SPORT CLASS AIR RACING
RACE AND PACE
TRAINING GUIDELINES AND
STANDARD OPERATING PROCEDURES

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INTRODUCTION AND BACKGROUND

The ***Sport Class Air Racing, Race and Pace Standard Operating Procedures*** manual is a comprehensive reference document that defines Air Racing and Pace Standard Operating Procedures (SOP) and Performance Standards, for Sport Class Race and Pace Pilots participating in the Reno National Championship Air Races (NCAR), and any Air Race Event that Sport Class Air Racing participates in. It is also intended for use as a study guide for Sport Class Air Racing Pylon Racing Seminar (PRS) events, as hosted by the Reno Air Race Association (RARA) or other Air Race Event promoters. All attendees at PRS, NCAR or other Air Race Events are tasked with full knowledge of it's contents.

SPORT CLASS AIR RACING TRAINING PHILOSOPHY AND PREREQUISITES

The training philosophy and training mission of Sport Class Air Racing is to provide prospective Sport Class Air Racers with the most professional and comprehensive air race training available in the world today. Only through the total commitment of Sport Class students, as well as that of Certified Sport Class Racers, Flight Leads, Instructors and Check Pilots, can Sport Class Air Racing fully prepare and issue Air Race Pilot credentials to prospective air racers for participation in the demanding environment of the National Championship Air Races, and other Air Race events. To support this training, all prospective Sport Class racers must meet all class minimum experience requirements, and must have a significant level of experience and expertise in formation flying, prior to being accepted for participation in PRS. The Sport Class Air Racing Formation Guidelines and Standard Procedures document defines Sport Class formation SOP. All prospective racers must not only have a strong working knowledge of those procedures, but must also possess the formation flying skill set to safely fly in a 4-ship or larger formation, in all of the formations and maneuvers described in that reference manual. The Sport Class Formation Warm-up, held just prior to, and in conjunction with, PRS, is not a basic formation training course. The prerequisite skills must be gained prior to arrival at Sport Class Formation Warm-up and PRS events.

MANUAL ORGANIZATION

This Air Race and Pace SOP document is organized to first present an overview of the general flow of the Sport Class Air Race Training Continuum, followed by presentation of Air Race procedures and maneuvers in the approximate sequence of a typical flight. Contingencies and Abnormal/Emergency Operations follow Normal Operations. A glossary of common terms is also included. This document is designed to present Air Race training reference material from a Sport Class Air Racing procedural perspective.

A CLASS CULTURE OF SAFETY AND RACING EXCELLENCE

The culture of Sport Class Air Racing is founded on our Core Values of Safety, Racing Excellence and Teamwork. The principles of Sport Class Culture are:

- We are disciplined in the air
- We take the responsibility we have to each other seriously
- We are here for the joy of flying and the camaraderie of competitive air racing
- We help each other
- We seek self improvement
- We take pleasure in a well prepared airplane and a well flown race

THE FORMATION CONTRACT AS IT APPLIES TO AIR RACING

The Formation Contract is Sport Class Air Racing's definition of Flight Lead and Wingman responsibilities. It is the commitment of every pilot in a flight to those in their flight, and to Sport Class Air Racing.

Flight Leads will:

- Follow SOP at all times
- Brief and Debrief Flights
- Fly a stable platform
- Control the flight maneuvers
- Monitor the flight
- Terminate maneuvers if flight safety is compromised
- Navigate
- Communicate

Wingmen will:

- Follow SOP at all times
- Attend and understand briefings (or will clarify with Lead)
- Always maintain visual contact
- Immediately advise lead if visual contact lost (blind)
- Don't hit Lead or other Wingmen
- Follow briefed formations/positions/maneuvers
- Have a formation exit plan ready
- Maintain a listening watch

Air Race Operations include a great deal of formation flying, in terms of organizing each flight, briefing, starting, departing, maneuvering to a race start, and recovering at the conclusion of a race. The standard Formation Contract applies to these operations at all times. Once the racing begins, the concept of a contract between racers is still in full effect. While air racing has been called, in jest, "Uncooperative Formation", the fundamental commitment to honor the contract with all pilots in the flight, remains paramount. The contract moves into a more fluid and dynamic, but no less binding, contract between racers. The race start and on-course passing are the most critical points in the Race Contract, and will be covered in detail in those sections of this manual.

MINIMUM PILOT QUALIFICATIONS

Any Pilot that wishes to participate in Sport Class Air Racing Formation Warm-up, PRS, NCAR or other racing events, and/or wishes to seek a Sport Class Air Racing License, must meet the following minimum qualifications:

- TravelHold an FAA Private Pilot Certificate
- 500 hours PIC time in fixed-wing aircraft
- 10 hours in their racing aircraft type
- 10 takeoffs and landings in their racing aircraft type, in the past 90 days
  - 3 of these takeoffs and landings must be in the actual race aircraft
- Hold an FAA Second Class Medical
  - For NCAR operations, the medical certificate must have been issued in the past 6 months

MINIMUM FORMATION EXPERIENCE REQUIREMENTS

Any Pilot that wishes to participate in Sport Class Air Racing Formation Warm-up, PRS, NCAR or other racing events, and/or wishes to seek a Sport Class Air Racing License, must have significant experience in formation flying. Significant experience, in Sport Class terms, is defined as:

- Military Formation Training
- An FFI or FAST card (Wingman qualification minimum)
- Completion of multiple formal FFI or FAST formation clinics
- Completion of an informal training regimen with Sport Class leads (prior to PRS and Sport Class Formation Warm-up)

The minimum performance level that must be attained, prior to acceptance to participate in Sport Class Formation Warm-up and PRS, is to be consistently safe, smooth and predictable, as a solo PIC in a 4-ship or larger formation, conducting all of the maneuvers found in the Sport Class Air Racing Formation Guidelines and Standard Procedures manual.

Additionally, all prospective Sport Class pilots must have formation flying experience in their race aircraft type prior to attending PRS. All race pilots must have flown in formation in their actual race aircraft prior to participating in an NCAR race heat.

AIR RACE TRAINING EVENTS AND MANEUVERS OVERVIEW

PRE-FLIGHT BRIEF

All PRS and NCAR flights will be briefed thoroughly, without exception. During PRS, the assigned Flight Lead will brief the flight. During NCAR, the assigned Flight Lead will brief all practice and qualifying flights, and the assigned Pace Pilot will brief all race heats and finals. Use of a briefing guide is mandatory. The Sport Class Air Racing formation/race briefing card is available for download at http://www.sportclass.com/prs/

RADIO PROCEDURES

Sport Class pilots will use their race number (Sport XX) as their call sign for all PRS and NCAR flight operations. During PRS training flights, and NCAR practice and qualifying flights, the Flight Lead's race number (Sport XX) will be used as the flight call sign, and the Wingmen will use race numbers (XX) as their individual call signs for check-in and frequency changes, etc. During NCAR race heats and finals, the flight call sign will be Sport (heat name) Flight (i.e., Sport Gold Flight). The Pace Aircraft will make all the standard calls for the flight, and will use the call sign, Sport Pace. Just as in training, Wingmen will use race numbers (XX) as their individual call signs for check-in and frequency changes, etc. "Sport XX" will be used for individual communications with Ground, Tower, or Race Control.

- Frequency changes will be executed either over the radio (preferred), or through hand signals if required during a NORDO event or other communications irregularity (stuck mic, etc)
- Frequency changes are called over the radio by Lead or Pace using the term "Go". Each flight member will respond in sequence (in flight order) to the call with their race number (Sport XX), prior to switching frequencies. If any flight member does not respond to the "Go" call, all flight members should remain on the current frequency until the Lead or Pace contacts that pilot and gets a response. After the frequency change, the Lead or Pace will check in the flight, and each flight member should respond to the check-in with their race number (Sport XX)

AIRCRAFT STAGING and ENGINE START

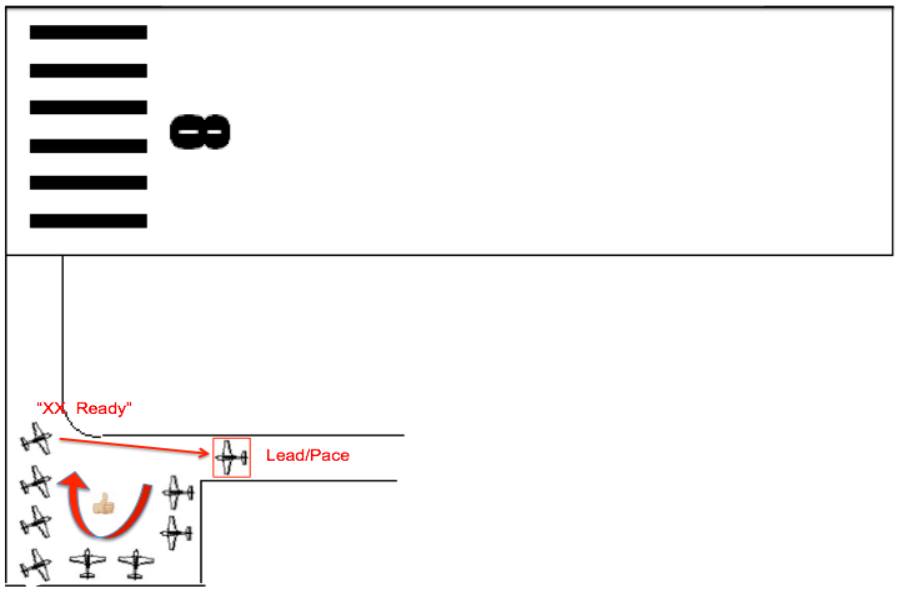
- During PRS and NCAR, aircraft are towed by Sport Class Tow vehicles to the staging area, at the assigned Spot times, as indicated on the daily flight schedule, or as modified by the class during operations
- Crews must have the aircraft prepared for towing prior to the assigned Spot time
- Pilots will meet at the Lead's aircraft (PRS and NCAR Practice Qualifying flights), and at the Pace aircraft (NCAR race heats), at the Meet time assigned by Lead/Pace
- During PRS, aircraft will be staged in flights (line abreast preferred) to the maximum extent possible. In situations where this is not possible, the Lead/Pace pilot should brief this contingency, and the desired start procedures, when the flight meets at the Lead/Pace aircraft
- Only authorized persons (essential crew) are allowed in the staging area during both PRS and NCAR. During PRS, crew must exercise extreme caution when in the staging area, due to the many aircraft staged and/or turning engines simultaneously
- The Sport Class Ramp Boss and the Ramp Team will monitor the ramp, and will direct aircraft during launch and recovery. The Ramp Boss will also notify flights of small schedule changes during PRS and NCAR staging
- All aircraft will start engines on Lead's or Pace's startup signal, on Lead's or Pace's engine start (prop turning), or on a time hack, as conditions require, and as briefed. Early starts for engine warm-up must be coordinated with Lead/Pace during the brief
- After engine start and crew thumbs-up, all crews must exit the staging area. During PRS, crews must exercise extreme caution when exiting the staging area, due to the many aircraft staged and/or turning engines simultaneously. It is each pilot's responsibility to ensure their crews are fully trained and complaint with these procedures. Pilots will be held responsible for the actions of their crews
- After engines are running, each pilot will individually tune radios to the pre-briefed frequency
- When ready for flight check-in, each pilot will pull their aircraft forward approximately 5 feet
- Flight Lead or Pace will check the flight in on the pre-briefed frequency (typically Stead Ground during PRS/NCAR). Each flight member will respond with their race number (XX)

TAXI

- During PRS and NCAR, after check-in, Lead/Pace will call for taxi clearance from Stead Ground, and will direct the first Wingman or the Pole position aircraft (NCAR Race flights) to begin his (her) taxi
- Sport Class flights will taxi in flight order, with the first Wingman or the Pole position aircraft (NCAR Race flights) taxiing first. The Lead/Pace follows the flight during taxi
- Standard taxi is staggered on alternating sides the taxiway centerline, with 1-2 plane lengths between aircraft. Additional spacing may be taken by tailwheel aircraft that need to do s-turns on the taxiway for forward visibility. This should be pre-briefed. Lead/Pace may also pre-brief, or call for, an on-centerline taxi if conditions warrant. Additional spacing should be allowed between each aircraft in this situation
- Lead/Pace will taxi at a controlled speed, and all flight members should maintain a safe speed during taxi, to allow goo situational, while maintaining flight integrity.
- As the aircraft enter the run-up area, the flight should fall into trail, and provide spacing needed for each aircraft to get into a run-up position in which they can see the pilot on either side of them for thumbs-up signals after run-up

RUNUP

- When taxiing into the run-up area, each pilot should attempt to match the first aircraft's angle, and line up heads. Parking in an arc of aircraft may be the best way to accomplish this. The Lead/Pace will take a position at the entry of the run-up area, or at the back of the flight, and observe the flight's run-up
- After completing his (her) run-up, each pilot checks over the aircraft to either side of them, looking for any out-of-the-ordinary conditions such as fluid leaks, open or unlatched doors/hatches/canopies, flaps or trim in an unexpected position, etc. If any are seen, the pilot must be notified
- When ready, each pilot, starting with the last wingman, passes a thumbs up to the pilot ahead of them in flight sequence. Each pilot will pass the thumbs up forward, until it reaches the first wingman/pole position aircraft. The first wingman/pole position pilot calls ready to the Flight Lead/Pace after receiving the last thumbs up, with their race number ("Sport XX, Ready")
- Lead/Pace will switch the flight to Race Control, and conduct a standard check in there. The flight should not auto-switch to Race Control frequency
- Lead/Pace will check in with Race control when ready for takeoff, and follow Air Boss/Race Control instructions

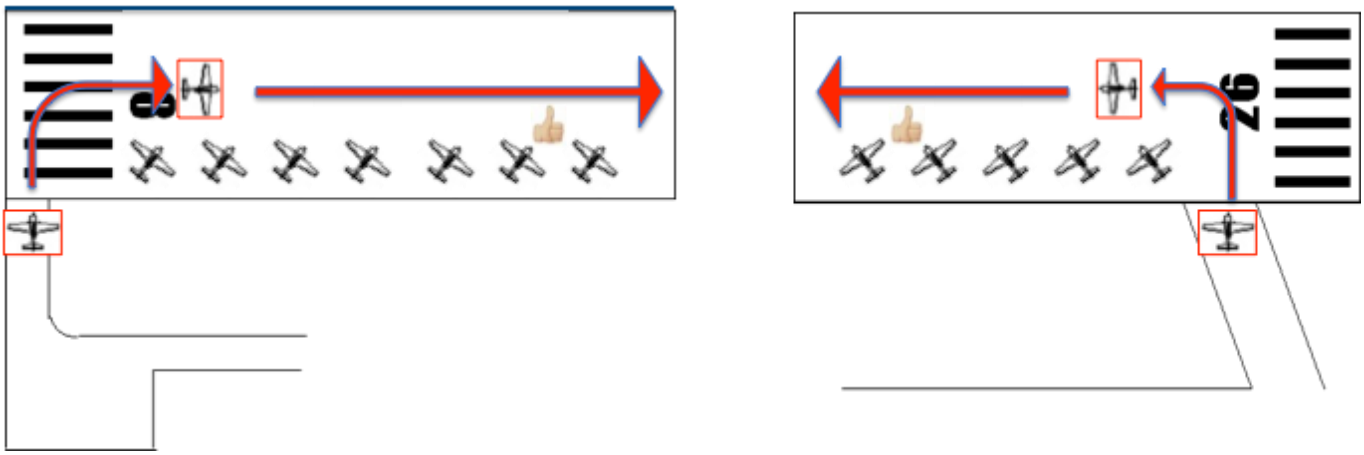


RUN-UP AREA PROCEDURES

TAKEOFF (Interval Takeoff)

Sport Class Air Racing uses its class-standard interval takeoff procedure during PRS and NCAR operations. This procedure will be briefed on each flight.

