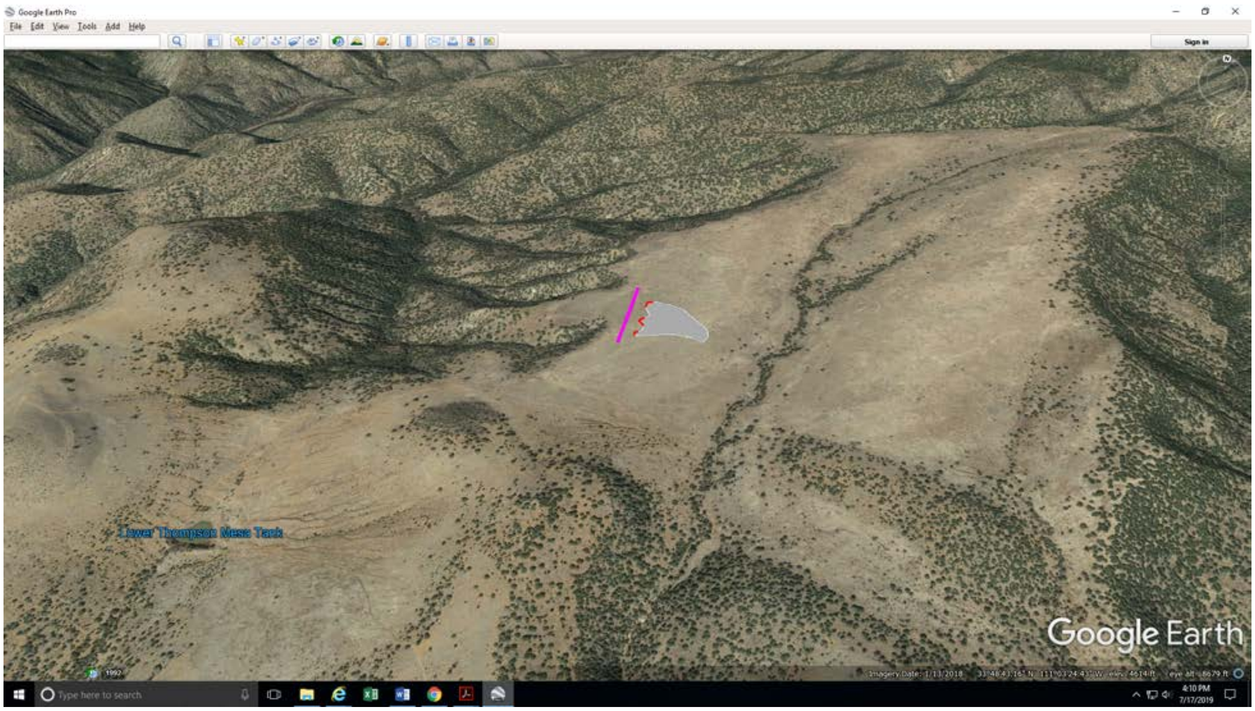
FTA

- FTA radio calls and procedures
- Mountain flying techniques
  - Winds

    - Turbulence
    - Terrain
    - Ridge crossings
  - High and low recon
  - Introduction to leadplane flight profiles
    - Visual effects over high or low terrain
    - Aircraft configuration
    - Pattern work – left hand
    - Airspeed control
    - Exit procedures
  - Target descriptions
- Departing the FTA
  - Dispatch radio calls
  - Tanker base radio calls
  - Air Traffic Control
- Post Flight
  - Dispatch
  - Fuel
  - Preparing the aircraft for the next dispatch
- Post Flight Briefing (30 minutes)
  - Review flight 2

