

NWCG Standards for Airtanker Operations, PMS 514

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Appendix E – S-2 Tactical Flight Procedures

Cal Fire S-2T Airtanker Tactical Flight Standards

Overview

This document establishes a baseline for how a pair of S-2Ts may operate as a team, allowing any two pilots to team up and have a clear understanding of the procedures to follow. The procedures here are the “standard” baseline but variations are expected to deal with local conditions or procedures not covered in this document. Variations should be briefed and clearly understood by all parties prior to execution.

The intent of this document is **NOT** to change how close together we fly. The objective of operating as a flight is to increase efficiency, minimize communication, and establish rules for visual mutual support. This will also provide Aerial Supervisors with a more efficient force packaging option to expedite firefighting operations when appropriate.

Roles and Responsibilities

Flight Lead

The flight lead is primarily responsible for visual lookout, navigation, and communication with outside agencies. Unless otherwise briefed, the flight lead owns the wingman’s radios and will direct the wingman to change frequencies. The flight lead should maneuver in a stable and predictable manner and verbalize any upcoming unanticipated maneuvers.

Wingman

The wingman is primarily responsible for maintaining visual, deconflicting from the lead aircraft and maintaining correct formation position. Wingman secondary responsibilities include visually looking out for other aircraft and hazards. In the fire environment the wingman is responsible for being in a position behind and/or above the lead aircraft and visually clearing “through” the lead aircraft. The wingman can also backup the flight lead during periods of busy communication.

Flight Communication Standards

Brevity Words

Brevity words are standardized words/phrases that are understood by all parties to communicate more complex ideas with minimum time. The following brevity words/phrases will be utilized:

- Push:** Directs all flight members to immediately change radio frequency. Wingmen do not acknowledge.
- Push Tactical:** Directs all flight members to set radios for fire operations. Normally Comm 1 to 122.92, Comm 2 to 122.67 or rotor victor, and Comm 3 to Air Tactics, and ensure transponder set and transmitting on altitude.
- Visual:** Flight member sees the other aircraft.
- Blind:** Flight member does not see the aircraft (add own ship altitude).
- Saddled:** In correct formation spacing and position (Normally inside 1 mile/100’).

Stripped: Outside normal formation position (add range).

Radio Naming/Usage

Comm 1 as “Comm One”:

- Will primarily be use for Air Traffic Control (ATC) communications when near the airport and 122.925 once clear of the airport area and ATC communication is no longer required.

Comm 2 as “Comm Two.”:

- Will primarily be used for Automatic Terminal Information Service (ATIS) then Base Victor, secondarily for rotor victor or 122.925.

Comm 3 as “Comm Three”:

- Will primarily be used for Air Tactics.
- Guard 1 shall be programed with Air Guard.
- Guard 2 shall normally be programed with the assigned Air to Ground frequency.

“Push” Comm

Flight leads “own” all the radios in both aircraft in a flight. The flight lead will direct the wingman to change frequency with the word “push.” When directed to “push” to a new frequency the wingman will not verbally acknowledge but will immediately switch to the new frequency. The wingman is assumed to be on the correct frequency and will not tell the flight lead they are on frequency. If the flight lead wants to ensure the wingman is on the correct frequency the flight lead may execute a check-in (see procedure below). When the flight lead is directing a frequency change, they will indicate which radio to change if it is not clear based on the context. For example, if directing a change from or to Common Traffic Advisory Frequency (CTAF) during return to base it can be assumed that both flight members will change the frequency in Comm 1. IF still communicating with ATC on departure on Comm 1 and desiring to switch Comm Two from base victor to “1-2-2-9-2” the flight lead would be specific with which radio to change.

Flight lead: “T76 Flight push 1-2-2-9-2 Comm 2.”

Call Sign Usage

When operating as a flight the callsign that ATC recognizes and will use is the callsign of the lead aircraft

ATC: “Tanker 76.”

The controller may or may not say “flight.” S-2 flight leads will always append the word “flight” to the callsign.

Flight lead: “Tanker 76 Flight.”

On the initial check-in with a new ATC agency or aerial supervisor, or when transmitting on a new frequency, the lead aircraft will state the callsign of the lead tanker, the number in flight, and the callsign of the wingman.