- When cleared to line up and wait, or when cleared for takeoff by Race Control, the Lead/Pace will direct the first wingman/pole position aircraft to lead the flight out onto the runway. The flight will taxi into position on the cold side (turnoff side) of the runway, at a 45 degree angle to the runway centerline and the departure end of the runway
- The Flight Lead/Pace will follow the fight onto the runway, and taxi down the hot side of the runway (the side away from the turnoff side), and will receive thumbs up from each aircraft. Each pilot will give a thumbs up to the Lead/Pace as they taxi past, to signal ready for takeoff
- After passing the final aircraft, the Lead/Pace will commence their takeoff roll, and call “Lead (or Pace) rolling” on the radio. The Lead/Pace will call “60 knots” when passing that speed on the takeoff roll
- Each subsequent aircraft in the flight will taxi to the hot side, and will commence their takeoff roll approximately 1000 feet behind the aircraft ahead, or 5 seconds after the previous aircraft rolled
- Takeoffs are conducted on the hot side of the runway, to allow for aborts on the cold side of the runway. Takeoff aborts are covered in the Emergency Procedures section of these guidelines
- When the last aircraft in the flight is safely airborne, that pilot will make the following radio call: “Sport XX Airborne”



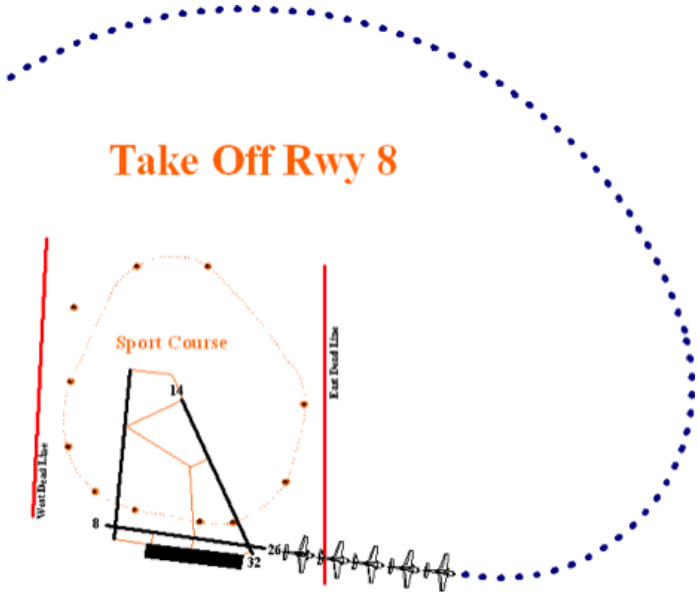
RUNWAY LINE-UP AND TAKEOFF PROCEDURES

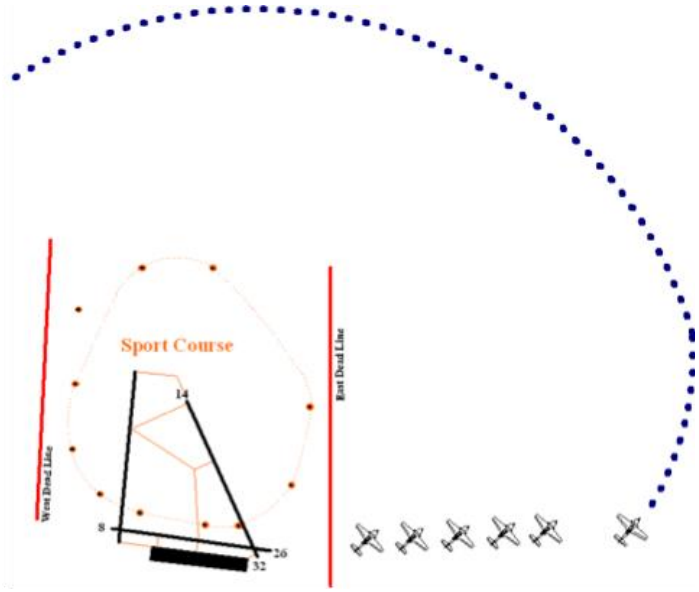
DEPARTURE REJOIN

- Departure rejoins will be flown at the pre-briefed airspeed. This speed will be selected by the Flight Lead/Pace Pilot based on the aircraft types that comprise the flight
- Flight Leads/Pace Pilots will fly the pre-briefed rejoin airspeed and rate of climb, to allow all wingman a power advantage with which to effect the rejoin
- Departure rejoins will be flown in the turning pattern briefed by the Flight Lead. This may be one of the standard Reno-Stead PRS/NCAR departure patterns (see the diagrams below), or may be briefed by lead for specific airport pattern requirements at other venues
- During PRS training flights, and NCAR practice and qualifying flights, Wingmen must fly beyond the race course boundaries before taking cutoff to move inside Lead's/Pace's radius of turn. This is because there may be racers on the course during the flight's departure
- During NCAR race heats and finals, no racers will be on the course during takeoff, so early turns to move inside Lead's/Pace's radius of turn, while inside the boundaries of the race course, are allowed. Sufficient altitude for a safe departure must be gained before Wingmen may start the rejoin turn
- Wingmen will utilize radius of turn, and a slight airspeed advantage, to effect the departure rejoin
- All aircraft will rejoin to the outside of the formation, in an echelon formation
- Wingmen must maintain sight of the interval aircraft ahead during the rejoin. If visual contact is lost on the entire formation during the rejoin, the pilot must make a "Blind" call, and must follow the Lead's/Pace's directive calls to regain visual contact and join the flight. Blind calls and Lost Sight procedures are discussed in detail in the Contingency/Emergency Procedures section of these guidelines
- Wingmen must not fly so acute during a rejoin as to fly in front of the 3-9 line of the Flight Lead/Pace or the aircraft ahead
- If an excessively acute position develops, or an excessively high closure rate develops, an overshoot/under-run is warranted
- After overshooting, Wingmen must stabilize outside the formation, maintain or regain sight of the entire flight, then cautiously move into their position in the echelon.
- If an aircraft ahead stagnates a small amount, it is best to slow your rejoin and allow them to complete their rejoin before completing your rejoin. Do not join on the aircraft ahead, or crowd/rush the pilot on their rejoin
- If an aircraft, or multiple aircraft ahead stagnate excessively, a following pilot may stagnate their rejoin, and remain on the inside of Lead/Pace until the wingmen ahead sort things out and rejoin into position. Another option is to continue his/her rejoin by passing well behind the stagnated pilot(s), take their position in the echelon, and leave space for that pilot to join the echelon inside of them. Caution must be taken not to cut other aircraft off, and if there is any doubt that the aircraft ahead does not see you after you have passed and joined, a safety radio call is appropriate
- If an aircraft ahead overshoots (under-runs) the flight, a following pilot must be cautious about joining the formation while the pilot ahead is correcting from the overshoot. Depending on the positioning of the overshooting pilot, the following pilot should consider slowing his rejoin to allow the pilot ahead to correct his position, or may join the formation if the overshooting pilot has stabilized well beyond the formation on the outside of the turn. The Lead/Pace should also make directive calls as appropriate to ensure the formation remains stable and maintains safe separation

RUNWAY 8 DEPARTURE REJOIN

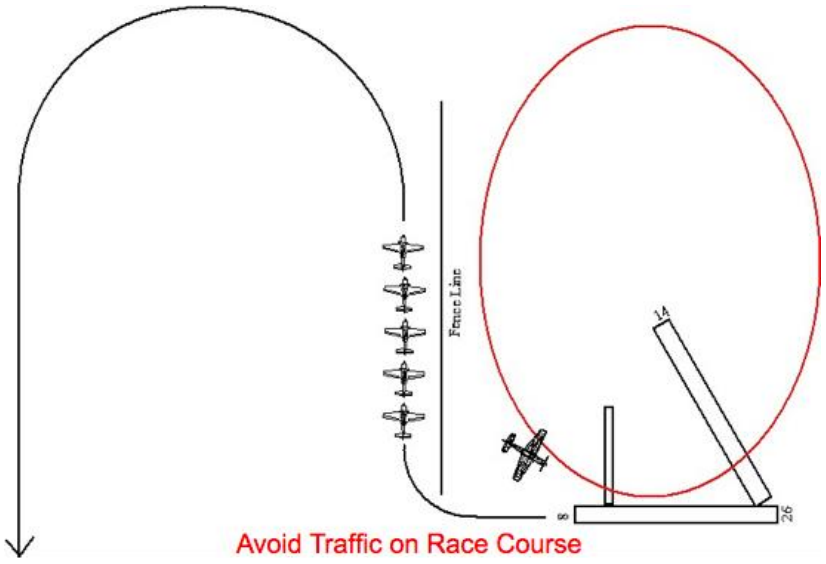
- Standard Interval Takeoff
- Last Wingman calls airborne
- Pace begins a left rejoin turn approximately 1 mile upwind
- Wingmen turn for cutoff when past race course boundary (PRS training and NCAR Practice/Qual flights)
- Wingmen may take earlier cutoff at a safe altitude during NCAR race flights
- Lead/Pace will fly large rejoin turn, remaining well north of race course boundaries
- If on a training flight outbound to the working area, Lead will continue westbound and rejoin will finish as a straight ahead rejoin westbound, if necessary
- If on a practice or race flight outbound to the chute, Lead will make a wide turn and roll out southbound to transit around Peavine Peak, and Wingmen not joined by the roll out will complete the rejoin as a straight ahead rejoin southbound
- All Wingmen will join to the outside (right side) of the Lead/Pace

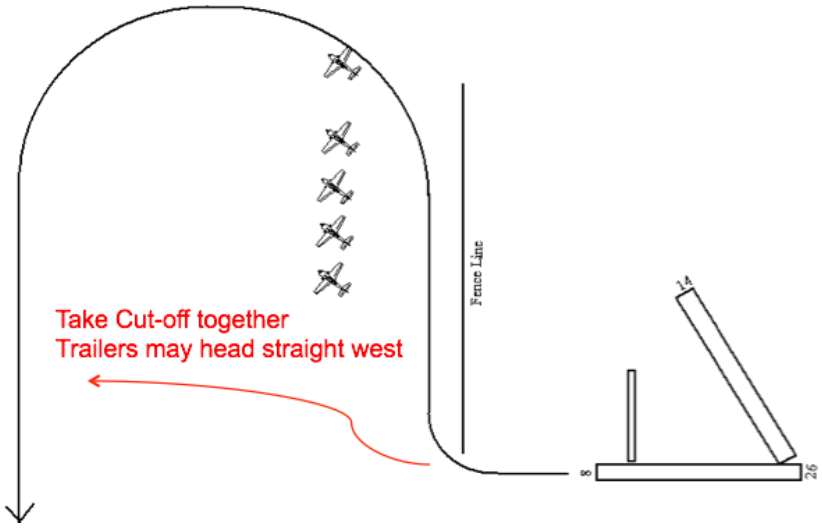




RUNWAY 26 DEPARTURE REJOIN

- Standard Interval Takeoff
- Last Wingman calls airborne
- Lead/Pace begins a right 90º turn beyond the course and the west field boundary, and flies N
- Wingmen turn into trail on Lead/Pace when past race course boundary (PRS training and NCAR Practice/Qual flights)
- Wingmen may take earlier cutoff at a safe altitude during NCAR race flights
- Lead/Pace will fly north for approximately 2 miles, then begin a left rejoin turn when passing “the saddle” geographic feature (as briefed)
- Wingmen will then move to a cutoff position in the left rejoin turn
- If on a training flight outbound to the working area, lead may continue the left rejoin turn, remaining well west of the west field boundary, or may roll out westbound and complete the rejoin as a straight ahead rejoin.
- If on a practice or race flight outbound to the chute, once headed S, Lead/Pace will roll out and begin the transit around Peavine Peak and Wingmen not joined by the roll out will complete the rejoin as a straight ahead rejoin southbound
- The last few Wingmen airborne may choose to fly straight west to intercept the flight (use caution for high aspect and closure)
- All Wingmen will join to the outside (right side) of the Lead/Pace





CLIMB

- Once the flight is joined, the Lead/Pace may push the power up to expedite the climb and the transit to the practice area, or to the race start chute
- If unable to stay with the formation after the power increase, Wingmen may call “gimme one” to inform the Lead
- Normal climb speed for a training hop should be briefed for each flight, and will be commensurate with the performance of all aircraft in the flight
- During a practice or actual race flight, Lead/Pace will brief the initial climb speed, the speed when level and transiting behind Peavine Peak, and the Chute speed. It will be commensurate with the performance of all aircraft in the flight
- Climb out to the practice area during training flights is normally conducted in either fingertip or route formation spacing, or both for practice
- Climb out to proceed to the race start chute is conducted in echelon formation, in route spacing (on the tight side of route, approximately 2-ship widths, is preferred, due to the size of the typical race formation)

TRANSIT TO THE WORKING AREA FOR PRS TRAINING MANEUVERING

- During PRS, when the PRS waiver is in effect, Leads training flights outbound to the working area will squawk 1200. As the flight leaves the airport area, and transits to the practice/working area, Lead will configure the flight in route spacing, and execute a frequency change to the flight’s discrete frequency (“company”/“tactical”)
- Transit to the practice area is normally conducted in either fingertip or route formation spacing, or both, for practice
- PRS training maneuvers may be briefed and flown during the transit to the practice area, at Lead’s discretion
- PRS training maneuvers, whether conducted in transit, or in the working area, are normally conducted at a pre-briefed baseline airspeed, based on the performance of the aircraft in the flight

• OPS CHECKS

- Ops Checks are a method for Flight Leads to manage the flight, and ensure that all flight members are monitoring their aircraft systems and fuel states
- Ops Checks should be conducted approximately every 30 minutes during a practice flight. Transit to and from the practice area or during a break in the maneuvering practice, are the recommended points in the flight to conduct Ops Checks
- To conduct an Ops Check, the Lead will place the flight in Route spacing, and direct the Ops Check with a radio call, such as “Sport XX flight, Ops Check”
- All pilots will continue to fly Route formation, and will check critical systems and fuel state. Lead will begin the check-in for the Ops Check by calling, “Sport XX, Green, 60 minutes”, signifying all aircraft systems/temperatures/pressures are good, and stating the current fuel state in minutes remaining
- Wingmen will respond in flight order, with their race number (“Sport XX, Green, 90 minutes”, as an example)

Even if the Lead has not called for an Ops Check, take other opportunities *when not in close formation*, to scan your aircraft systems and fuel state.

PRS AREA WORK AND TRAINING/EVALUATION MANEUVERS

OVERVIEW

Prior to the beginning of PRS training flights, all Wingmen will have been required to demonstrate safe, consistent and predictable performance in basic Fingertip, Route and Echelon formations, as well as in Pitchout and Rejoins, and Extended Trail Maneuvering. All Wingmen, prior to PRS flights begin, will have also demonstrated consistent performance in all basic formation procedures, from Brief to Debrief, and all phases of flight.

PRS training and evaluation flights focus on advanced maneuvering in preparation for racing, as well as all aspects of actual racing.

PRS ADVANCED MANEUVERING

Upset Recovery Demonstration

The Upset Recovery Demonstration is an exercise that is used to train and evaluate prospective Sport Class Race pilots in upset recovery. Wake turbulence encounters happen on the race course, and pilots must be confident in their ability to manage the path of the aircraft during such encounters. At race altitude, there is no margin for error when wake turbulence is encountered, so pilot action must be immediate, and instinctual. The most common wake encounter on the course is a left roll, towards the ground, while in the left turns of the race course. There is not sufficient altitude to roll with the encounter and recover, so pilots must oppose the rolling moment, and recover to a normal racing attitude.

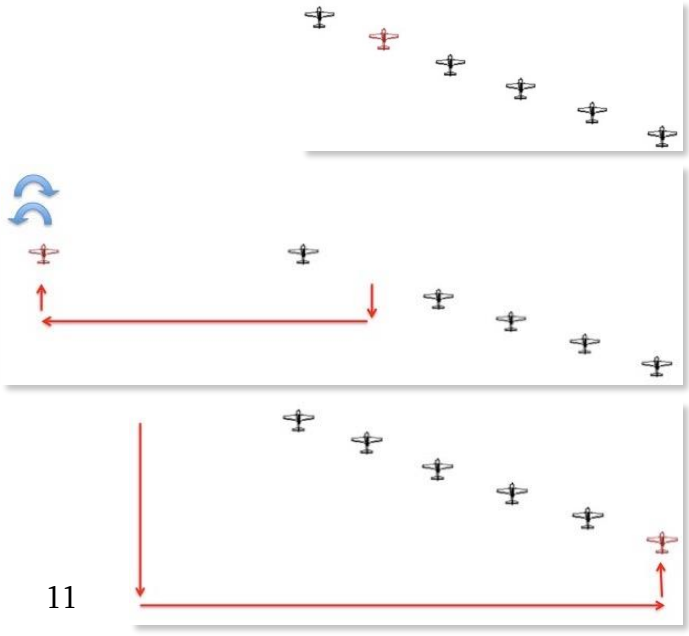
The Upset Recovery Demonstration trains and evaluates this action and reaction. To accomplish the Upset Recovery Demonstration, the Lead will configure the flight in right echelon, in route spacing. Lead will have the first wingman cross under to the left side, and take approximately 1000-1500 foot lateral spacing. Lead will then tell the Wingman on the left, “Sport XX, you are cleared to execute the Upset Recovery Demonstration” (or similar). The Wingman being trained or evaluated in the Upset Recovery Demonstration executes a half-roll to inverted, and immediately reverses the roll and returns to straight and level. The maneuver is a half roll left, followed by a half roll right. Slight pitch up may be used at the beginning of the maneuver. When momentarily inverted at the end of the half roll, negative g is not required, and the pilot does not need to maintain an inverted attitude. The roll out back to upright should be immediate.