Armor Practice Area, Flight 3, Scenario 1a

N334915 / W1110306

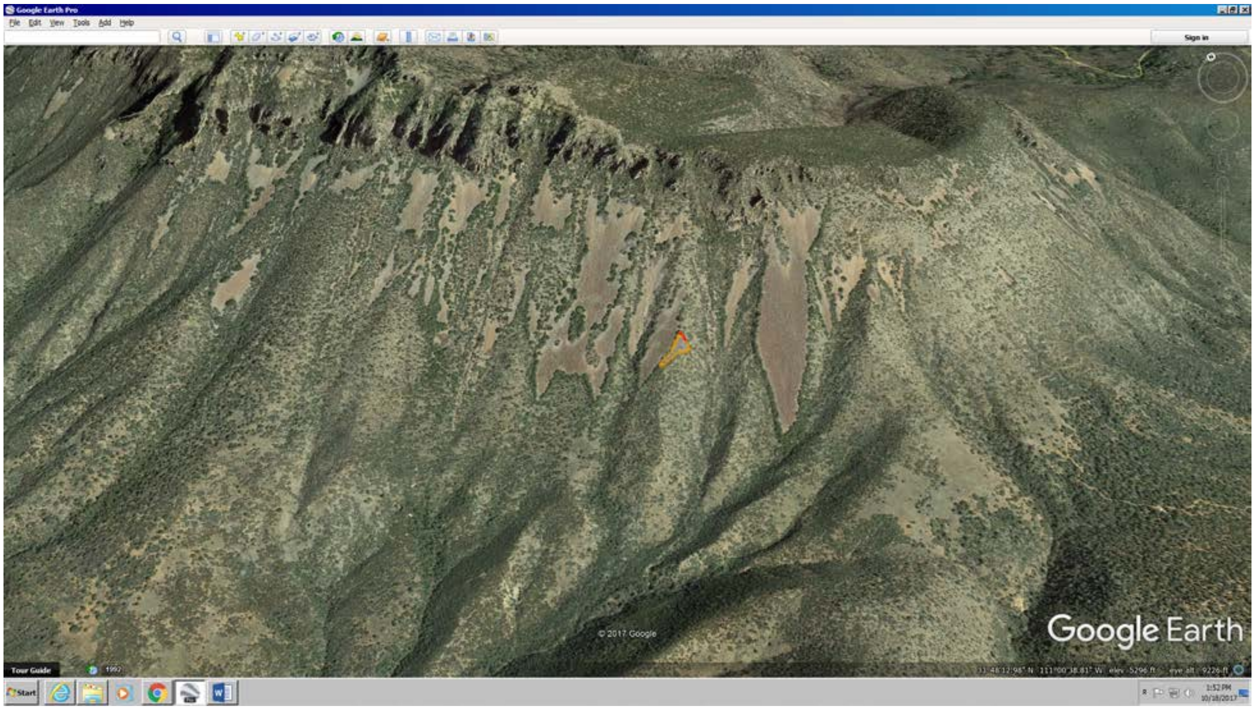


Scenario photos are to aid in the communication between the evaluator and the student.

The goal of this scenario will be to introduce right hand patterns. Right hand patterns can be introduced over terrain from Scenario 1a to minimize the terrains influence on patterns.

Armor Practice Area, Flight 3, Scenario 3a

N334821 / W1110026



Scenario photos are to aid in the communication between the evaluator and the student.

Small fire, middle third of the slope, low intensity, direct attack. The goal of the retardant drop will be to minimize the fires spread.

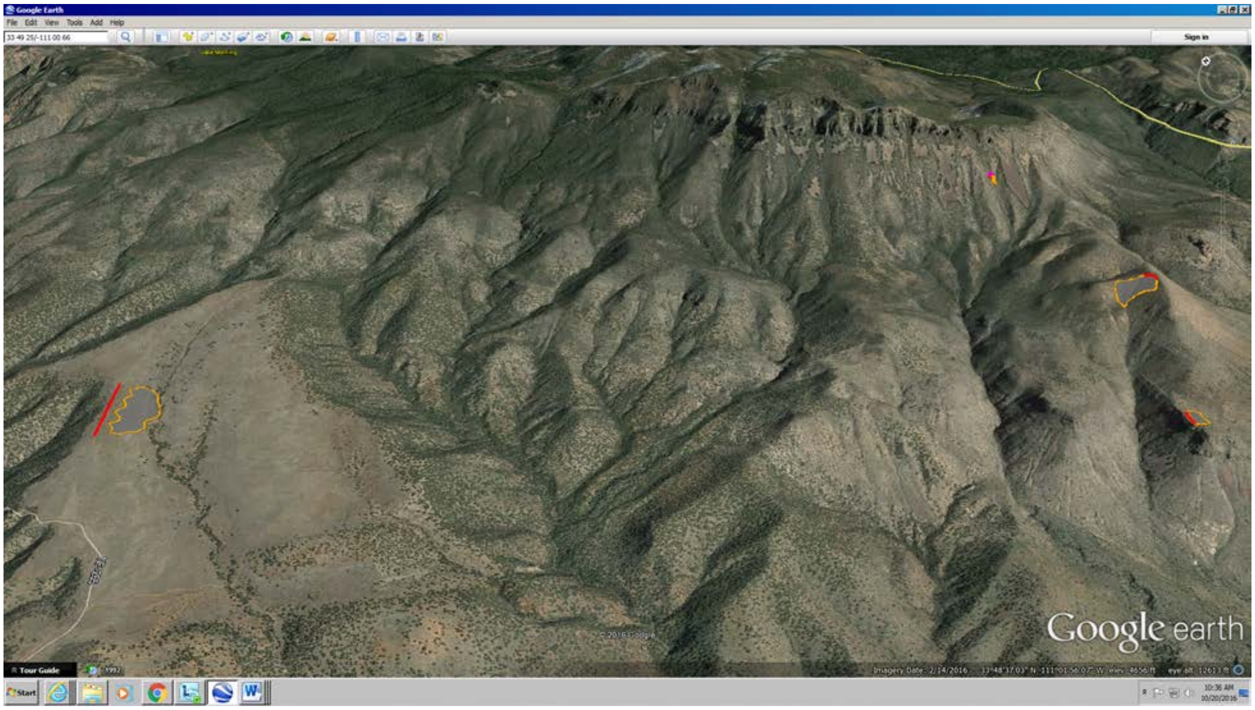
The goal of this scenario will be to fly a pattern with wings parallel to the terrain. The pattern will allow a tanker to drop across the head, start stop, and then side step down the slope with subsequent drops. The use of the anchor points should be addressed and the inaccessible terrain for firefighters. The position of this fire will cause the leadplane pattern to be adjusted for terrain. The steepness of the terrain will make it difficult to fly down slope and maintain airspeed. Flying cross slope will be difficult due to the proximity of the aircraft wingtip to the up slope side of the fire.