Flight lead: “NorCal Approach Tanker 76 flight of 2 with Tanker 78, request.” Or “Rock Air Attack, Tanker 76 flight of two with Tanker 78 12 miles east 4500.”

Radio Check-In Procedures

To minimize communication S-2s will normally only perform a traditional “check-in” on tower frequency or CTAF prior to departure and on return to base prior to landing. This is essential to ensure both pilots are on frequency in the event of a change in takeoff or landing clearance or an emergency. At an uncontrolled airport the check-in should be accomplished on CTAF prior to taxi. At a towered airport the check should be accomplished after switching to tower frequency.

Flight lead: “Tanker 76 Flight check.”

The wingman will respond.

Wingman: “2.”

Flight leads may execute a check-in at other times such as after a series of multiple frequency changes or when switching to a manually programmed duplex frequency and desiring to confirm correct programming.

Transponder Use

The flight lead will always squawk 1255 and altitude or a code as assigned by ATC. Wingman should turn off transponder for any en route operations if operating as a flight with an ATC assigned transponder code (this prevents false traffic alerts to ATC). Wingman will ensure transponder is turned on for all operations in the Fire Traffic Area (FTA).

Typical “Standard” Operations

Start and Radio Setup

When operating as a flight both aircraft will start engines, obtain ATIS/AWOS, then set their radios to ground (CTAF)/Base Victor/Assigned Air Tactics.

Dispatch Over Base Victor

If obtaining dispatch info on base victor each aircraft will report ready to copy on base victor.

Wingman: “Porterville Base Tanker 78 ready to copy.”

Flight lead: “Tanker 76 ready to copy.”

Ready to Taxi

Once ready to taxi the second aircraft will report on base victor.

Wingman: “Tanker 78 ready.”

If pilots have line of sight between cockpits the wingman may indicate ready with a thumbs up instead. The lead aircraft may acknowledge verbally or may just call for taxi.

Uncontrolled Airport: Check-In and Taxi

If at an uncontrolled airport the flight lead should check the flight in on CTAF prior to taxi.

Flight lead: “Tanker 76 Flight check.”

The wingman will respond.

Wingman: “2.”

The lead aircraft should call for taxi on CTAF. Wingman will not respond.

Flight lead: “Tanker 76 flight of two with Tanker 78, taxi to RWY 30 Fire Dispatch.”

Towered Airport: Taxi, Push Tower, Then Check-In

It is assumed the wingman is monitoring ground and will hear the flight lead call for taxi. flight lead will request taxi clearance at a towered airport as follows:

Flight lead: “Redding Ground Tanker 76 flight of 2 with Tanker 78 taxi from the Tanker base with information B.”

ATC: “Tanker 76 flight taxi to RWY16 via Alpha.”

Flight lead: “Tanker 76 Flight taxi to RWY 16 via A.”

Rolling

The wingman will call the flight rolling if required to the base and note the time.

Wingman: “Porterville Base T76 and T78 rolling.”

Taxi Spacing

The flight will taxi together with the trail aircraft maintaining a safe distance to prevent Foreign Object Debris (FOD) ingestion (approximately 150’ minimum).

Ready Upon Reaching

The expectation is that both aircraft are ready for takeoff reaching the end of the runway. Wingman will not call “ready,” and the flight lead will not ask. IF as the wingman you are not ready for takeoff approaching the runway speak up on base victor. The lead aircraft may elect to wait or coordinate for a flight split and depart as a singleton.

Wingman: “T-78 needs one min.”

Push Tower and Check-In at Towered Airport

After taxi out approaching the departure runway the flight lead will direct the flight to switch to tower frequency by stating:

Flight lead: “Tanker 76 flight push tower (or Tanker 76 flight push 119.8).”

The wingman will not verbally acknowledge this call but will immediately switch to the directed frequency. The flight lead will pause to allow the wingman time to switch frequency then state:

Wingman: “Tanker 76 Flight check.” The wingman will respond “2.”

Line Up and Wait

If directed to line up and wait the flight lead will taxi into position and the wingman will hold short to reduce the possibility of FOD. Once the flight lead release brakes the wingman will execute a normal takeoff.