The candidate is evaluated on the following performance metrics:

- Smooth roll in, and roll out
- Heading maintained within+/- 15º of initial heading
- Smooth and appropriate pitch control throughout the maneuver
- Altitude +/- 100 feet from initial altitude
- No tendency to dish out excessively low, and no tendency to Split-S out of the inverted position

Following the completion of the Upset Recovery Demonstration, the Flight Lead will ensure the Wingman has regained sight of the formation, and will direct them to cross behind the entire formation, and take the outermost position in the echelon. The next Wingman may then move into position for the demonstration

THE UPSET RECOVERY DEMO



LINE ABREAST FORMATION

Line Abreast formation is a specialty formation that is utilized by Sport Class for race starts. It is also practiced during Sport Class PRS training flights. Line Abreast formation is flown stacked level (no step-up or step-down), and in a position such that the wing-line (also known as the 3-9 line) of all aircraft in the formation are aligned. As with Echelon, movement of Wingmen tends to get transmitted and amplified down the line. Smooth technique is important, as is maintaining relative position on, and separation from, the aircraft to the left, A recommended technique for Wingmen is to look through the line of aircraft and fly off the Lead as a stable platform

- Line Abreast is flown with the Lead to the left, and all Wingmen to the right, during Sport Class operations
- Line Abreast is only moved into from Echelon Right during Sport Class operations, and is directed by Lead via a radio call, such as “Sport XX, move it up to Line Abreast”
- Line Abreast formation is *always* flown in Route spacing (2-4 ship-widths) during Sport Class operations

LINE ABREAST FORMATION

MOCK START EXERCISE

During specified PRS training flights, once the flight is established and stable in Line Abreast, the Flight Lead will run the flight through a Mock Start Exercise, as follows:

- Lead will pre-brief the beginning speed and the max speed (simulated release speed) for the exercise
- Lead will make a radio call announcing, “Sport XX Flight, Mock Start, starting downhill” (or similar)
- Lead will ease the flight into a shallow descent (approximately 2-3º nose down, or 500 feet per minute descent rate)
- Lead will make formation adjustment calls, as might be made in a race start, such as “XX move it forward (or back)”, “XX, step it up (or down) a bit”, etc

The objective of this exercise is to provide prospective Sport Class racers with experience in a Line Abreast Race Start scenario, and to allow pilots to practice flying line abreast in a dynamic, accelerating environment

BREAKOUT EXERCISE (SIMULATED BLIND/LOST SIGHT)

During specified PRS training flights, when the flight is established in either Echelon or Line Abreast, or during a Mock Start Exercise in Line Abreast, the Flight Lead will conduct a Breakout (simulated Blind/Lost Sight) Exercise, as follows:

- Lead will pre-brief the formation, timing and technique they will utilize for this exercise
- Lead will only give the Breakout call to one Wingman at a time
- Lead will initiate the exercise with a call such as, “Sport XX, Breakout”, or “Sport XX, you have Lost Sight, Breakout”, or “Sport XX, you are Blind”, or similar
- The Wingman so directed, will initiate an immediate Breakout, as described in the Emergency/Contingency Procedures section of this manual
- After the Breakout Wingman recovers the aircraft to straight and level from the Breakout, the Lead will direct the Wingman back into the formation

The objective of this exercise is to provide prospective Sport Class racers with experience in Breakout/Lost Sight/Blind procedures, in order to build a practiced, predictable, and automatic response to Losing Sight, or being grossly out of position

PRS RACE COURSE TRAINING

During PRS training flights, extensive on-course training takes place. This training is sequential in nature, and builds from smaller flights, operating at slower speeds, to larger flights, operating at full race speed. This training process is designed to build situational awareness, confidence, and comfort level for pilots, in terms of both low altitude, high speed operations, and in terms of proximity to other aircraft in the dynamic racing environment.

In all PRS training periods, on-course time is a limited, and valuable commodity. The training periods are divided among the various race classes, and Sport Class further divides its periods among various training flights. Flight Leads are tasked with managing their formations to ensure they enter and exit the course at their assigned times. All Wingmen, whether PRS students or Certified Racers, must be prepared to meet all briefed times for each training flight. The flights must meet their assigned times, or valuable on-course training time will be lost. Preparation is the key to readiness for each flight.

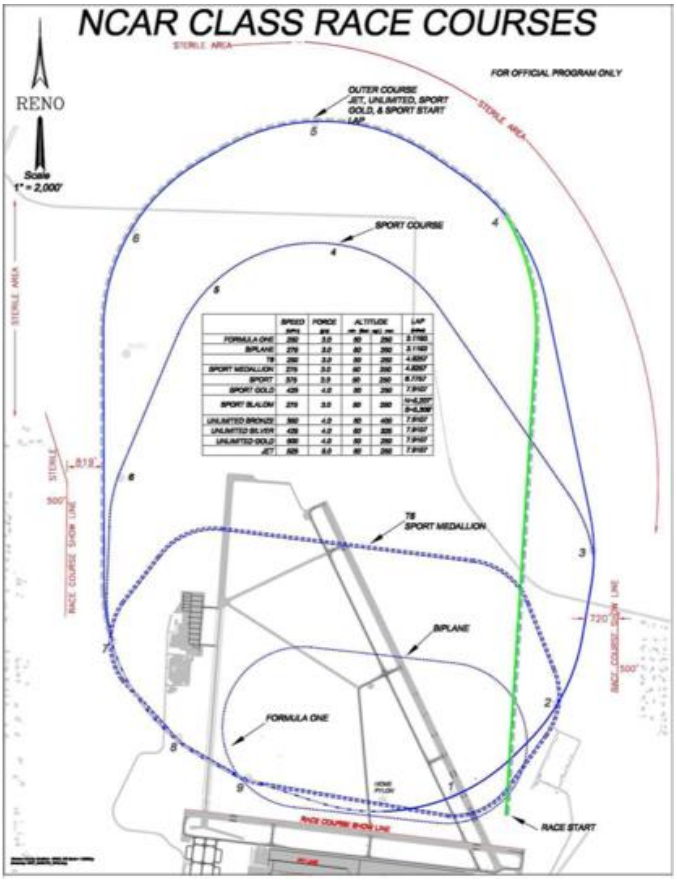
This section will cover, in a sequential manner, the race course overview, race course entry, on-course training and normal procedures, race course features of each course that Sport Class races on, and race course exit and recovery.

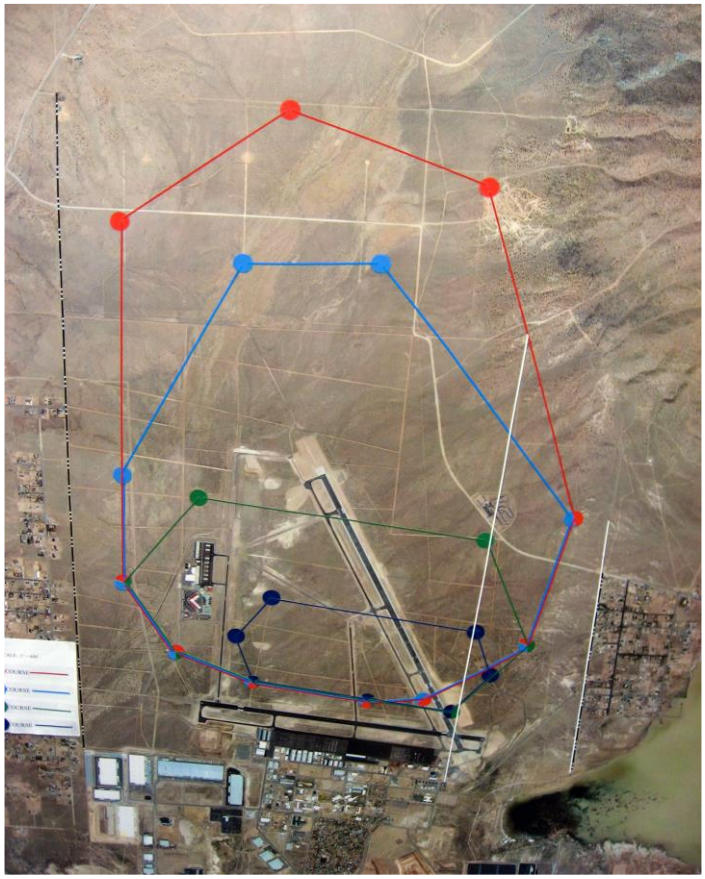
THE RENO RACE COURSE - OVERVIEW

The diagram below depicts an overview of all the available NCAR certified race courses. The courses include:

- The Outer Course (Unlimited, Jet, and Sport Gold)
- The Sport Course (Sport Silver and Bronze)
- The T-6 / Sport Medallion Course (T-6 and Sport Medallion, and in some cases, Sport Bronze)
- Biplane
- Formula

The distances depicted in the diagram are based on the pylon-to-pylon distance between all pylons, from Home Pylon to Home pylon. Aircraft speed on the course is determined by dividing course distance by elapsed time from Home Pylon to Home Pylon.



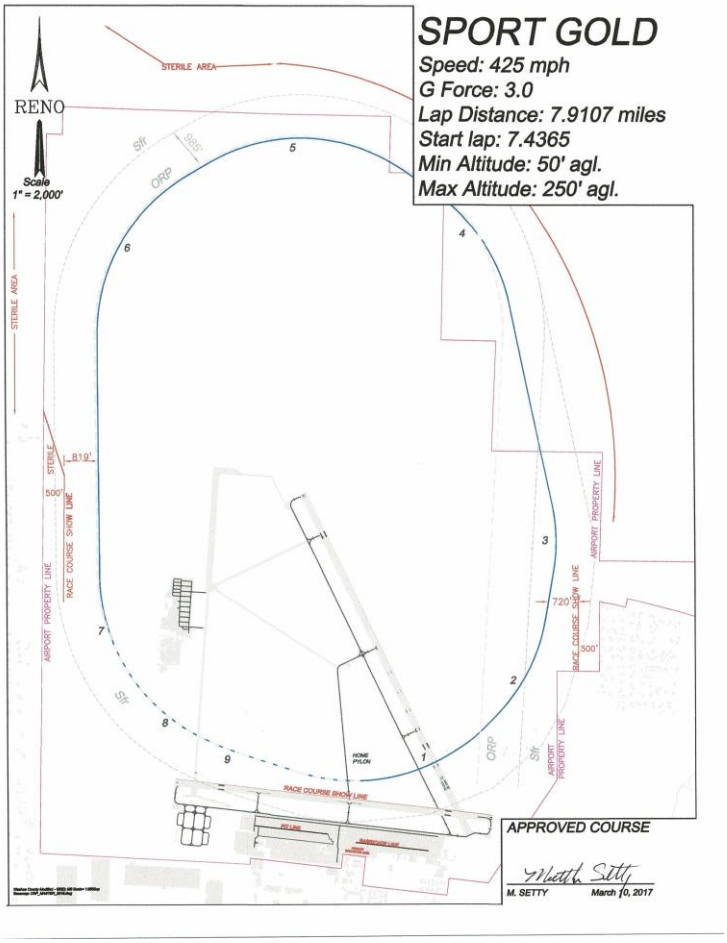


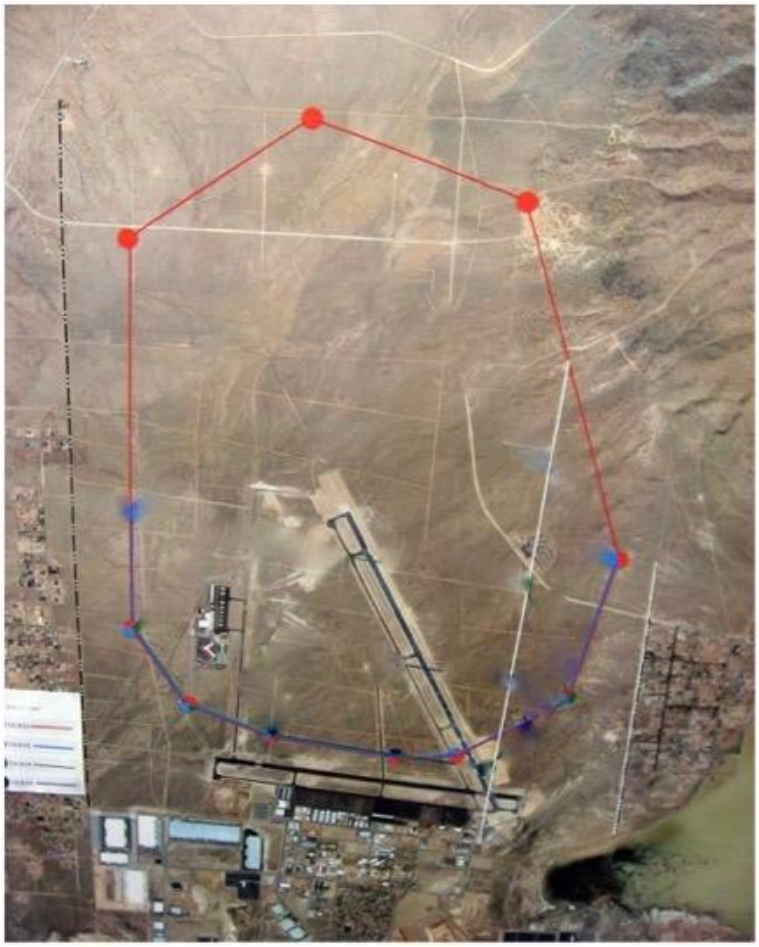
SPORT CLASS RACE COURSES

The diagrams below depict each of the race courses that Sport Class conducts races on. Some Features of each course are included:

THE OUTER COURSE (Sport Gold)

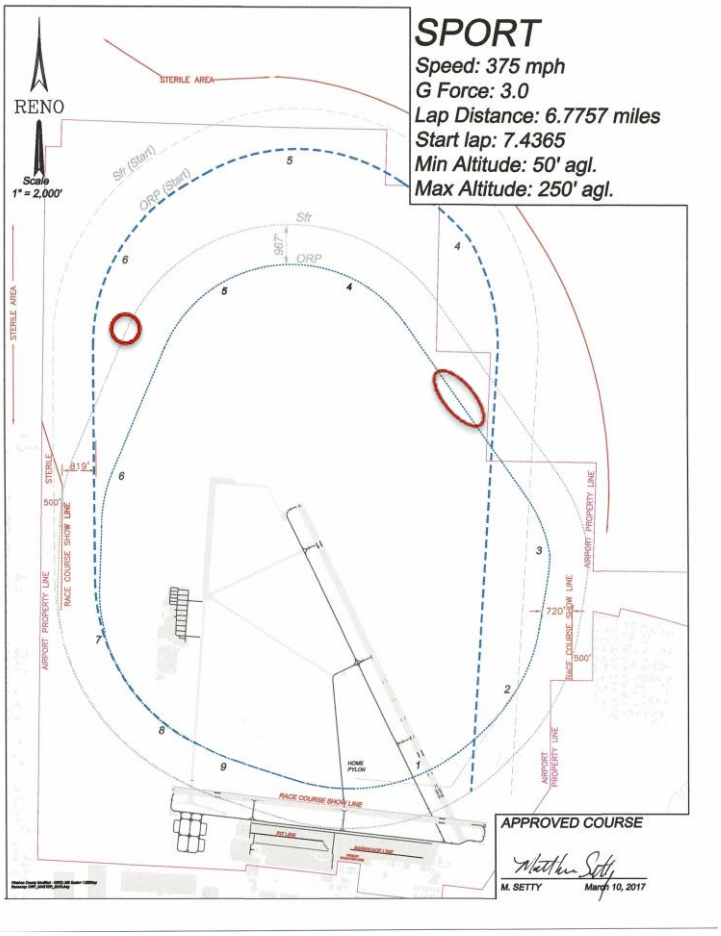
- Outer Course Pylons are painted white.
- The Lighted Start Pylon is inside the Outer Course line, between Outer Pylons #3 and #4
- Outer Pylon #4 is near the highest terrain on any race course
- Terrain rises rapidly between Outer Pylons #3 and #4
- There is a significant drop in terrain elevation between Outer Pylons #4 and #5
- The Valley of Speed, between Outer Pylons #6 and #7 is the lowest terrain on the race course
- There is a lighted Guide Pylon between Outer Pylons #6 and #7Outer as a guide to the Outer Course
- Outer Pylon #7 is also lighted
- Home Pylon, and Outer Pylons #1, #2, #3, #7, #8 and #9 are shared by all Sport Class race courses