Completion Standards:

The lesson is complete when the student can demonstrate appropriate radio calls and communication procedures.

The lesson is complete when the student can demonstrate appropriate mountain flying and leadplane profiles.

Armor Practice Area, Scenarios 1 thru 4 Locations



Leadplane Training Lesson Plan

Flight 3, Scenarios 1b and 3b

13-03-N9065-HO

Objective:

Demonstrate clear and concise radio calls and communication procedures.

Demonstrate good decision making while determining leadplane profiles.

Demonstrate positive aircraft control while flying leadplane profiles.

Content:

Pre Flight Briefing (15 minutes)

- Flight 1 review
- Flight 2 briefing
- Review flight scenario

Preflight (15 minutes)

Flight (1.0 hours)

Taxi

- GPS set up
- FM radio set up
- Tanker base operations

Airport Departure

- Dispatch

In Route

- In route procedures

FTA

- FTA radio calls and procedures
- Mountain flying techniques
    - Winds

- Turbulence
- Terrain
- Ridge crossings

High and low recon

Introduction to leadplane flight profiles

- Visual effects over high or low terrain
- Aircraft configuration
- Pattern work – left hand
- Airspeed control
- Exit procedures

Target descriptions

Departing the FTA

Dispatch radio calls

Tanker base radio calls

Air Traffic Control

Post Flight

Dispatch

Fuel

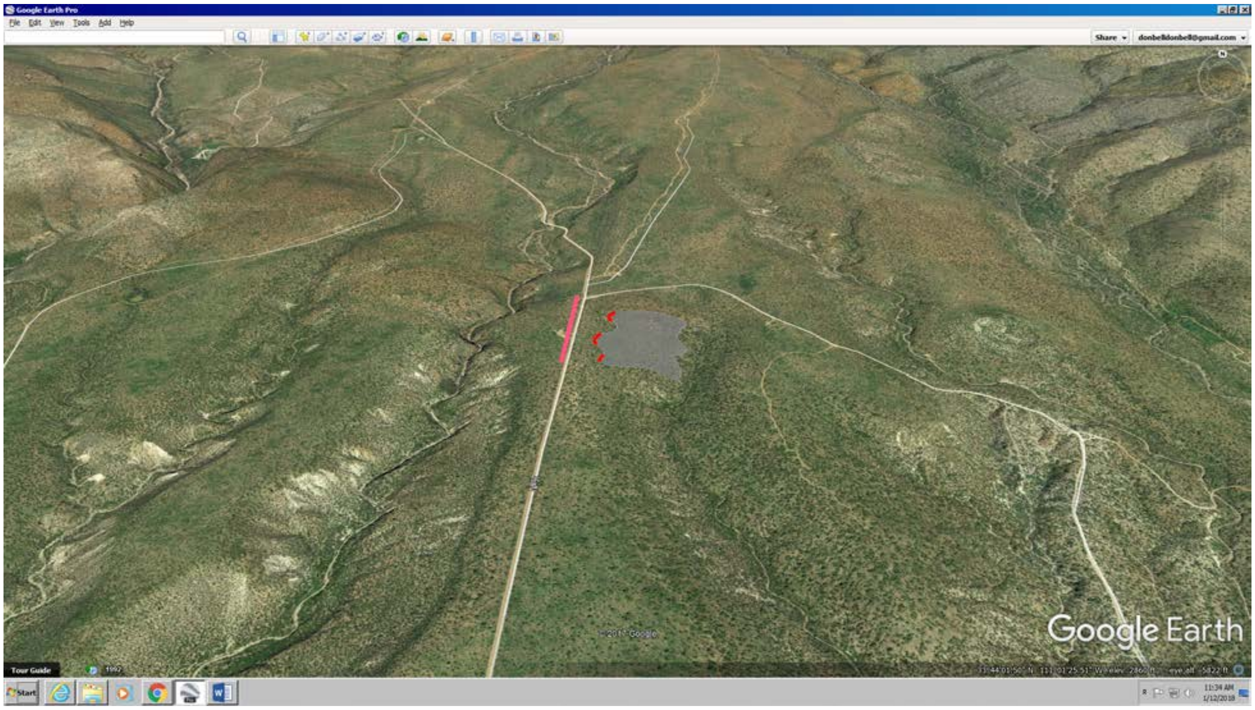
Preparing the aircraft for the next dispatch

Post Flight Briefing (30 minutes)