Takeoff

The flight lead will call for takeoff clearance, take the runway, and depart on the centerline using normal single ship procedures. Upon getting airborne, cleaning up the aircraft, and attaining a safe airspeed the lead aircraft will offset at least 200' from the centerline in the downwind direction to reduce the wingman's exposure to wake turbulence.

Once the flight lead is rolling the wingman may taxi on to the runway. The wingman will not release brakes until the flight lead is airborne.

Joinup on Departure

Flight lead should extend the upwind by ½-1 mile and/or fly a large radius turn if turning after departure. If the departure route is straight out, the flight lead should reduce power slightly (10% less than normal climb torque) and hold 160 knots during departure to allow the wingman to achieve standard formation. The wingman will use geometry and full power as well as climb at a higher indicated airspeed (180-200kts) until rejoined to standard formation. Under normal circumstances with both aircraft transponders and Traffic Collision Avoidance Device (TCAD) working, the flight lead will use TCAD, Visual, or Automatic Dependent Surveillance-Broadcast (ADS-B) data to assess when the wingman has obtained standard formation position and will automatically increase speed to normal climb/cruise speed appropriate for the fire response once the wingman is established at approximately 4500'(inside standard formation).

If the wingman has obtained standard formation and the flight lead has not increased speed, the wingman may use the term "saddled" to communicate that they have achieved standard formation with the call:

Wingman: "2 saddled."

If wingman is unable to achieve standard formation and the flight lead is requesting flight following, the wingman should report actual spacing as follows:

Wingman: "T78 is stripped 2 miles."

Flight Spacing

The normal flight spacing will be **3000-6000'** with the wingman in a cone within 60 degrees either side of the flight lead's tail. Wingman should strive to be 45 degrees off the tail at about 4500'.

When operating as a flight in controlled airspace with ATC flight following the flight is expected to maintain ATC standard formation dimensions which are one mile laterally and 100' vertically. If unable to comply with the standard formation dimensions, flight lead must inform ATC of actual spacing.

Flight lead: "Tanker 76 Flight is non-standard 3 miles front-to-back."

En Route

Once clear of the airport operations area and done communicating with ATC the flight lead will direct a frequency change to set radios for firefighting with the term.

Flight lead: “push tactical.”

Until this time interflight communication will be limited and contained to base victor.

Flight lead: “Fresno departure Tanker 76 flight request frequency change to tactical.”

ATC: “Tanker 76 squawk 1255 frequency change approved.”

Flight lead: “Tanker 76 flight push tactical.”

Wingmen will switch to 122.92 and ensure all radios, audio panel, and transponder settings are correct for firefighting operations.

Initial Attack Comm Check

Once the flight lead pushes the flight to tactical frequencies on an Initial Attack (IA) dispatch while following the Air Attack which departed from the same base the flight lead will initiate the communications check with the Air Attack as follows:

Flight lead: “AA 410, Tanker 76 Flight of 2 with Tanker 78 up Air Tactics 6. Tanker 76 number 1.”

Wingman: “Tanker 78 number 2.”

FTA Operations

When operating as a flight in the FTA the flight lead is still primarily responsible for communication. It is the responsibility of both the wingman and the flight lead to ensure that the aerial supervisor is aware that the flight contains two airplanes and that both airplanes receive clearance into the FTA.

FTA Initial Check-In (per *NWCG Standards for Aerial Supervision, PMS 505, page 109*)

On the initial call at 12 miles the lead aircraft will make the following call:

Flight lead: “Rock Air Attack Tanker 76 Flight of 2 with Tanker 78, 12 miles southwest at 6500.”

The aerial supervisor will respond as follows:

Air Attack: “Tanker 76 **Flight** altimeter 2992, you’re cleared in 6500’ Air Attack is 7500’ no known hazards.”

The flight lead will read back the clearance as follows:

Flight lead: “Tanker 76 Flight cleared in 6500, 2992.”

The wing many will then make the following call:

Wingman: “Tanker 78 number 2.”

Normally while operating as a flight in the FTA the wingman will only respond to calls directed to him/her.

Air Attack: "T78 I am going plan to have you drop on the opposite flank up by the power lines"

Wingman: "T78 Copy. I have the power lines."