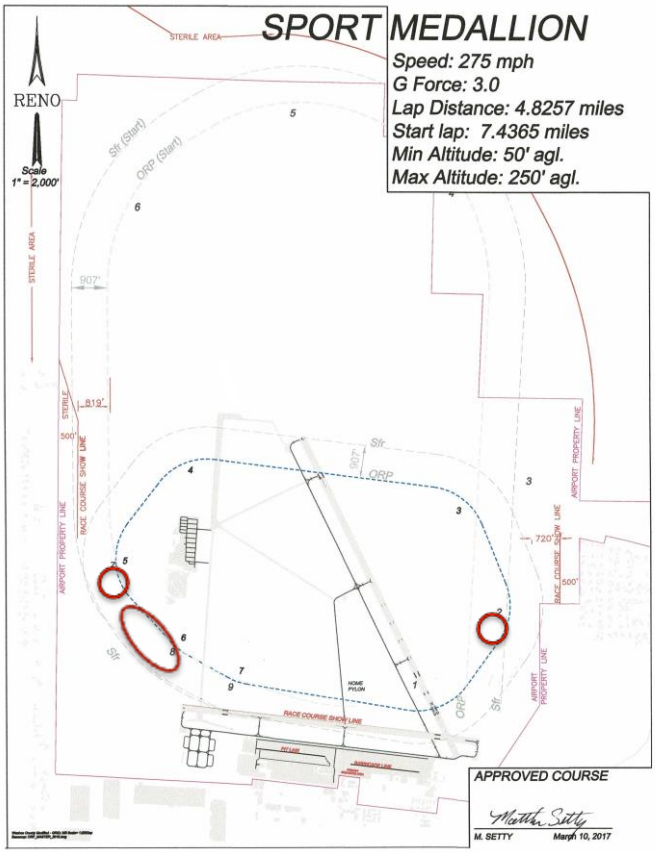
SPORT COURSE

- Sport Course Pylons that are specific to the Sport Course only (Sport Pylons #4, #5, and #6 are painted Blue and White
- The Lighted Start Pylon is outside the Sport Course line, between Outer Pylons #3 and Sport Pylon #4. Do not fly around the Start Pylon after the first lap in a race on the Sport Course
- The terrain rises in a deceiving manner between Outer Pylon #3 and Sport Pylon #4. Pilots must be cautious of their altitude in this portion of the course, which is depicted by an oval
- There is a drop in terrain elevation approaching Sport Pylons #4
- Pilots sometimes mistake Outer Pylon #5 for Sport Pylon #4, and fly wide of the Sport Course at this turn
- The lighted guide pylon between Outer Pylons #6 and #7 is outside the Sport course race line
- Pilots sometimes mistake lighted guide pylon (circled in the diagram below) for Sport Pylon #6, and fly wide of the Sport Course at this turn



MEDALLION (T-6) COURSE

- The Medallion Course uses Inner Pylon #1, which is lighted, and can be raised and lowered for races using the Formula, Biplane, T-6 and Sport Medallion courses
- Inner Pylon #1 is a red-white-red barrel, on a black frame (used to raise and lower the pylon). It is located just east of Outer Pylon #1, and just east of Runway 14/32
- Medallion/T-6 Course Pylons that are specific to the Medallion Course only (Medallion/T-6 Pylons #3, and #4) are painted Red
- The Lighted Start Pylon is well outside the Medallion Course line, beyond Medallion/T-6 Pylon #3 and the Go-Kart track north of Medallion/T-6 Pylon #3. Do not fly around the Start Pylon after the first lap in a race on the Sport Course
- The turns at each end of the Medallion course have varying geometry through the turns…the course is not a symmetrical oval
- The turn at the west end of the Medallion course tightens significantly, creating a potential for South Show Line overshoots. This area is depicted by an oval

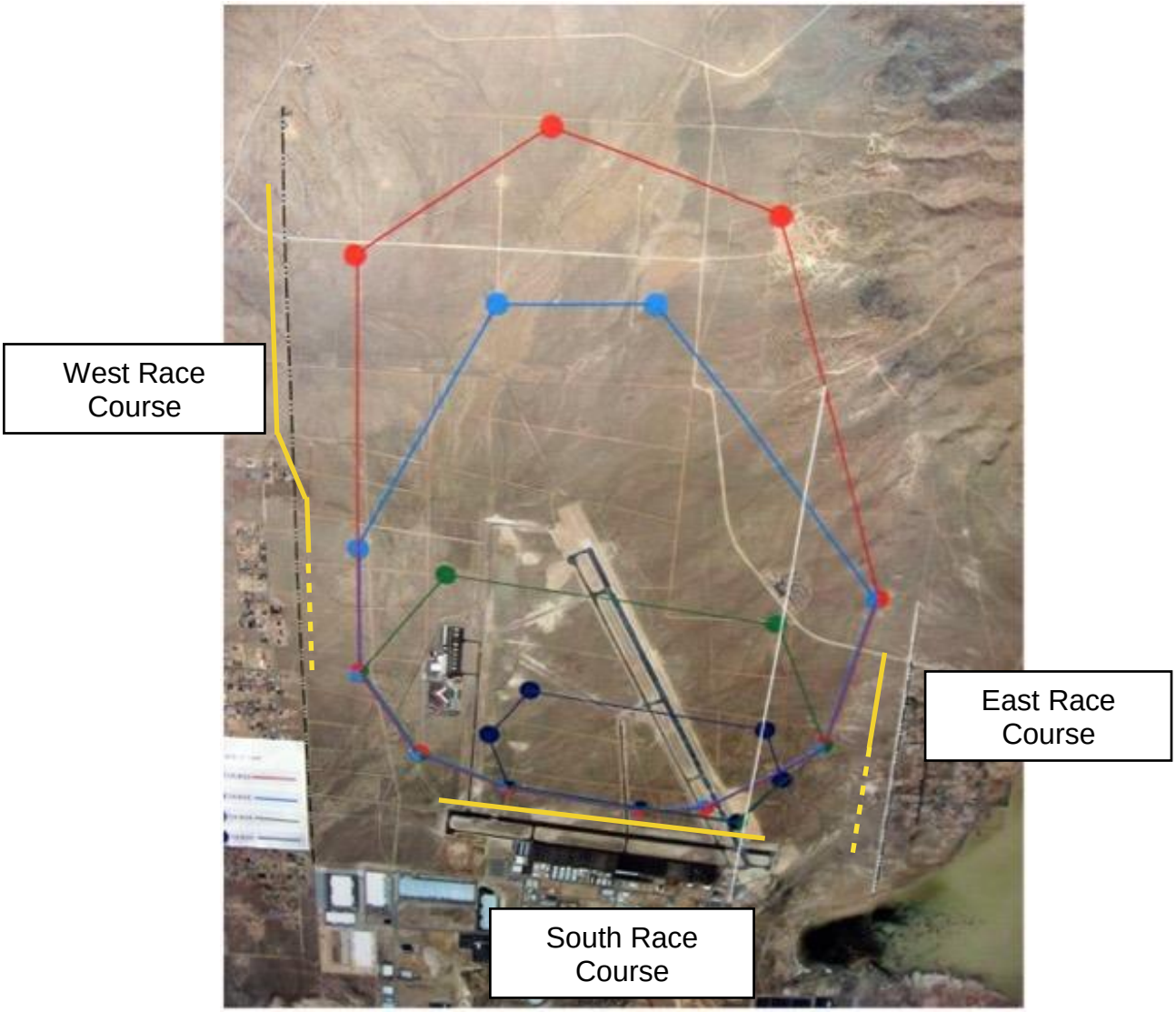


RACE COURSE LIMITS AND LIMITATIONS

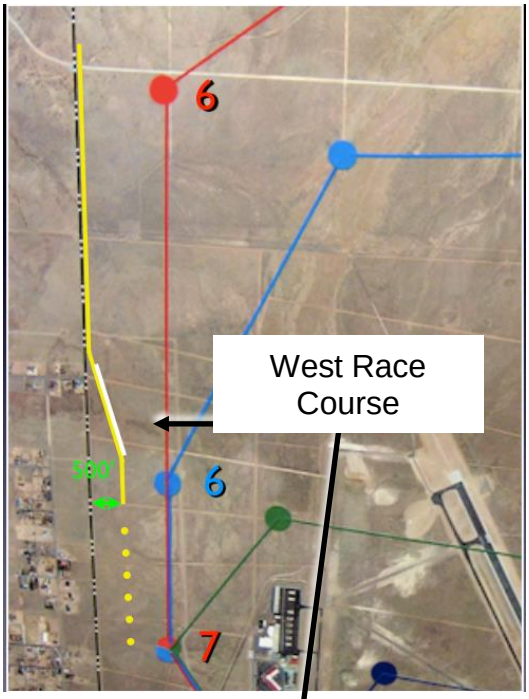
Each of the race courses that Sport Class aircraft race on share the same altitude limitations and external boundaries, or “Show Lines”. These are:

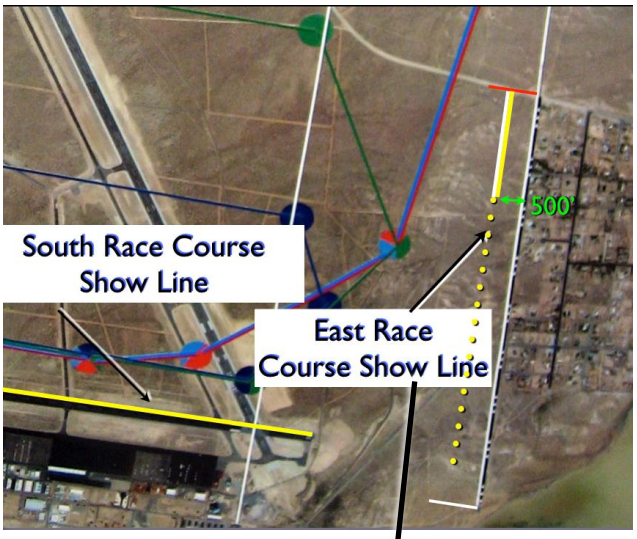
- Minimum Altitude - 50’ AGL (the top of the pylons). At the Home Pylon, the minimum altitude is the “R” in RENO. The pilot’s head, as viewed from the timers/judges stand, must be above the “R” in Reno
- Maximum Altitude - 250’ AGL
- The South Show Line is the north edge of Runway 8/26
- The East Show Line separates the race course from Lemmon Valley housing. It is a line that begins just east of Outer Pylon 2, extending northward, parallel to the N-S airport boundary in the Lemmon Valley Area.The surface is graded in a cleared swath, with a series of white boards erected in this area
- The West Show Line separates the race course from Red Rock housing. It is a line that begins on the airport boundary west of Outer Pylon 6, follows the boundary southbound, then angles towards the course about halfway between Outer Pylons #6 and #7 (near Sport Pylon #6), then again parallels the airport boundary southbound.The surface is graded in a cleared swath, with a series of white boards erected in this area in this area

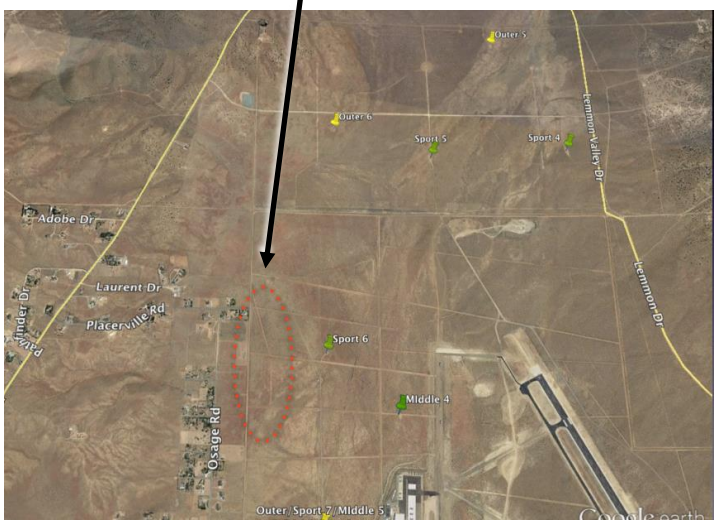
Flying below the minimum course altitude, above the maximum course altitude, or beyond any of the Race Course Show Lines, is grounds for disqualification. Escape maneuvers exist for situations where a racer may be forced high, or beyond a show line, due to traffic. Those escape maneuvers will be covered in the Emergency/Contingency Procedures section of this manual. The diagrams below depict the race course overview and the show lines:

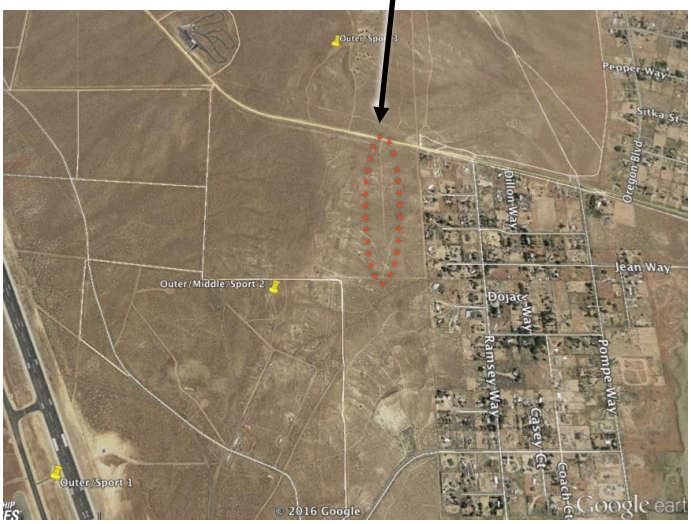


A CLOSER LOOK AT THE RACE COURSE SHOW LINES









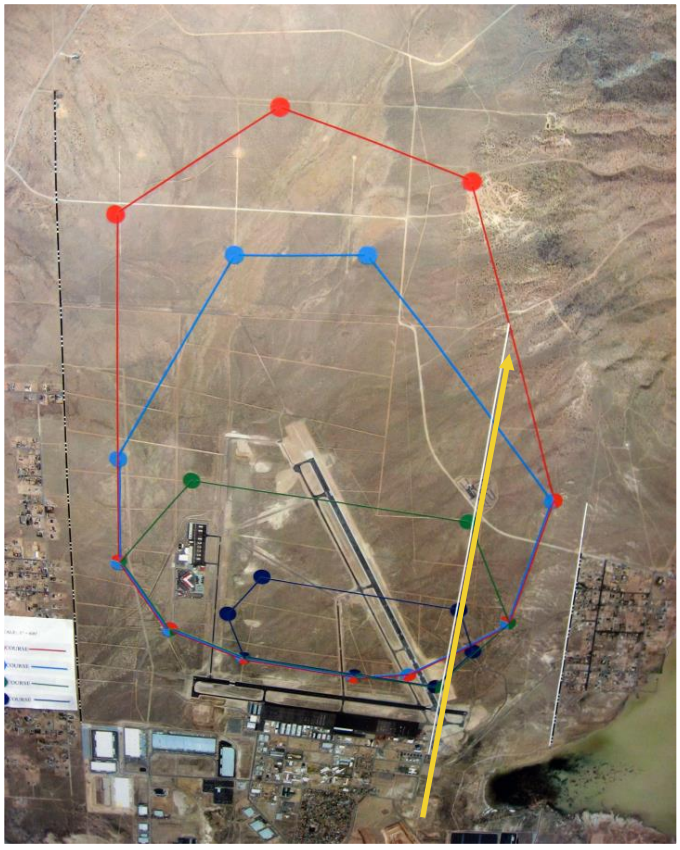
RACE COURSE ENTRY

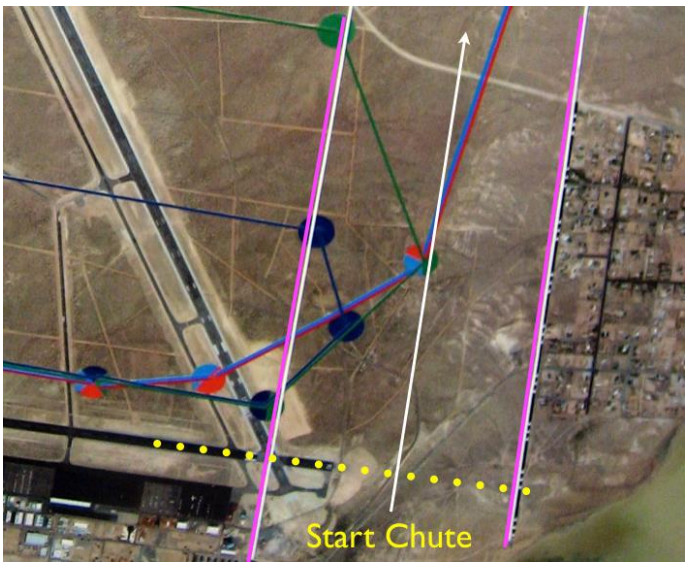
Race course entry is accomplished in one of three different methods:

- Via the Race Start Chute, or simply, “The Chute”
- From the Queue, a holding pattern above the race course (defined in a later subsection)
- Via a Direct Entry after takeoff (defined in a later subsection)

THE RACE START CHUTE - “THE CHUTE”