Review flight 2

Armor Practice Area, Flight 3, Scenario 1b

N334406 / W1110129

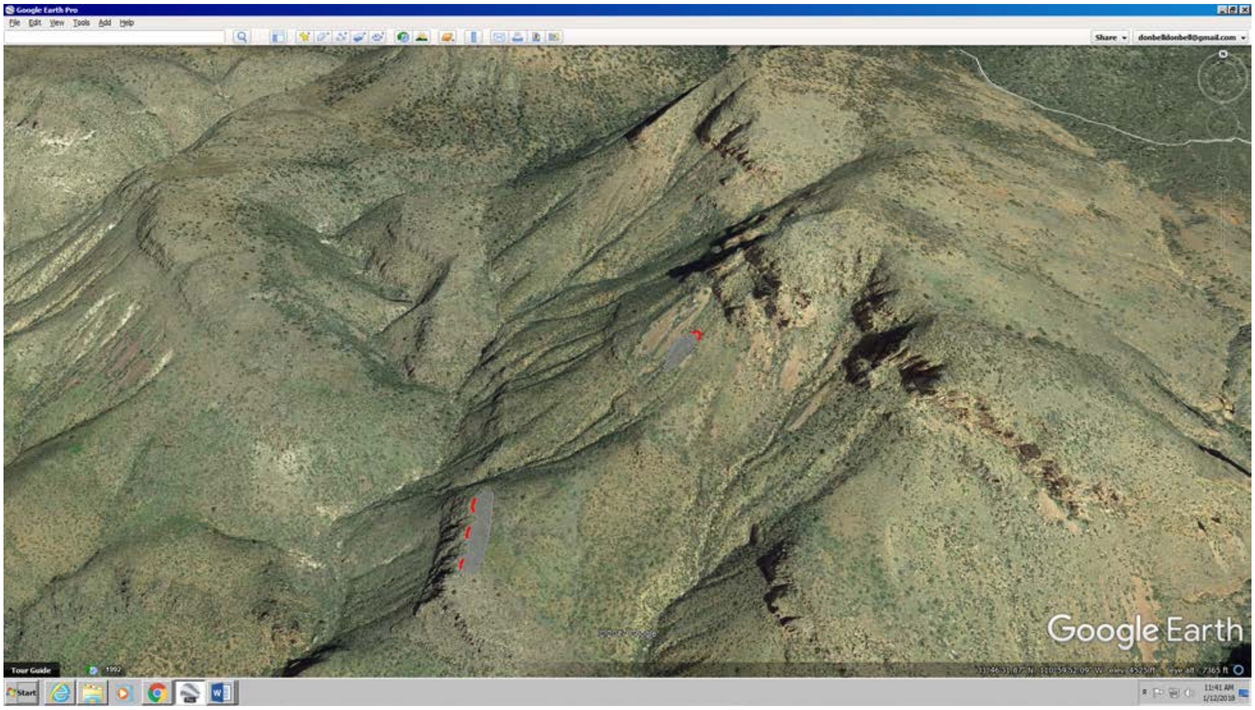


Scenario photos are to aid in the communication between the evaluator and the student.

The goal of this scenario will be to introduce right hand patterns. Right hand patterns can be introduced over terrain from Scenario 1a to minimize the terrains influence on patterns.

Armor Practice Area, Flight 3, Scenario 3b

N334634 / W1105953



Scenario photos are to aid in the communication between the evaluator and the student.

Small fire, middle third of the slope, low intensity, direct attack. The goal of the retardant drop will be to minimize the fires spread.