Maneuvering/Dropping #1 and #2-CAL FIRE Aerial Supervisors

CAL FIRE Air Attacks will not clear flights to maneuver "as a flight" but tankers may be "cleared to maneuver #1" and "cleared to maneuver #2." Once tankers are cleared to maneuver #1 and #2 the tankers will increase spacing to ensure enough space between the aircraft so that the retardant has time to clear the air and the aerial superior has time to evaluate the first drop and provide a correction to the second tanker. Normally having one aircraft turning final as the second turns base is correct spacing. Each tanker will call their legs but comm priority will be given to the first tanker.

Air Attack: "T76 cleared to maneuver #1."

Flight lead: "T76 cleared to maneuver #1."

Air Attack: "T78 tag and extend, cleared to maneuver #2."

Wingman: "T78 cleared to maneuver number 2."

Flight lead: "T76 base."

Flight lead: "T78 downwind."

Go Around

If the first tanker goes around the second tanker many continue and drop but must ensure safe separation from the first tanker. If the second tanker goes around the first tanker will exit and the second tanker will initially fly the exit following #1 until a new clearance to maneuver is received.

Maneuvering/Dropping as a Flight-Federal Aerial Supervisors

Federal Aerial Supervisors (AA, Lead planes, ASMs) that wish the flight to maneuver and drop as a flight may clear both aircraft to maneuver as a flight as follows:

Air Attack: "T76 Flight cleared to maneuver."

In accordance with *NWCG Standards for Aerial Supervision*, PMS 505 comm procedures, only the flight lead will respond to this call as follows:

Flight lead: "T76 flight cleared to maneuver."

If it is ever unclear if both aircraft are cleared to maneuver as a flight the flight lead has primary responsibility for asking for clarification. IF the flight lead fails to confirm or if the wingman is unsure the wingman may ask for clarification.

Flight lead: "Rock Air Attack confirm T76 FLIGHT is cleared to maneuver?"

Or:

Wingman: "Rock Air Attack confirm T76 Flight is cleared to maneuver or do you want T78 to remain in the orbit?"

Once the flight is cleared to maneuver, the flight will increase spacing to ensure enough space between the aircraft so that the retardant has time to clear the air and the aerial superior has time to evaluate the previous drop and provide a correction to the second aircraft. Normally having one aircraft turning final as the second turns base provides appropriate spacing.

The flight lead will call the pattern legs for the flight. The aerial superior will clear the flight to drop which is clearance for both aircraft to drop. Once the final aircraft is off the drop the last aircraft will call:

Wingman: “Tanker 76 Flight is off the drop” or “Last Tanker off the drop.”

Go Around

If the first tanker goes around, the second tanker may continue and drop but must ensure safe separation from the first tanker. If the second tanker goes around the first tanker will exit and the second tanker will initially fly the exit following #1 until a new clearance to maneuver is received.

Maneuvering/Dropping as Individual Aircraft

The aerial superior or either tanker may prefer to have the airtankers maneuver and drop as individual aircraft and not as a flight. In this case the two tankers will be issued separate clearances to maneuver and drop. While the lead aircraft is maneuvering, the wingman will maintain the orbit altitude and a position above and behind the maneuvering tanker. The wingman should focus his/her attention on clearing the flight path of the maneuvering tanker, especially focusing on long-range hazards such as helicopters along the exit route. The wingman will maintain a position so as not to interfere with the maneuvering of the lead aircraft.

If only the lead airtanker is approved to maneuver for a right-hand traffic pattern the wingman must remain in the left pattern at orbit altitude. If the flight lead is going to begin right turns, they should make a positive maneuver to descend 500’ to maneuvering altitude prior to starting right turns.

Once the lead aircraft begins maneuvering as a single aircraft the flight is considered split and the two tankers will plan to return to base as singletons. If conveniently aligned the flight may coordinate to rejoin as a flight as they depart the FTA for efficiency during return to base (RTB).

Initial Attack Without an Air Attack

Two S-2s responding to an IA fire without an aerial supervision platform can work closely to split their radios to coordinate with the Incident Commander (IC), other aircraft, and the Emergency Communications Center (ECC) if required. This can be done many ways.

One option is to have the lead S-2 keep his/her FM on Air Tactics with guard on the assigned Air to Ground. The flight lead can manage the airspace and clear in any additional resources. The lead can also establish contact with the IC on A/G. The wingman can continue to monitor Air Guard.