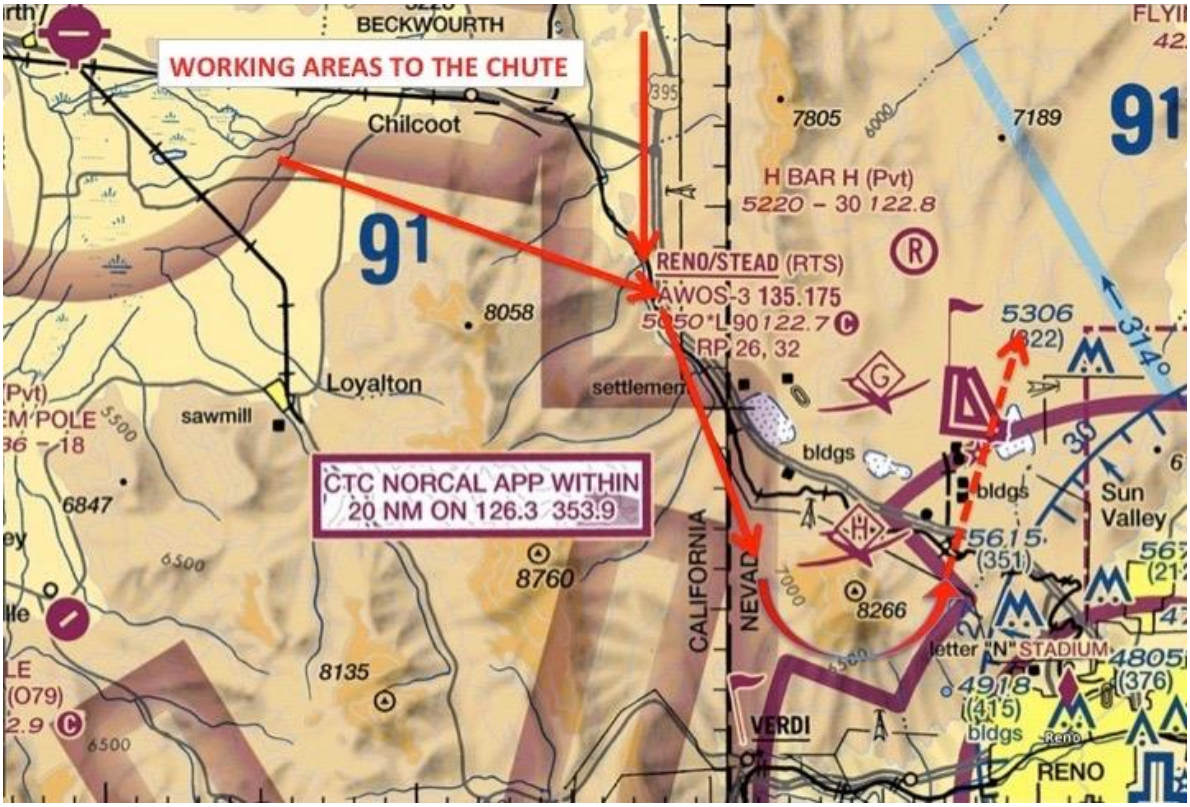
The Chute is an entry lane that runs from South to North, from a point just northeast of Peavine Peak, to just east of, or to the right of, the lighted Start Pylon. The chute is utilized to enter the race course during every Sport Class race heat, and is also utilized during PRS training flights and pre-race NCAR practice flights. Every Sport Class race heat begins with one lap on the Outer Course, then transitions to the appropriate course for the race heat, so the chute *procedures* are identical for all Sport Class race heats. Due to differences in aircraft limitations and speed limitations in each Sport class heat (Gold, Silver, Bronze and Medallion) the altitude at specific places in the chute, and the descent rate and speed of the formation, will be adjusted and managed by the Pace Pilot, to ensure a safe transition from the Chute to the race course. Below are diagrams depicting the chute and its relationship to the race course. The yellow arrow in the left diagram depicts the approximate path of the Pace aircraft, and that of the Pole Position aircraft after release, which occurs approaching the intersection of the two runways. The diagram on the right shows a closer view of the release area.





MANEUVERING TO THE CHUTE FROM THE PRACTICE AREA

PRS training flights and NCAR warm-up/practice flights that utilize the practice area, and then proceed to the Race Course, will enter the course via the Chute. Flights will proceed around the south side of Peavine Peak, and descend via the Chute onto the course. When returning from the working area during the PRS or NCAR waiver period, Flight Leads will switch the flight to Race Control, and do a flight check-in. Leads will report inbound to the Chute to Race Control, with an ETE to the Chute. During the PRS or NCAR waiver period, Leads will squawk 1200 while in the Practice Area, and then squawk 0302 (or as instructed) when proceeding to, and around Peavine Peak. Wingmen will always have transponders on STBY or OFF. Leads will configure the flight to echelon right, in route spacing, as the flight nears Peavine Peak. For movement to the start chute, spacing at the tight side of Route is recommended (approximately 2 ship widths). Leads must plan the arrival to the Chute at the beginning of their on-course period start time. Techniques for managing Chute Entry timing is discussed further below. The following diagram depicts typical paths from the working areas to the Chute:

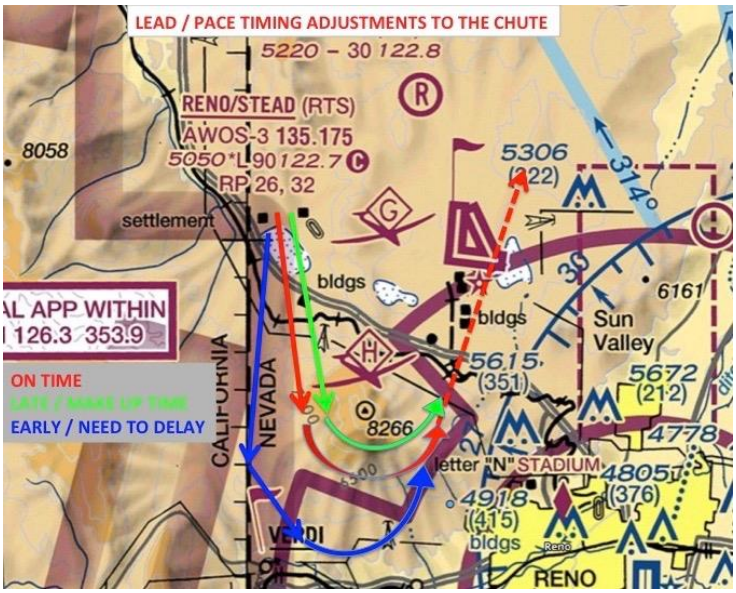


MANEUVERING TO THE CHUTE FROM THE DEPARTURE REJOIN

During PRS training flights that do not fly to the practice area, and during all NCAR race flights, Sport Class flights will proceed from the departure rejoin, fly around the south side of Peavine Peak, and descend via the Chute onto the course. The flight will remain on Race Control frequency for the entire flight to the Chute and onto the course. The flight will also remain in echelon right, in route spacing, throughout the transit to the Chute. For movement to the start chute, formation spacing on the tight side of Route is recommended (approximately 2 ship widths). Leads must plan the arrival to the Chute at the beginning of their on-course period start time. The following diagrams depict a typical path from the the takeoff Rejoin for Runway 8 and Runway 26, and the flight to the Chute:

COURSE ENTRY TIME MANAGEMENT WHEN MANEUVERING TO THE CHUTE

Whether entering the course for a practice period during PRS, or for an actual race start during NCAR, hitting the course time is critical. On-course practice time is a very limited and valuable asset, and must not be wasted. During PRS, and on NCAR practice and qualifying days, the Sport Class is allotted practice periods each day. Each class period is further divided among Sport Class flights. These individual flight periods may be as short as 8-12 minutes of course time. Arriving into the Chute early may force racers off the course before their period ends, or cause the entering flight to continue maneuvering. Arriving into the Chute late simply wastes your flight's course time. Flight Leads and Pace pilots must manage their formation to arrive at the top of the Chute on time. This can be done with flight path management when traveling behind and around Peavine Peak. If behind schedule, the flight may be flown closer to the west and south sides of Peavine Peak (green line in the diagram below). If early, the flight may be flown further to the west and south, thus more widely spaced around Peavine Peak (green line in the diagram below). Because the flight is in right echelon, all turns must be made to the left, so flight path management is an important consideration for the Lead/Pace. In instances where the flight is quite early, and it has arrived behind Peavine Peak with several minutes before course time, a left 360º turn may be executed. This is less desirable, due to limits in maneuvering space within the TFR, and the size of the echelon formation. Staying on time is supported by Wingmen by being on time to every aspect of the flight, using standard procedures, and flying solid formation.



The following diagram depicts the standard PRS and NCAR TFR layout, for comparison to the above flight paths around Peavine Peak. Flights must not exit the TFR during PRS and NCAR. Interstate 80 is a good visual no transgression line to use on the south edge of the TFR (the south deg of the light blue area below):

FLYING THE CHUTE

Flying the Race Start Chute is one of the more dynamic and demanding aspects of Sport Class Air Racing Operations. It demands concentration and focus, and requires absolute commitment to the Standard Operating Procedures and the Formation Contract. Smooth Line Abreast formation flying skills are critical.

- As the flight maneuvers around Peavine Peak, the Lead/Pace will make informative and directive calls to the formation. These calls may be to the entire formation, or to an individual aircraft
- Compliance with all directive calls is mandatory. Failure to comply with directive calls may lead to removal of the aircraft from the formation, or direction to fall back into trail of the formation
- As the flight begins its rollout onto the final chute heading, with approximately 10-20º of turn remaining to the final chute heading, the Lead/Pace will call the formation to line abreast. At this point, the flight moves smoothly from echelon right to line abreast
- Pilots in the formation, especially those on the outside of the formation, should anticipate power requirements to move up to line abreast, so as to arrive in line abreast as, or slightly after, the Pace aircraft rolls out onto the final chute heading
- Pilots in the formation should not cheat forward of echelon position during the turn around Peavine Peak, or prior to being called up to line abreast by the pace. Early moves forward of echelon add instability to the formation, as line abreast formation is very difficult to fly well while in a turn
- Pilots in the formation should not fly forward of the 3/9 line of the aircraft to their left during the transit to the Chute, or when rolling out in the Chute. The outside aircraft may appear in the peripheral vision of the inside pilot and cause a distraction or a startle response, at a time when the inside pilot must focus on the aircraft to their left
- The Pace aircraft will begin a shallow descent to the appropriate angle. Depending on the altitude of the formation, and the desired speed in the Chute, this descent may be initiated just prior to, during, or just after the rollout on the chute final heading
- Due to the dynamic nature of the rollout into the Chute, pilots must focus on flying a smooth position, maintaining separation from the aircraft to its left, and looking through the formation to the Lead/Pace as a stable platform
- During this phase of the start sequence, power and trim requirements are changing with speed changes, and aircraft systems are monitored and sometimes reconfigured for the race start. Throughout this transition phase, all pilots *must* fly formation first, and manage their aircraft systems second. A plan must be developed by each pilot to manage the demands of this phase of the flight
- As the flight descends down the Chute, Lead/Pace will manage the path of their aircraft so as to aim just to the right of the lighted Start Pylon. This will place all aircraft outside the Start Pylon, in preparation for the first turn around Outer Pylon 4
- All aircraft in the flight must maintain their start lane throughout the descent down the Chute, both before and after the Pace aircraft pulls up and releases the flight
- The start lane is defined as each aircraft's appropriate position in line abreast, approximately 2 ship widths apart at a minimum. The exact abeam distance will depend on the stability of the formation and the smoothness or roughness of the air. The 2 ship-widths is a rule of thumb, and slight additional spacing, if needed, is appropriate
- Prior to release, lane management is fairly straight-forward. Fly solid formation per the SOP
- In this phase of the start, the formation contract is refined to dictate that each Wingman is responsible to maintain visual contact with, and maintain separation from, the aircraft on their left
- Prior to release, Lead/Pace may make fine-tuning directive calls to individual aircraft, to stabilize the formation, or to adjust the line abreast into a straight line, both vertically and horizontally
- Large position errors by any Wingman during the start cannot be tolerated, and must be corrected. In some cases, Lead/Pace may direct the pilot to fall into trail, or may direct a Breakout of the formation. In some cases, a Wingman must make their own Breakout maneuver. In all cases, all Wingmen must know where their "out" is at all times. Breakouts and gross position error corrections are discussed in the Contingency/Emergency Procedures section of this manual
- As racers gain experience and become more adept at flying the Chute, expanding the scan to occasionally take a snapshot of the course ahead, for situational and timing awareness, may be incorporated. However, the fundamental responsibility, and the highest priority, is to fly solid formation on the aircraft and formation to the left

THE RELEASE AND RACE START

A Race Start is signified by the Pace Aircraft pulling up sharply from the formation, accompanied by the radio call, “Ladies and Gentlemen, You Have a Race!”. While this signal may be one of the most awe-inspiring and exciting things to see and hear in a pilot’s flying career, every Sport Class Race Pilot must remain focused, and do the following tasks when released to a race start…*in the following order*:

- FLY FORMATION
- MAINTAIN YOUR LANE
- UPHOLD THE CONTRACT
- FIND AND FLY THE RACE COURSE
- MANAGE YOUR AIRCRAFT SYSTEMS

At the release point, nothing changes with respect to each pilot’s responsibility to maintain visual contact and separation from the aircraft to its left. As the race aircraft accelerate following release, different aircraft accelerate at different rates. Due to the qualification and race heat pairing process, aircraft to the left (to the inside) of the formation are typically faster than those on the right (to the outside). However, sometimes an aircraft will accelerate in front of the aircraft to its left. Turbocharger spool-up time or bringing complex power systems online may cause this. Another cause could be a previous race’s pylon cut that placed a faster aircraft outside its qualifying spot. From the release point, there is approximately a 30 second period of straight ahead, downhill acceleration to the point where the aircraft begin the turn at Outer Pylon 4 to enter the course. During this phase of the start, even if an aircraft accelerates ahead of an aircraft to its left, all pilots must maintain their lanes, and uphold their formation contract with the aircraft to their left. The following apply from approaching the release point until past Outer Pylon 4 during the start.

- Do not try to anticipate the release, and hold back behind line abreast slightly, then slingshot forward at the release by adding power to be moving forward at the release. Slingshot starts are grounds for disqualification from the race heat
- Maintain your relative co-altitude (stacked level) position with the formation as the flight descends onto the course. Diving or Climbing at the start is very disruptive to start integrity, and is a major safety issue
    - Do not dive. The Lead/Pace will place the formation on a trajectory that will intercept on-course altitude just past the Start Pylon and approaching Outer Pylon 4. Diving at the start creates unusually fast acceleration, and may place you in front of the aircraft to your left momentarily, until you must level off. It also makes it difficult for you to maintain visual contact with the aircraft to your left, and for the aircraft outside of you to maintain visual contact with you. Diving at the start is grounds for disqualification from the race heat
    - Do not climb. Climbing slows your acceleration, and makes it difficult for you to maintain visual contact on the aircraft to your left as they descend on to the course. It also makes it difficult for the aircraft outside you to maintain visual contact with you. Excessive climbing at the start is grounds for disqualification
- Maintain your lane by maintaining the appropriate line abreast distance from the aircraft to your left, whether they are ahead of, next to, or behind you
- If you accelerate ahead of the aircraft immediately to your left, avoid the tendency to turn left when looking over your left shoulder. Maintain your lane by keeping the aircraft immediately to your left in sight, and scanning to the next aircraft inside them for spacing cues. Leave enough room for the aircraft immediately to your left to accelerate back into position. Do not close the gap and pinch off the aircraft immediately to you left. Not maintaining your lane in this situation, and impeding the racer to your left, is grounds for disqualification from the race heat
- As the formation accelerates, and begins to round Outer Pylon 4, the faster aircraft on the inside tend to move out in front, and the slower aircraft on the outside tend to fall back. With the left turn at Outer Pylon 4, there is a natural tendency for the flight to start to move into trail
- As this natural move towards trail begins, slower aircraft on the outside, that may not have yet reached Outer Pylon 4 for the first turn, may move to the left towards the race course line, only if all aircraft ahead are in sight, and forward of them. Caution must be taken to ensure no racer to the left will be pinched by this move
- As the flight moves into trail, If any racer remains to an aircraft’s left, the lanes must be maintained around the turn at Outer Pylon 4, and onto the course at Outer Pylon 5. From this point forward, standard passing rules, as described in the next section, apply
- Because of the dynamics of the race start, passing during the start, prior to passing Outer Pylon 4, is only allowed if cleared (with a radio call) by the aircraft that is being passed. All standard passing rules apply as well; this is an added restriction

FIRST LAP AND TRANSITION TO THE APPROPRIATE RACE COURSE

During PRS training, or NCAR practice and racing, any time a flight enters the course via the Chute, the first lap is always flown on the Outer Course, no matter which course the flight will fly for the remainder of the flight or race. If the flight will fly on the Sport Course or the Medallion Course, all aircraft will transition to that course after passing Home Pylon the first time (on lap 1).