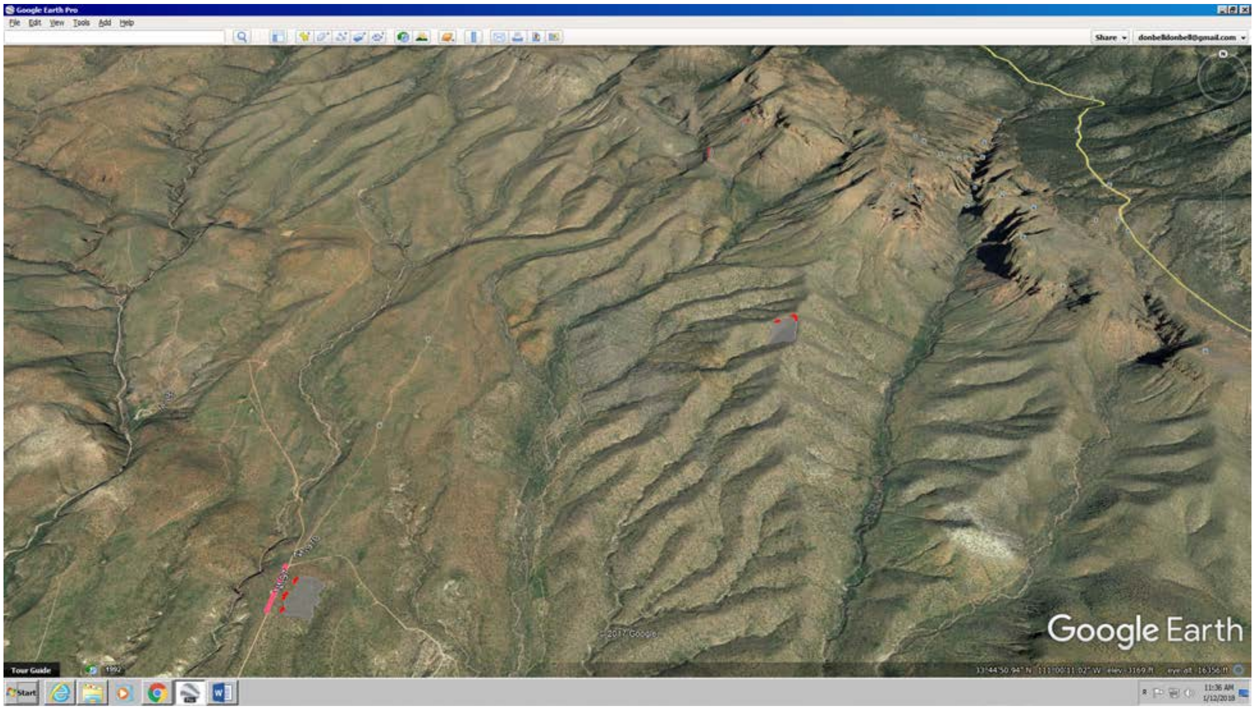
The goal of this scenario will be to fly a pattern with wings parallel to the terrain. The pattern will allow a tanker to drop across the head, start stop, and then side step down the slope with subsequent drops. The use of the anchor points should be addressed and the inaccessible terrain for firefighters. The position of this fire will cause the leadplane pattern to be adjusted for terrain. The steepness of the terrain will make it difficult to fly down slope and maintain airspeed. Flying cross slope will be difficult due to the proximity of the aircraft wingtip to the up slope side of the fire.

Completion Standards:

The lesson is complete when the student can demonstrate appropriate radio calls and communication procedures.

The lesson is complete when the student can demonstrate appropriate mountain flying and leadplane profiles.

Armor Practice Area, Scenarios 1 thru 4 Locations



Leadplane Training Lesson Plan

Flight 4, Scenario 4a

13-04-N9065-HO

Objective:

Demonstrate clear and concise radio calls and communication procedures.

Demonstrate good decision making while determining leadplane profiles.

Demonstrate positive aircraft control while flying leadplane profiles.

Introduce join ups and flying with another aircraft.

Content:

Pre Flight Briefing (15 minutes)

- Flight 1 review
- Flight 2 briefing
- Review flight scenario

Preflight (15 minutes)

Flight (1.0 hours)

Taxi

- GPS set up
- FM radio set up
- Tanker base operations

Airport Departure

- Dispatch

In Route

- In route procedures

FTA

- FTA radio calls and procedures
- Mountain flying techniques

Winds

Turbulence

Terrain

Ridge crossings

High and low recon

Introduction to leadplane flight profiles

Visual effects over high or low terrain

Aircraft configuration

Pattern work – left hand

Airspeed control

Exit procedures

Target descriptions

Introduction of a second aircraft

Leading Profile

Chase Profile

Show Me Profile

Departing the FTA

Dispatch radio calls

Tanker base radio calls

Air Traffic Control

Post Flight

Dispatch

Fuel

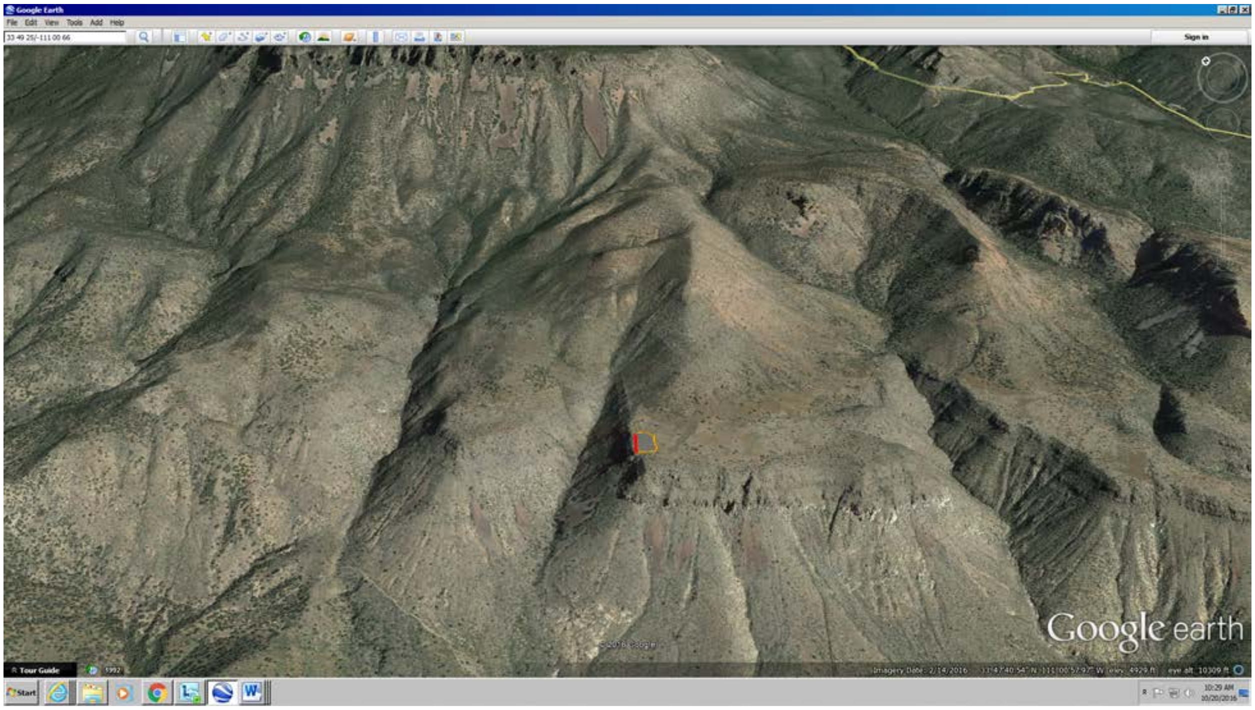
Preparing the aircraft for the next dispatch