If unable to contact ground resources on A/G, the flight lead can direct the wingman to attempt contact on Command or a Ground Tactics channel. Once the wingman establishes communications with ground resources, he should request the ground resources come up on A/G. The wingman can also pass a size up to the ECC or get the IC priorities that they can pass to the flight lead on 122.92 so that retardant application can commence rapidly.

Rejoin/Join Up

Normally the most efficient place to join up as a flight is on the ground prior to taxi. Airtankers may coordinate to join as a flight airborne. This could be off the fire during RTB, en route to the fire, or while holding at an Initial Point (IP). The Federal Standards for aerial supervision prohibit the creation of flights inside the FTA (at the fire).

Either the lead or trail aircraft may initiate a join up request. The lead aircraft may initiate a join up by stating (normally on 122.92):

Flight lead: "Tanker 78, Tanker 76 cleared rejoin."

If the second aircraft wants to accept, they will respond with:

Wingman: "2."

If the second aircraft does not want to rejoin, they can respond with:

Wingman: "Tanker 78, negative."

The second aircraft may initiate the rejoin with a request as follows:

Wingman: "Tanker 76, Tanker 78 two miles in trail request rejoin."

The lead aircraft can respond with:

Flight lead: "Tanker 78 cleared rejoin."

Or:

Flight lead: "Tanker 78 negative."

During a rejoin while flying straight and level the standard speed is for the lead aircraft to be at 160 knots. The lead aircraft may utilize a check turn of 20-30 degrees from the desired direct course to allow the wingman to use geometry to expedite the rejoin. If holding (such as at an IP) the standard speed is 130-150 knots. Wingman may adjust speed or use geometry to close to the desired distance. Once at the desired distance (normally inside one mile) the wingman will call:

Wingman: "2 saddled."

The flight lead will automatically resume normal desired speed and routing.

Return to Base/Landing

S-2s should attain standard formation prior to contacting ATC with a request for RTB to towered airport or class B or C airspace entry. Approaching the airport, the flight lead will push the flight from 122.925 to APPCH/TWR/CTAF as appropriate.

Traffic Check/Fuel Request/ATIS

The flight lead should direct the wingman to contact base to request a traffic check, fuel, or to advise three minutes out if required as follows:

Flight lead: "2 cleared off traffic check and weather T76 positive fuel."

Wingman: "2."

The wingman will request the traffic check or order fuel etc., get the weather/ATIS and report back up base victor or 122.92 with the ATIS or WX.

Wingman: “2’s up with Bravo RWY 16,2992.”

Flight lead: “1.”

Untowered Airports

Approaching the airport lead will push the flight to CTAF and check the flight in on the CTAF frequency. IF the traffic pattern is uncrowded and the flight of S-2s does not have any concerns about possible traffic conflicts the flight may remain a flight for pattern and landing with only the lead aircraft talking on the radio. If the pattern is busy or either pilot is concerned about confusing other pilots or safe separation from other aircraft, the second tanker will also call his/her pattern legs or otherwise communicate their position and ensure that other pilots are aware of the existence and position of both tankers.

Flight lead: “T76 Flight push 122.97 (or push CTAF).”

Flight lead: “T76 Check.”

Wingman: “2.”

Flight lead: “McClellan traffic Tanker 76 flight of 2 S-2s with Tanker 78, 15 miles east inbound for a right crosswind RWY 16.”

Wingman: “McClellan traffic T78 the second S-2 is turning a 1 mile final 16 full stop.”

Towered Airports

Approaching the airport the flight lead will push the flight to tower frequency and check the flight in on the tower frequency.

Flight lead: “T76 Flight push tower (...push 119.8).”

Flight lead: “T76 Flight Check.”

Wingman: “2.”

Flight lead: “Redding TWR T76 is a Flight of 2 S-2s with tanker 78, 15 miles east inbound with Bravo.”

Landing as a Flight

Tankers should ensure spacing is approximately 4500 ‘when landing behind another tanker. When landing as a flight the lead aircraft should make a normal landing then slow to a controllable speed but not execute a max performance deceleration. This will maximize runway separation spacing for the aircraft landing second. The wingman should take spacing no later than turning base to ensure landing no less than 3000’ after the lead aircraft. If there is any doubt about safe spacing the wingman will execute a go around.