- The Sport Gold heats will always fly on the Outer Course for all laps during NCAR. No transition to another course is required
- The Sport Silver heats will always transition to fly on the Sport Course after lap 1. If, in the determination of the Sport Class Officers and the Pilot Standards/Contest Committee, the qualifying speed of the entire Silver field is fast enough to warrant, the Silver heats may be flown on the Outer Course during NCAR
- The Sport Bronze heats will transition to fly on either the Sport Course or the Medallion Course after lap 1. The determining factor for which course the Bronze heat will fly on is the qualifying speed of the Bronze heat aircraft. If *all* Bronze racers qualify at less than 275 mph, the Bronze heat may fly on the Medallion Course or the Sport Course, at the discretion of the Sport Class Officers and the Pilot Standards/Contest Committee. If *any* Bronze racers qualify at greater than 275 mph, the Bronze heat must fly on the Sport Course
- The Sport Medallion heats will transition to fly on the Medallion Course after lap 1. However, if *any* Medallion racers qualify at greater than 275 mph, the Medallion heat must fly on the Sport course
- The transition from the Outer Course to the Sport Course requires a tight turn at Outer Pylon 3 to fly towards Sport Pylon 4. This turn flies inside the lighted Start Pylon. Should a pilot miss the turn at Outer Pylon 3, they must not make a hard turn to the left to fly back to the course, as aircraft behind them that do not miss the turn may be a collision hazard. Pilots must smoothly correct back to the correct course, and must ensure the area to their left is clear during the correction. Pilots in this overshoot scenario must also be conscious of rapidly rising terrain between Outer Pylon 3 and Outer Pylon 4
- The transition from the Outer Course to the Medallion Course requires a tight turn at the lighted Inner Pylon 1 to fly towards Outer Pylon 2, and then another tight turn to fly towards T6/Medallion Pylon 3. Should a pilot miss the turn at Inner Pylon 1, they must not make a hard turn to the left to fly back to the course, as aircraft behind them that do not miss the turn may be a collision hazard. Pilots must smoothly correct back to the correct course, and must ensure the area to their left is clear during the correction

FLYING THE PYLONS

Once on the racecourse, pilots must not only fly formation, but must also fly the course around the pylons. This section will cover basic pylon flying techniques.

The fundamentals of Pylon Racing apply to all race courses. The various techniques and turn timing may need to be modified for racing on each of the various courses, due to the geometry and size of each race course. Techniques also differ based on the speed of the aircraft racing, as well as the energy bleed rate of different aircraft designs at different speeds and turning g forces. For example, techniques and timing employed at 400 mph on the Outer Course, in an aircraft with a laminar flow wing, will differ markedly from those employed at 230 mph on the Medallion course, in an airplane with a non-laminar flow wing. Some overall truisms apply, such as:

- The optimum race course path to fly is not directly from pylon to pylon, with a hard turn executed at each pylon. This tends to bleed energy rapidly, and slow the aircraft
- Aiming slightly wide of the pylon ahead, then leading the turn around the pylon, tends to preserve energy more effectively. The amount of aim offset , and the timing of the lead turn, depends on the speed and energy sustaining g capability of the aircraft, as well as the geometry of the turn
- Aiming too wide of the pylon ahead may give the appearance to following racers that you are flying off course
- Smooth roll-in and roll out of turns, and consistent rate, non-scalloping turns are the most effective turning techniques, and fosters confidence in fellow racers that you are flying a consistent, predictable race course path
- Smooth altitude control, both during turns and in straight and level flight, is a far more effective energy management technique than rapid climbs and descents, and fosters confidence in fellow racers that you are flying a consistent, predictable race course path
- Lift vector control (via angle of bank) is more effective at both altitude and course line management, than is utilizing hi g turns, and maintains energy state (speed) more effectively

ON-COURSE RACING WITH OTHER AIRCRAFT

Following a race start, as the aircraft settle onto the race course, the formation tends to string out into trail a bit. However, there are often pairs, or packs, of aircraft racing in close proximity. The formation contract continues to apply to all aircraft in the race, and is especially pertinent to both aircraft that are racing in close proximity, and to aircraft that are passing or being passed. The following apply to on-course racing:

- An aircraft at the front of a heat, or at the front of any pack of racers, owns the race course line. Aircraft behind the lead aircraft in a pack may not impede the lead from flying the race course line
- An aircraft at the front of a heat or a pack has the formation contract responsibilities, as they pertain to racing, of a Lead. Specifically, a lead race aircraft should fly a predictable race course line, and avoid erratic flight path movements, both in course line and altitude. This does not preclude strategic path management, as long as the path is flown smoothly
- An aircraft behind a lead aircraft in a heat or a pack, has the formation contract responsibilities, as they pertain to racing, of a Wingman. Specifically, a following race aircraft must maintain visual contact with, and separation from, aircraft ahead
- Positioning of aircraft following a lead aircraft is dependent upon the proximity of the aircraft, the relative speeds of the aircraft, and the position on the race course. Aircraft may fly in trail of the aircraft ahead, and match the lead aircraft's line, or may fly on the outside wing of an aircraft with fairly matched speeds. A tight, extended trail maneuvering cone is one way of visualizing the appropriate area of maneuvering
- Caution must be taken when flying in close proximity to the lead aircraft. Maintaining a position slightly above and outside the aircraft ahead (similar to a fingertip turn away) is the safest position, because visual contact is more easily maintained, and turning g can be more easily matched. Maneuvering to a high trail, or inside portion of the maneuvering cone requires enough nose-to-tail separation to always maintain sight of the aircraft ahead. From these positions, without sufficient nose to tail, a mis-match in turning g can easily cause the following aircraft to lose sight, break their contract on the aircraft ahead, and create a safety hazard
- An aircraft may have enough speed to begin to overtake the aircraft ahead on a straightaway, but may lack the speed to pass in a turn. In this case, the safest course of action is to move from the trail position to the high and outside position, and translate overtake into potential energy by flying slightly high and outside the lead's turn
- If an aircraft moves up on a pack of aircraft, they must not attempt to move between the aircraft. The safest position to take when catching a pack, is to move to the slightly high and outside position on the outermost/aft-most aircraft

MANAGING CLOSURE

Recognizing and managing closure is a critical skill for all racers to develop and hone. In situations where rapid closure develops on an aircraft ahead, every racer must know where to fly their aircraft to avoid conflict…they must know where their "out" is.

- Whether on a strait-away, or entering, exiting or in a turn, if closure is gained on an aircraft ahead, the pilot must manage their aircraft path to maintain visual contact with and separation from the aircraft they are closing on. The safest path, as long as the aircraft ahead is flying a standard and predictable line, is to convert closure to potential energy, by flying to a point that is slightly high and outside of the aircraft ahead (similar to a fingertip turn away position). If closure and overtake is sufficient, this may lead directly into a pass. If overtake is not sufficient to execute a pass, the high and outside position may be flown, until a pass can be made
- The movement from trail to a high and outside passing position must be done smoothly, as other aircraft may be in proximity to, and flying off, of the closing aircraft
- With high closure rates, moving to a low and inside position should not be done. This increases closure, and because inside passing is not allowed under normal circumstances, as the aircraft ahead is approached from low and inside, it closes off all "outs", or all avenues of escape. Moving to a high and inside position also should not be done, as this can easily cause the following aircraft to lose sight of the aircraft ahead, especially in a turn, thus breaking the contract on the aircraft ahead, and creating a safety hazard
- Managing closure should be done with aircraft path management and purposeful positioning. Power changes are not required, under normal circumstances. A power reduction is only recommended if the aircraft must execute a breakout or escape maneuver. Breakouts and escape maneuvers are discussed in the Emergency/Contingency Procedures section of this manual

PASSING

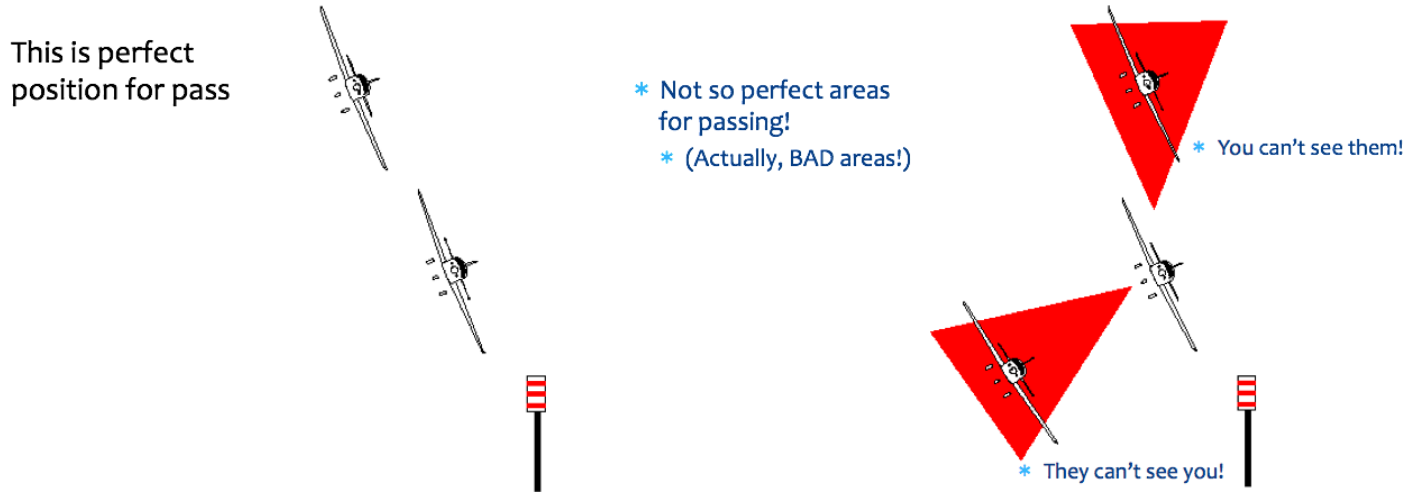
Passing another aircraft on the race course is a dynamic and demanding event. Safe passing requires strict adherence to SOP and the Formation Contract (as it applies to racing). Safe passing also requires a pilot to recognize rapidly changing relative motion (opening and closing rates), and utilize good judgement in the timing of, and aircraft path management during, a safe pass.

- An aircraft that is being passed owns the race course line until the pass is complete. Aircraft attempting to pass may not impede the aircraft being passed from flying the race course line
- Impeding an aircraft during a pass is grounds for a protest or disqualification
- A pass is complete when the aircraft passing has gained nose-to-tail separation, and is opening from (pulling further ahead of) the aircraft being passed
- During the pass, the aircraft passing has the formation contract responsibilities of a wingman. They must maintain visual contact, and maintain separation from, the aircraft being passed at all times, until the pass is complete (nose-to-tail separation and opening has been achieved)
- During a pass, the aircraft being passed has the formation contract responsibilities of a lead. They must maintain a predictable flight path for the passing aircraft to reference during the pass. This does not preclude strategic path management, as long as the path is flown smoothly
- A passing aircraft may make a radio call to the aircraft they are passing, such as “XX, YY is on your right” to advise the aircraft being passed of the impending pass. This call is not mandatory. If such a call is used, it should only be used when a pass is imminent. It is not appropriate to make multiple calls such as this while flying along side another aircraft, but not able to pass. This only adds distraction and blocks the Race Control frequency unnecessarily
- An aircraft being passed may relinquish contract the lead and the ownership of the race course line, and accept the contract responsibilities of a wingman, by clearing the passing aircraft over the radio. This is done with a call such as, “YY Clear”
- As a pass is completed, whether a “Clear” call is made or not, the aircraft that has been passed immediately has visual contact and separation contract responsibilities on the aircraft that has passed
- All passes will be made to the outside (right side) of the aircraft being passed

Note: The only exception to the “outside passing-only” rule is when an aircraft ahead strays so wide of the race course, that an inside pass may be executed without losing sight of the aircraft ahead, and without impeding the path of the aircraft being passed. If the passing aircraft will go belly up and lose sight of the aircraft being passed, then an inside pass must not be attempted, unless the two aircraft are communicating with each other and remaining clear of each other.

- If a pilot feels they were impeded during a pass, or otherwise feels a pass was unsafe, they may protest the pass to the Air Race Contest Committee, via the process outlined in the Air Race rules and the Sport Class Rules

The diagrams below depict safe and unsafe passing positions:



PYLON CUTS, PENALTIES, AND PROTESTS

PYLON CUTS AND PENALTIES

Each pylon is manned by a crew of Pylon Judges. The Pylon Judge crews are among the most senior, long-standing groups of volunteers at NCAR. They take their job very seriously, and have a great deal of pride in their positions and responsibilities. Pylon cuts are judged by looking up through the hollow barrel of the pylon, and if any portion of a race aircraft is visible through the barrel as it passes the pylon, a pylon cut is called. Pylon cuts are not subject to protest, and the judges' ruling is final. The only exception to this non protest rule is in the case of a forced cut (described below).

The penalty for a pylon cut is a 2 second time penalty for each lap of the race. For instance, in a 6 lap race, a single pylon cut is assessed a 12 second penalty. The 12 seconds is added to the total elapsed time for that aircraft in the heat or race, and the resulting elapsed time and calculated speed is used for placement for the heat or race, and thus placement in the next day's heat. During the finals, a pylon cut can change the final standings of the race.

Pylon cuts may occur due to several factors. Some examples are:

- Flying too tight of a course line
- An overly-aggressive turn at a pylon
- Mis-timing a lead turn towards a pylon
- Mis-judging wind effects on the race course

Pilots may not be aware of a pylon cut when it happens, or it may be obvious to them. If a pilot recognizes that a pylon cut is imminent, it is critical they they NEVER TURN RIGHT, or otherwise fly erratically, to avoid the pylon cut. There could be a racer just outside the aircraft trying to avoid the pylon cut, and making an unpredictable move to avoid a cut creates a severe safety hazard. Pilots must accept the pylon cut and fly on, in a predictable manner.

Should a racer cut a pylon significantly, and is then well inside the race course line, they must continue in a predictable path and return to the course cautiously. Racers in this situation must visually clear the path ahead and outside that leads back to the course line, to ensure they will not become a collision hazard to another racer, who is on the race course line. If there is not a clear path to return to the course, the racer inside the course may have to accept another pylon cut on the next pylon, before returning to the race course line. In extreme situations, where no clear path to the race course line exists, and the racer inside the course will go belly up to racers on the course, the escape maneuver (covered in the Contingency/Emergency Procedures section) may be required to clear the conflict safely.

FORCED PYLON CUTS

A Forced Cut is a pylon cut that is caused by one racer cutting off another aircraft that they do not have sufficient nose-to-tail clearance on during a pass. The passing aircraft has the formation contract separation responsibilities of a Wingman until they have achieved positive nose-to-tail clearance, and are opening. If a passing racer "closes the door" on a racer they are passing before they have sufficient nose-to-tail clearance, they have illegally impeded the aircraft that "owned" the course line, per the contract. Typically, the only safe "out" for the racer being illegally passed in this manner is to move further inside. If this results in a pylon cut, it may be determined to be a Forced Cut. If a passed racer feels they were impeded into a Forced Cut, they must file a protest in accordance with the Sport Class Rules and the NCAR Rules of Competition. If the Forced Cut protest is upheld, the racer that was forced into the pylon cut will not be penalized, and the racer that caused the Forced Cut will be disqualified from that heat or race.

OTHER PROTESTS

Pilots may protest the actions of another racer, if those actions result in an illegal or unsafe pass (even if it did not result in a Forced Cut), or the actions created a safety hazard on the course. In such a case, a protest must be filed in accordance with the Sport Class Rules and the NCAR Rules of Competition. Such a protest may result in the offending racer being disqualified from that heat or race.

DISQUALIFICATIONS

Disqualification from a race may be imposed by the NCAR Contest Committee, by the Sport Class Pilot Standards/Contest Committee, or by the Pace pilots for the race. They may also occur as the result of a protest by one racer against another racer. A disqualification may be imposed for the following reasons:

- On the start
  - Slingshot starts
  - Diving on the start
  - Climbing on the start
  - Erratic flying in the Chute
  .
- Low Flying on the Race Course
  - Flying below the pylon height at any point on the race course
  - Flying below the R in RENO on the Home Pylon (pilot's head below the R)
- High Flying
  - Flying above the Race Course maximum altitude
- Show Line Violations with no Escape Maneuver performed
  - South, East or West Show Lines
- Erratic Flying
  - Poor or unpredictable race course line management
  - Turning right at any point on the race course
  - Creating a safety hazard or conflict with other race aircraft
- A Forced Cut

RACE FLAGS

During a race, Race Flags of various colors are waved by personnel at the base of Home Pylon, to signify various race situations. Radio calls accompany the flags. The meaning of each flag, and the accompanying radio calls, are as follows:

- Green Flag
  - Race Start
- White Flag
  - One lap to go for the lead aircraft (and all aircraft on the same lap)
  - Radio call: "White Flag, White Flag" (when the leader passes Home Pylon with one lap to go)
- Checkered Flag
  - The leader has passed the Home Pylon on the final lap, and all aircraft will exit the course the next time passing Home Pylon, no matter what lap they are on
  - Radio call: "Checkered Flag, Checkered Flag" (when the leader passes Home Pylon on their last lap)
- Yellow Flag
  - Emergency in progress. All non-emergency aircraft remain on the race course
  - Radio call: "Emergency in Progress" (this Race Control call follows the emergency aircraft's "MAYDAY" call)
- Red Flag
  - Major Emergency in progress. All aircraft exit the race course.
  - Radio call: "Red Flag, Red Flag, all aircraft exit the race course"
- Black Flag
  - A major safety violation has been committed by a specific racer, or a racer has demonstrated erratic, unsafe flying. If a Black Flag is given to a specific racer, that racer must exit the race course. All other racers remain on the race course
  - Radio call: "Black Flag, Black Flag, Sport XX"

During Qualifying, Race Flags are also used. This will be covered in the section on qualifying.