Post Flight Briefing (30 minutes)

Review flight 2

Armor Practice Area, Flight 4, Scenario 4a

N334731 / W1110106



Scenario photos are to aid in the communication between the evaluator and the student.

Small fire, middle third of the slope, low intensity, direct attack. The objective of the retardant drop will be to keep the fire from slopping over the cliff into the canyon to the west. A secondary objective will be to line the fires perimeter with retardant.

The goal of this scenario will be to fly a right hand pattern due to terrain. The pattern will allow a tanker to drop along the head. The lack of anchor points should be addressed and the inaccessible terrain for firefighters.

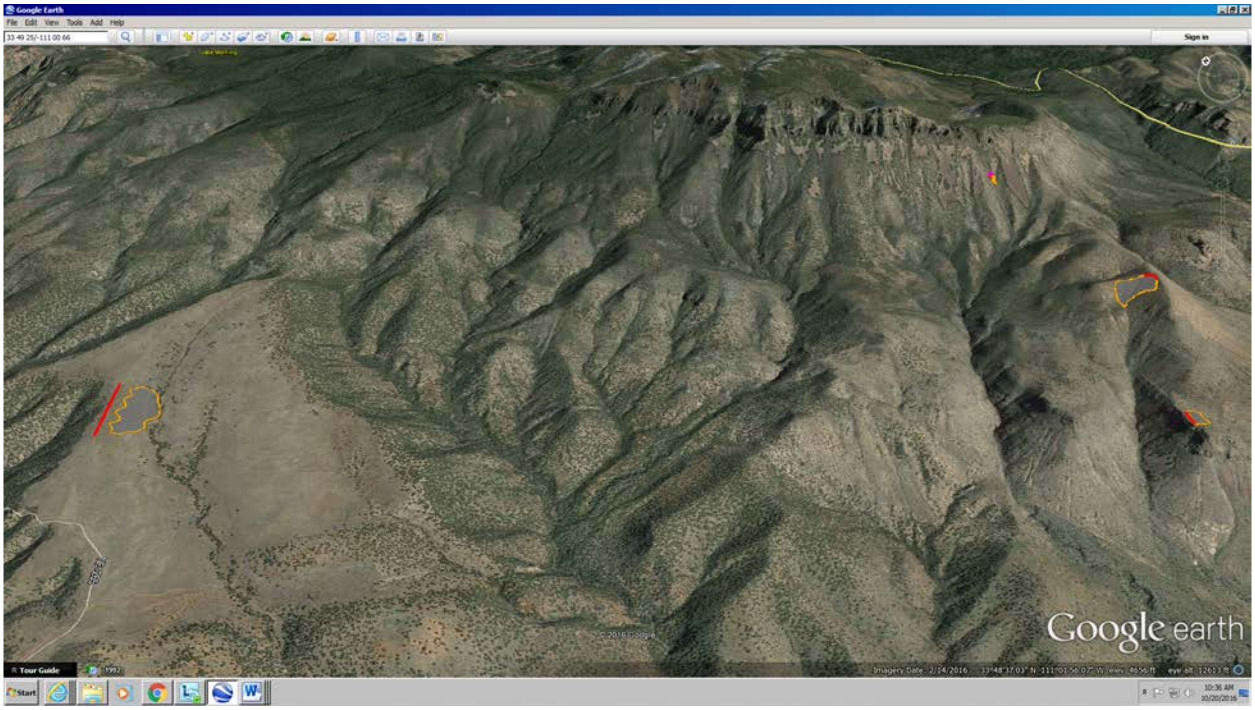
The position of this fire will cause the leadplane pattern to be adjusted for terrain. The steepness of the terrain will make it difficult to fly down slope/down canyon in a standard left hand pattern and maintain airspeed.