Taxi Back as a Flight-Towered Airport

Once clear of the runway ATC expects the flight to taxi back together. Once the flight lead is clear of runway the flight lead should switch to ground frequency and call for taxi clearance. The wingman

likely will not hear the clearance as they must remain on TWR frequency until clear of the runway. The wingman should clear the runway at the same exit as the flight lead and follow the same routing. IF ATC provides alternate instructions for the wingman the flight lead must inform the wingman on base victor.

Flight lead: “Tanker 78 hold short of Bravo,” or “Tanker 78 get your own taxi clearance.”

Taxi Back as a Flight-Non-Towered Airport

If the flight lead is not able to see the wingman clear the runway the wingman will report clear of the runway on base victor and the flight lead will make a call that the flight is clear of the runway with taxi intentions.

Flight Splits

If operating as a flight is reducing efficiency or safety either flight member can advise that flight is splitting up. The other member shall acknowledge. Wingman will maneuver outside of one mile spacing and turn on his/her transponder.

If splitting the flight while communicating with ATC the flight lead will inform ATC of the flight split and clearly state the call sign of the wingman. You can expect ATC to establish comm with the wingman and assign a new squawk if required.

Flight lead: “Fresno approach T76 Flight request to split the flight. T78 is the trail aircraft up this frequency one mile in trail.”

Air Attack: “Have T78 squawk 1725 maintain VFR at or above 2500.”

Wingman: “T78 squawk 1725 VFR at or above 2500.”

Abnormal Operations

Canceled Dispatch

When a dispatch is canceled en route to the fire or neither aircraft drops the flight should maintain formation position and return to the base as a flight without a lead change.

Blind

It is assumed that the wingman sees the lead aircraft at all times. If the wingman ever loses sight of the lead aircraft, they will immediately call “blind with an altitude.” While maneuvering away from the last know position of the lead aircraft. If the lead is also blind, they will clear their flight path while maneuvering away from the altitude communicated in the blind call. The flight lead will then coordinate to get the wingman back visual by communicating their position and talking the wingman’s eyes back on. Once the wingman reacquires the visual, they will communicate “visual”:

Wingman: “T78 blind climbing to 2000.”

Flight lead: “T76 is level 1500. T76 is over the right flank just coming around the column.”

Wingman: “T78 is visual descending to 1500.”

Flight lead: “T76 Copy.”

Weather/Reduced Visibility

During periods of reduced visibility (primarily due to smoke) the wingman should reduce spacing to no less than 3000' to maintain sight of the flight lead. If it becomes excessively difficult to maintain sight the wingman can advise that he is departing formation. In this case the wingman should execute a positive turn away from the position of the flight lead of at least 30 degrees of heading change and if possible, also change altitude. The wingman should communicate that what they are doing with their aircraft.

Wingman: "Tanker 78 is lost wingman heading 230 degrees climbing to 4500."

Emergencies/Damage Check

When encountering an aircraft emergency both pilots should work together to get the aircraft safely on the ground. In general, the aircraft with the emergency should be offered the lead and the "good" aircraft should assume a chase position above and behind the emergency aircraft. The chase aircraft can be used to execute Crew Resource Management (CRM) duties such as reading checklists, notifying outside agencies, and backing up the emergency aircraft on his/her plan of action. The good aircraft can also inspect the emergency aircraft to investigate for damage from a collision with a bird, UAV, or trees and can also visually confirm the status of configuration changes such as during emergency landing gear extension. When performing a damage check the good aircraft should fly no closer than necessary to inspect for damage and should investigate the view from above, below, and both sides, or the emergency aircraft.

Radio Failure

In the event of total communication failure an S-2 should rejoin on another S-2 and rock his/her wings multiple times. A visual signal for comm failure is waving an open palm up and down in front of your mouth and then up and down next to your ear. Upon witnessing this signal, the aircraft with good radios should lead the comm out aircraft back to a suitable field. Once cleared to land the lead should be visually passed back to the comm out aircraft by making a forward and aft motion with a finger in the side window. The comm out aircraft should land, clear the runway then look for light gun signals for taxi. The healthy aircraft should make a low approach then coordinate for closed pattern and subsequent landing.