Completion Standards:

The lesson is complete when the student can demonstrate appropriate radio calls and communication procedures.

The lesson is complete when the student can demonstrate appropriate mountain flying and leadplane profiles.

Armor Practice Area, Scenarios 1 thru 4 Locations



Leadplane Training Lesson Plan

Flight 4, Scenario 4b

13-04-N9065-HO

Objective:

Demonstrate clear and concise radio calls and communication procedures.

Demonstrate good decision making while determining leadplane profiles.

Demonstrate positive aircraft control while flying leadplane profiles.

Introduce join ups and flying with another aircraft.

Content:

Pre Flight Briefing (15 minutes)

- Flight 1 review
- Flight 2 briefing
- Review flight scenario

Preflight (15 minutes)

Flight (1.0 hours)

Taxi

- GPS set up
- FM radio set up
- Tanker base operations

Airport Departure

- Dispatch

In Route

- In route procedures

FTA

- FTA radio calls and procedures
- Mountain flying techniques

Winds

Turbulence

Terrain

Ridge crossings

High and low recon

Introduction to leadplane flight profiles

Visual effects over high or low terrain

Aircraft configuration

Pattern work – left hand

Airspeed control

Exit procedures

Target descriptions

Introduction of a second aircraft

Leading Profile

Chase Profile

Show Me Profile

Departing the FTA

Dispatch radio calls

Tanker base radio calls

Air Traffic Control

Post Flight

Dispatch

Fuel

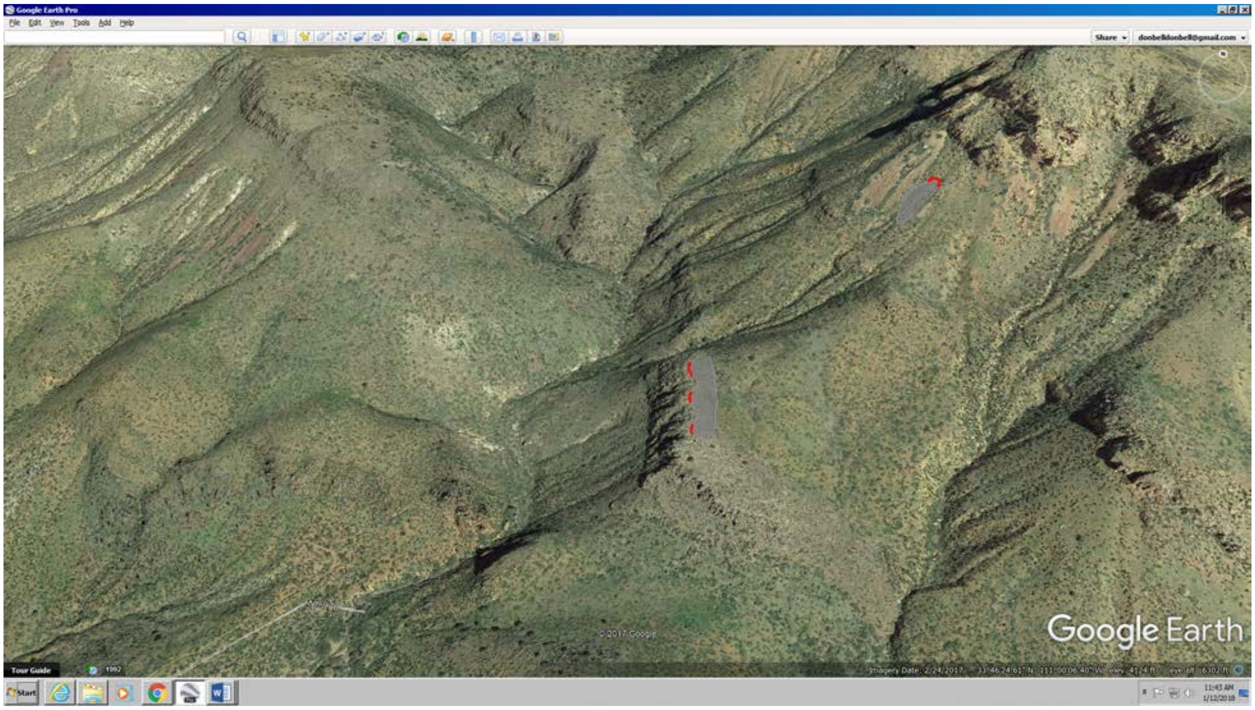
Preparing the aircraft for the next dispatch

Post Flight Briefing (30 minutes)

Review flight 2

Armor Practice Area, Flight 4, Scenario 4b

N334625 / W1110004



Scenario photos are to aid in the communication between the evaluator and the student.

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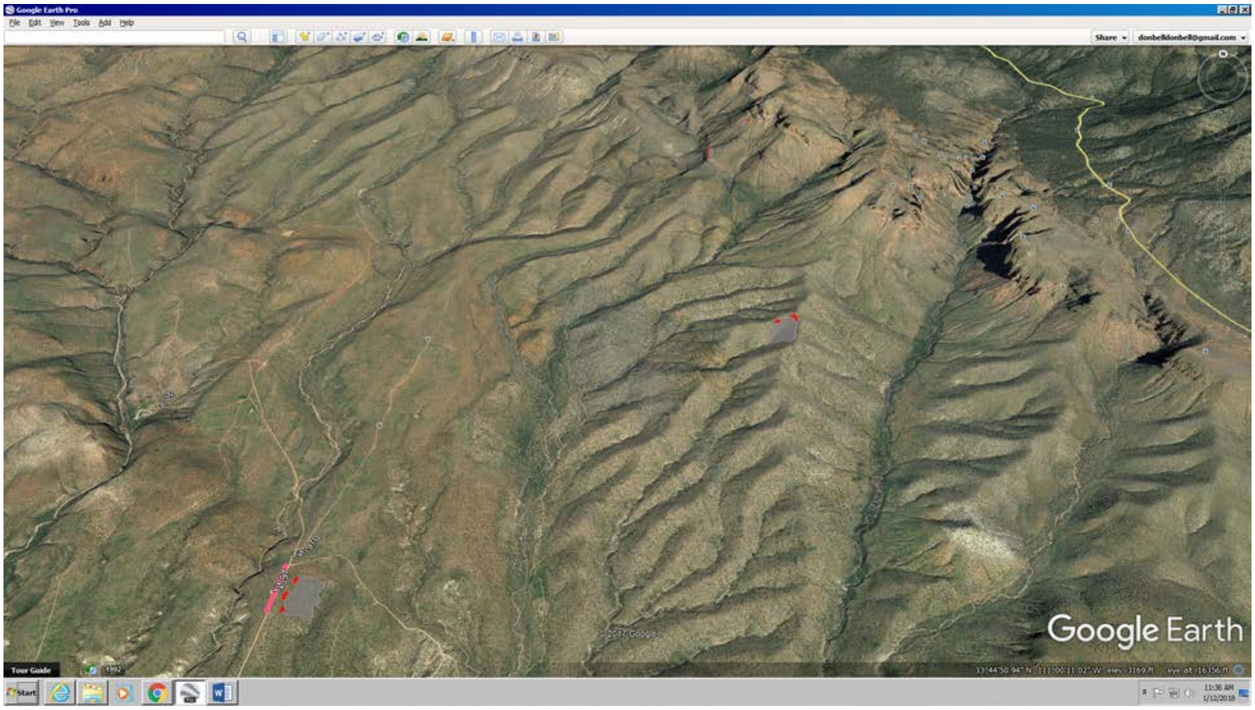
The lesson is complete when the student can demonstrate appropriate mountain flying and leadplane profiles.

Armor Practice Area, Scenarios 1 thru 4 Locations



Back to Table of Contents

UNIT OVERVIEW

Course Leadplane Pilot Training N-9065

Unit 14 – Course Review

Time 0.5 Hours

Objectives

1. Review the ground and flight training and clarify any student questions.
2. Review the course for any improvements.

Strategy

The goal of this unit is to review the entire course and address any concerns or recommendations.

Instructional Methods

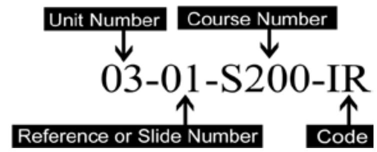
- Informal lecture
- Facilitated interactive group discussion

Instructional Aids

- Computer with LCD projector and presentation software
- Flip charts and markers or dry erase board

Outline

I. Review



Aids and Cues Codes:

The codes in the Aids and Cues column are defined as follows:

IG – Instructor Guide	SW – Student Workbook
IR – Instructor Reference	SR – Student Reference
HO – Handout	PPT – PowerPoint

UNIT PRESENTATION

Course Leadplane Pilot Training N-9065

Unit 14 – Course Review

OUTLINE	**AIDS & CUES**
Review Objectives	
I. Course Review	14-01-N9065-HO

a. Cover any topics requested by the student.
b. Discuss any suggested improvements in the course.

Leadplane Pilot Training Evaluation Form

14-01-N9065-HO

Instructor: Date:

Please provide the evaluation of the statements listed below:

1. The objectives of the training were clearly defined. Agree Neutral Disagree
2. Participation and interaction were encouraged. Agree Neutral Disagree
3. The topics covered were relevant to me. Agree Neutral Disagree
4. The content was organized and easy to follow. Agree Neutral Disagree
5. The materials distributed were helpful. Agree Neutral Disagree
6. This training experience will be useful in my work. Agree Neutral Disagree
7. The instructor was knowledgeable about the topics. Agree Neutral Disagree
8. The trainer was well prepared. Agree Neutral Disagree
9. The training objectives were met. Agree Neutral Disagree
10. The time allotted for the training was sufficient. Agree Neutral Disagree
11. The meeting room and facilities were adequate. Agree Neutral Disagree
12. What did you like most about this training?
13. What aspects of the training could be improved?
14. Please share any other comments or expand on previous responses.