THE RACE FINISH AND EXITING THE COURSE

Each race has a specified number of laps. Sport heats and races that are run on the Outer or Sport courses are run for six laps. Sport heats and races that are run on the Medallion course are run for 8 laps. When the lead aircraft in a race

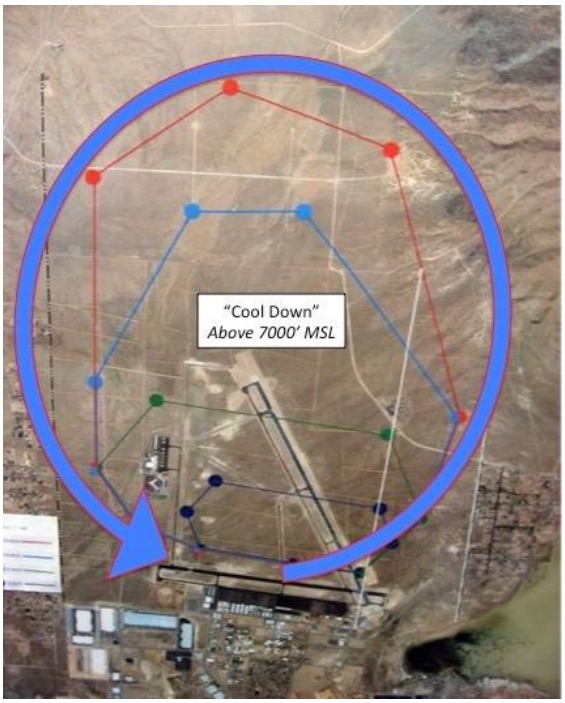
passes Home Pylon on the final lap, and the “Checkered Flag, Checkered Flag” call is made by Race Control, all racers will complete the lap they are on, and exit the race course passing Home Pylon. Any racers that have been lapped by the lead aircraft will also exit the course passing Home Pylon on that lap, even though they have not completed the full number of laps.

The race is not over when the “Checkered Flag” call is made. All racers shall continue to race until passing Home Pylon on the final lap and exiting the race course. Racers must not mentally let down, or stop following race SOP and the contract, when that Checkered Flag call is made. Placing in the heat or race is determined by order of finish passing Home Pylon, adjusted for penalties, such as Pylon Cuts, or disqualifications. Timing and judging of finish order is done with cameras focused on the Home Pylon finish line.

To exit the race course at Home Pylon, racers shall fly past Home Pylon, and then begin a smooth pull-up to exit the course. An early pull-up prior to Home Pylon may climb the aircraft out of view of the Timers’ cameras, and may even allow a racer to pass at the finish line. A rapid, high-g pull-up should not be done, as other racers may be very close behind, so the pull up should be smooth and predictable to allow all racers to exit the course safely. As each racer pulls up and off the course, power may be smoothly reduced, and a climb to a left-hand circling orbit over the course is made. Racers that are close behind another racer should remain behind and outside the aircraft ahead’s turn into the left-hand orbit. Do not cut off a racer ahead during the climbing left turn.

COOL DOWN AND RECOVERY

The “COOL DOWN” is a left-hand orbit, with a track over, to slightly outside, the race course. Cool Down altitude is ABOVE 7000’ MSL. During the time in the Cool Down, pilots must be vigilant for other aircraft, both in the Cool Down, and coming off the course into Cool Down. Racers should not fly south of Runway 8/26, or over the spectator areas while in Cool Down. Typically racers will line up in a daisy chain and will exit Cool Down and land in sequence. That sequence does not need to be in race start or finish order, but is typically driven by who arrives at the Cool Down exit point first, and chooses to leave Cool Down. There are no specified maximum or minimum laps required in Cool Down. However, excessive time and laps in Cool Down are not desirable, given the overall NCAR schedule of events. The Pace may brief a desired number of laps in Cool Down for a race flight. During Cool Down, racers mentally shift gears from racing mode into landing mode, and continue to monitor aircraft systems. Emergencies do happen in Cool Down, so pilots must remain vigilant at all times. Should an emergency occur in Cool Down that requires an immediate landing, or that requires remaining in Cool Down to troubleshoot, a MAYDAY should be called.



EXITING COOL DOWN AND LANDING

Sport Class has very specific procedures for exiting Cool Down, entering the landing pattern, and landing. These procedures must be followed by all racers. For each landing runway, there is a specific geographic location to exit Cool Down, and a specific pattern to fly from Cool Down to the downwind, and into the landing pattern. The proscribed pattern must be followed by all racers, to support racers acquiring visual contact on aircraft ahead, and to mitigate pattern conflicts. The hot spots for traffic conflict are the off-course pull-up, the turn from Cool Down to Downwind, and the Approach turn. Racers in Cool Down or entering the pattern must give way to aircraft exiting the course. Racers in the pattern must identify their interval and maintain visual separation in the pattern. The appropriate interval in the approach turn is to leave the downwind perch when the aircraft ahead is 90º through the approach turn on base. Do not extend the pattern by delaying the approach turn.

There are also specific radio calls to be made by each pilot during recovery. These radio calls are:

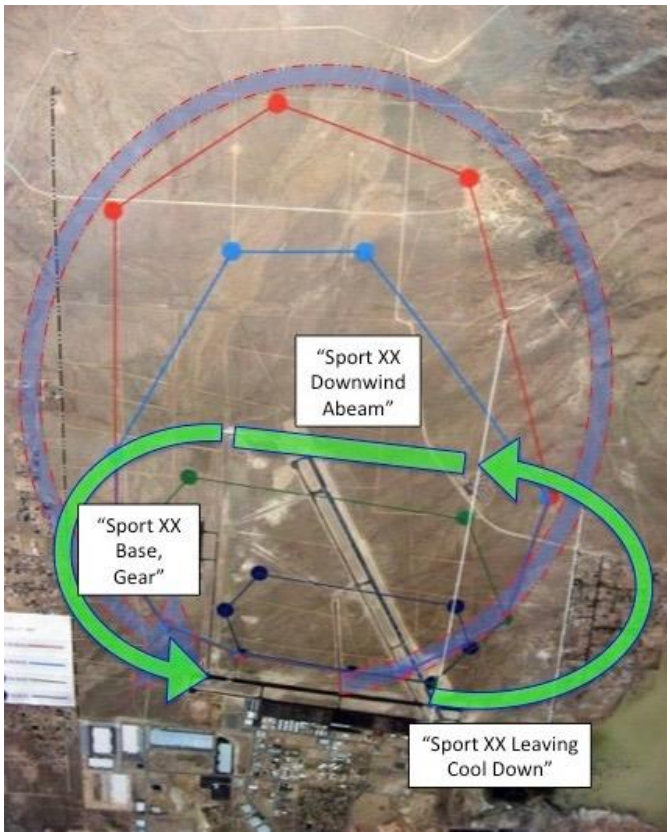
- "Sport XX, Leaving Cool Down" (at the Cool Down exit point and beginning descent to the pattern)
- "Sport XX, Downwind Abeam" (on downwind, abeam the Race Control tower for 8 or 26, or midfield downwind for any other runway)
- "Sport XX, Base - Gear" (on the base turn)

Timing of these calls may need to be adjusted slightly for pattern calls by other racers during the recovery. Use professional comm discipline and comm brevity.

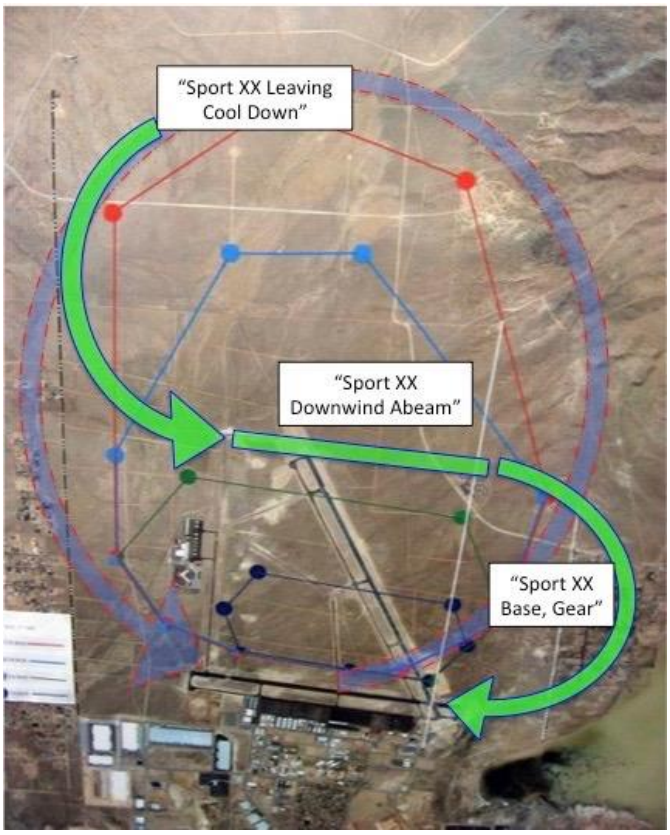
When Race Control has control of the airport, during the PRS or NCAR waiver period, each aircraft will be cleared to land by by Race Control when the pilot makes the "Sport XX, Base-Gear" call. However, clearance to land during a PRS or NCAR recovery is assumed, meaning this landing clearance is not mandatory, and does not require a reply. Reply is at the pilot's discretion, and pilots should land, whether the clearance is received or not (unless a safety hazard exits that requires a go-around).

The following diagrams depict the Cool Down exit and Landing Pattern for each of the Reno-Stead Runways:

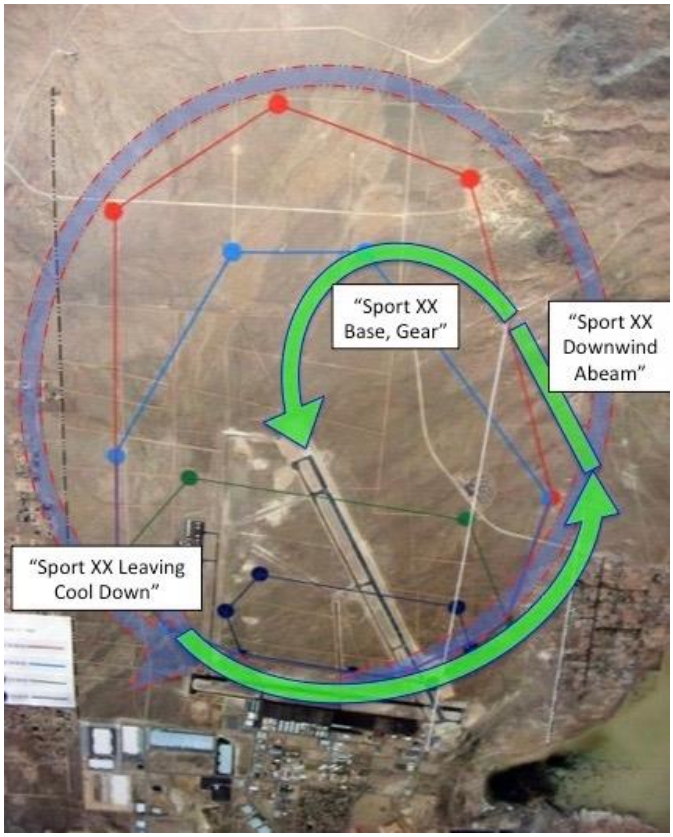
RUNWAY 8 RECOVERY



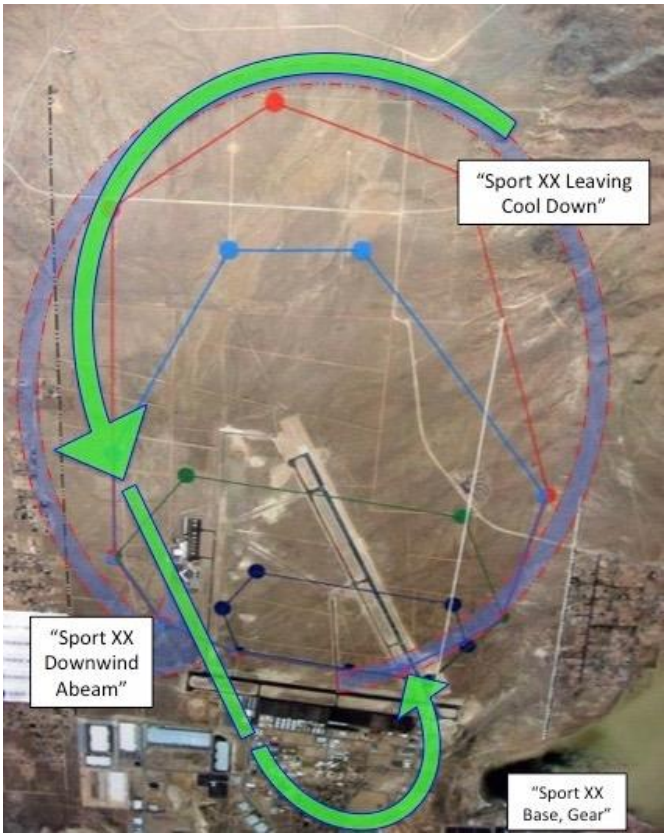
RUNWAY 26 RECOVERY



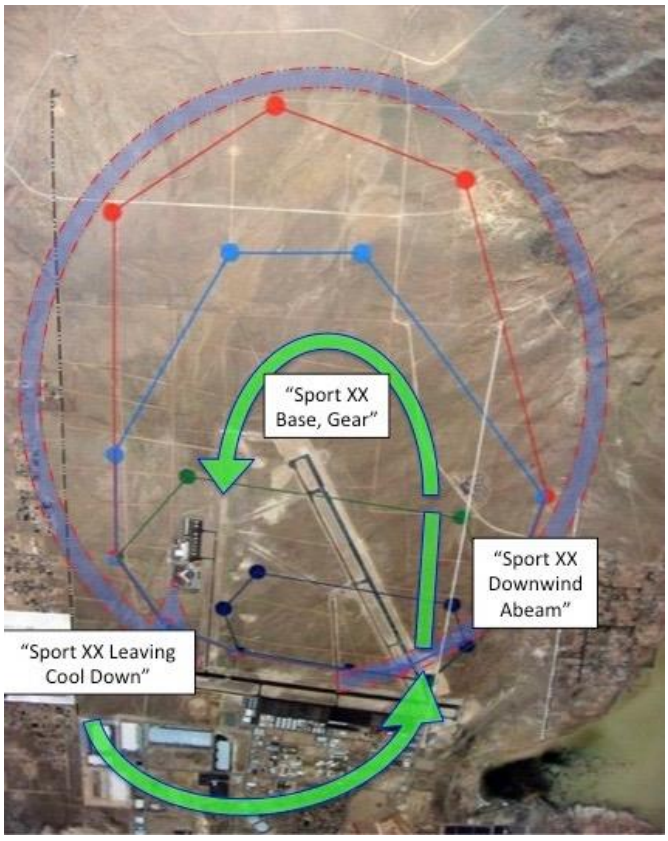
RUNWAY 14 RECOVERY



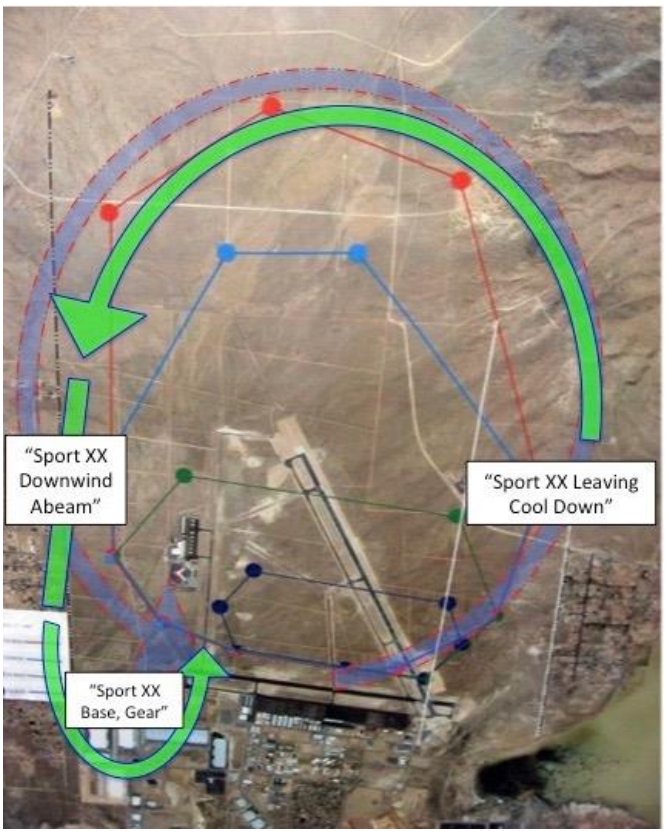
RUNWAY 32 RECOVERY



RUNWAY 18 RECOVERY



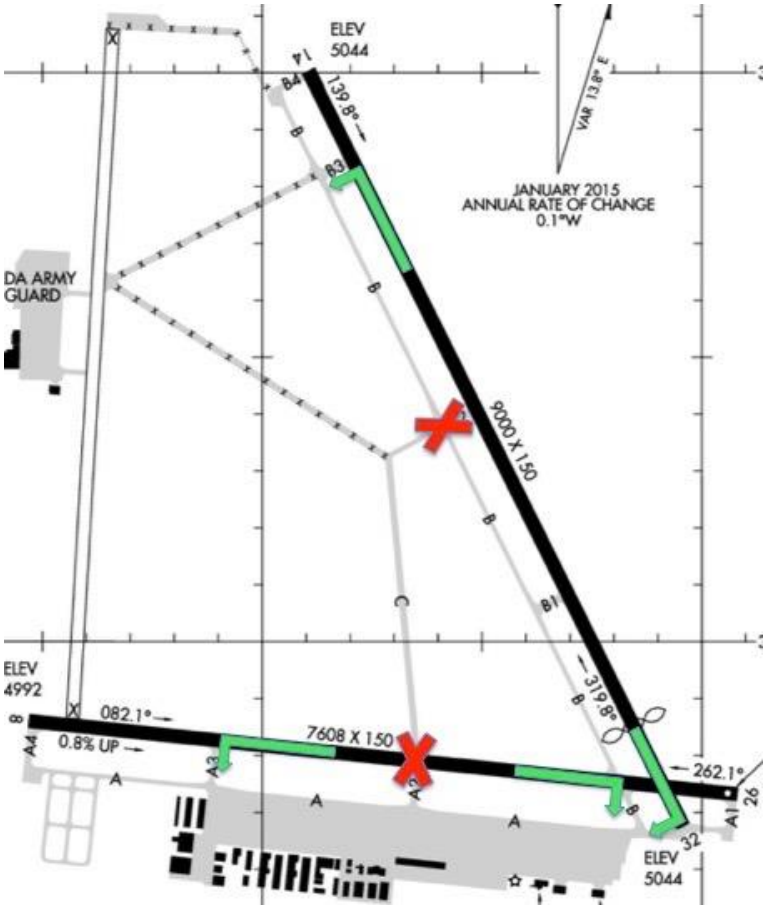
RUNWAY 36 RECOVERY



LANDING ROLLOUT AND RUNWAY EXIT

Landing following a PRS or NCAR recovery is done following the Sport Class SOP, using the Hot Side - Cold Side procedure. Turnoff will be made on the designated taxiways (shown on the diagram below. No early turnoffs at the midfield exits are authorized. Long landings are authorized, so as to allow rollout to the designated turnoff, without excessive rollout distances.:

- Runway 8: Taxiway B
- Runway 26: Taxiway A3
- Runway 14: Full length (cross Runway 26, unless Race Control directs holding short of 26)
- Runway 32: Taxiway B3
- Runway 18: Full length
- Runway 36: Full length



TAXI IN AND PARKING

During PRS and NCAR, after clearing the runway, pilots will switch and monitor Stead Ground during the taxi to parking. When entering the Sport Class parking area, pilots must follow the directions of the Ramp Chief and the Ramp Crew, and must exercise extreme vigilance for aircraft and race crews in the parking area. Pilots must never taxi or coast across the no-prop-turn line, and must not taxi or coast up the fuel truck.

POST-SHUTDOWN DEBRIEF

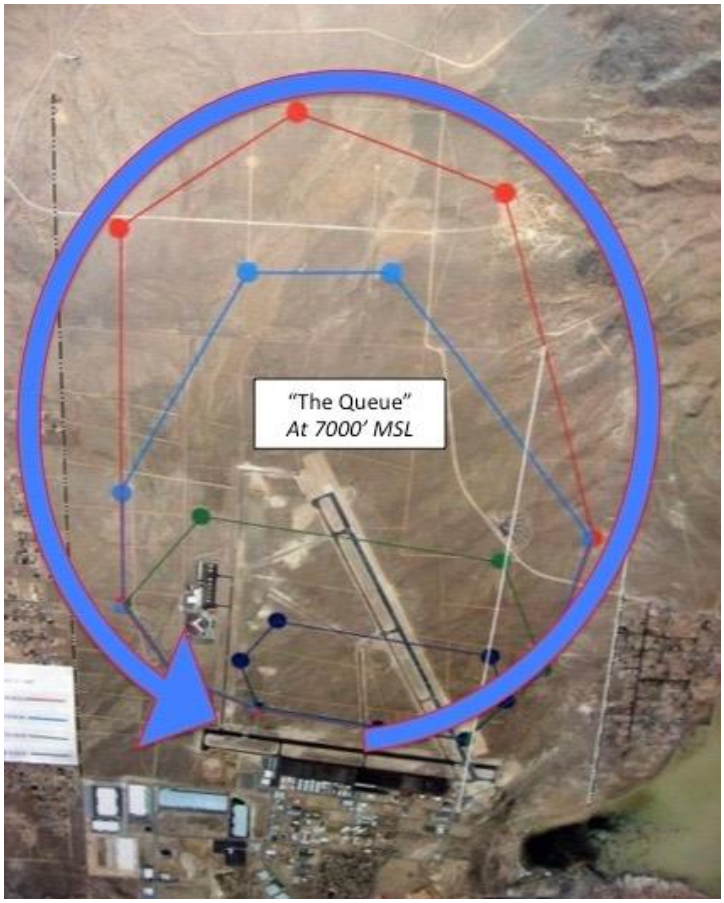
After shutdown, all pilots will meet at the Lead's aircraft (PRS) or the Pace Aircraft (NCAR). Leads will assign a debrief location and time for PRS debriefs. NCAR flights will be debriefed by the Pace Pilot on the ramp. A representative of Pilot Standards will attend all NCAR debriefs at the aircraft. If any additional debrief is required for an NCAR flight, the Pace Pilot and Pilot Standards rep will assign a place and time for that debrief.

ALTERNATIVE RACE COURSE ENTRY PROCEDURES

In addition to normal Chute entries, the race course may be entered from the Queue, a holding pattern above the race course, or via a Direct Entry after takeoff.

THE QUEUE

The Queue is a holding pattern above the race course, at 7000 feet AGL. It is the same pattern as the Cool Down, a left-hand orbit, with a track over, to slightly outside, the race course. The difference between the Queue and Cool Down in altitude. The Queue is flown *at* 7000', and Cool Down is flown *above* 7000'. Racers should not fly south of Runway 8/26, or over the spectator areas while in the Queue.



ENTERING THE QUEUE

The Queue may be entered in three ways:

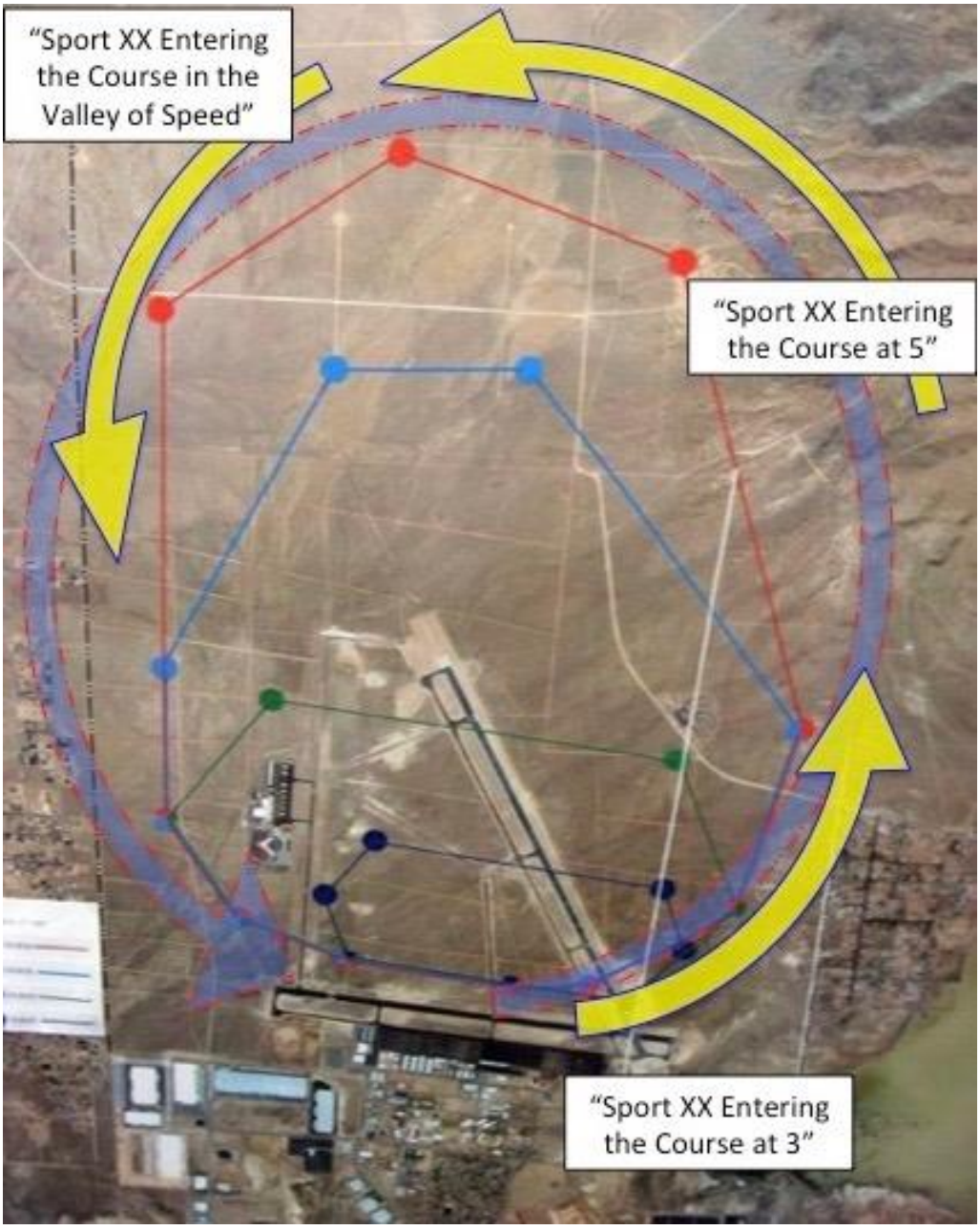
- On takeoff: by climbing directly into the Queue
- From the race course: by pulling off the course and climbing into the Queue
  - Home Pylon is the standard place to climb into the Queue, but exiting the course and climbing to the Queue may be done at any point on the course. Pilots must clear the area ahead and above, and must make a radio call when climbing into the Queue, such as "Sport XX, off the course at Home, climbing to the Queue"
- From the Chute: a flight may enter the Queue from the Chute by leveling at 7000' AGL and entering the left orbit over the course at approximately overhead, to slightly outside, the Start Pylon
  - This may be required if a flight is early in the Chute, and another flight is on the course, and has several minutes of course time remaining
  - This is also an option for a pilot that wishes to enter a test-flight pattern in the Queue or Cool Down

RACE COURSE ENTRY FROM THE QUEUE

Entering the race course from the Queue requires pilots to exercise vigilance and caution, to ensure they do not create a conflict with racers on the course. Entry is best executed at Outer Pylon 3, Outer Pylon 5, or in the Valley of Speed. To enter the course at these points, a radio call is made, such as “Sport XX, leaving the Queue, entering the course at 3”, or “Sport XX, entering the course at 3”. The descent from 7000’ is begun about 1/4 lap prior to the entry point, and the pilot must remain outside the pylon to pylon course line, and merge to the outside of traffic on the course. Pilots must not impede racers on the course, and must not cut across the course to join the course line. Pilots must also be cognizant of, and remain inside, the Race Course Show lines as they descend to race course altitude. Pilots must use discretion in power setting when descending from the Queue to the course, as a full power descent may result in exceeding airspeed limitations. As an aircraft joins the course, if they move up and around racers on the course, the standard passing contract, procedures and communications rules must be followed. Racers must also be aware that additional speed gained in the descent may be lost upon level off, so passing must be done with caution, as the opening speed on a racer being passed may decrease rapidly upon level off.

The diagram below depicts proper paths and locations to enter the course from the Queue:

RACE COURSE ENTRIES FROM THE QUEUE



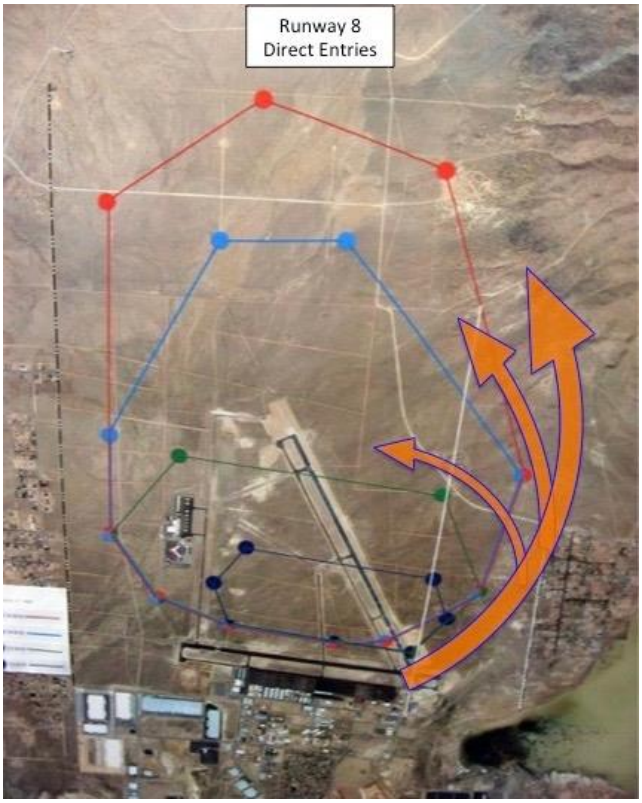
DIRECT ENTRY TO THE RACE COURSE ON TAKEOFF

On flights that will not fly to the practice area, and will not fly to the Chute for entry, a Direct Entry to the race course may be made on takeoff. Any of the Sport Courses may be entered via a Direct Entry. The procedure is markedly different for each runway. Each of the primary runway direct entry procedures is described below.

RUNWAY 8 DIRECT ENTRY

Aircraft departing runway 8 turn directly onto the course, turning near the end of the runway, to fly around Outer Pylon #2.

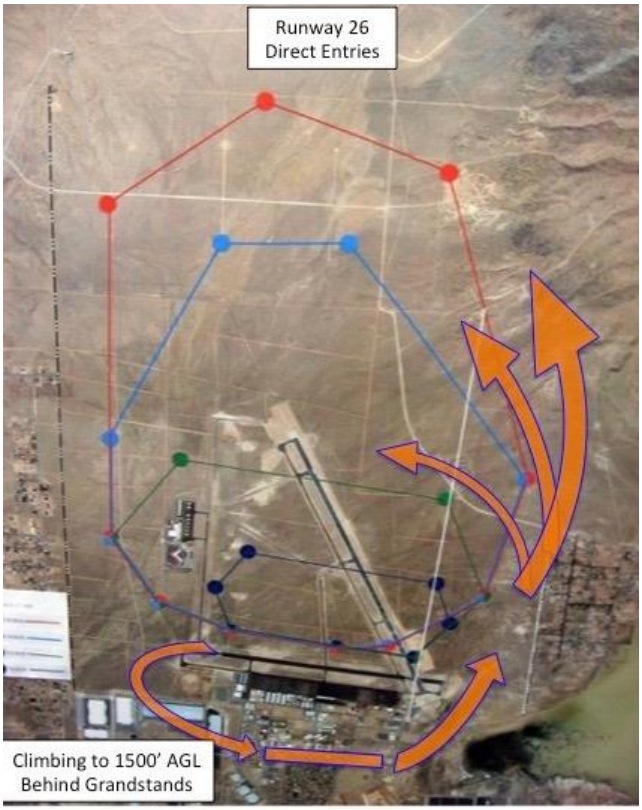
Pilots may turn at Outer Pylon #2 to enter the Medallion Course, at Outer Pylon #3 to enter the Sport Course, or may continue to the Outer Course around Outer Pylon #4. Pilots must be cognizant of rising terrain between Outer Pylons #3 and #4, if entering the Outer Course, especially since the aircraft are still accelerating after takeoff during a runway 8 Direct Entry.



RUNWAY 26 DIRECT ENTRY

Aircraft departing runway 26 make a climbing left turn to begin a left downwind for runway 26. Pilots must fly upwind to the west, beyond the Stead west-end hangars, before beginning the left turn, and must not fly over the hangars or the Sport Class staging area. Pilots must climb towards 1500 feet AGL, and fly south of (well behind) the grandstands. Approaching the abeam point of the intersection of the runways, make a left turn towards Outer Pylon #2, and begin the descent to enter the course.

Pilots may turn at Outer Pylon #2 to enter the Medallion Course, at Outer Pylon #3 to enter the Sport Course, or may continue to the Outer Course around Outer Pylon #4. Pilots must use discretion in power setting when descending from the runway 26 Direct Entry to the course, as a full power descent may result in exceeding airspeed limitations.

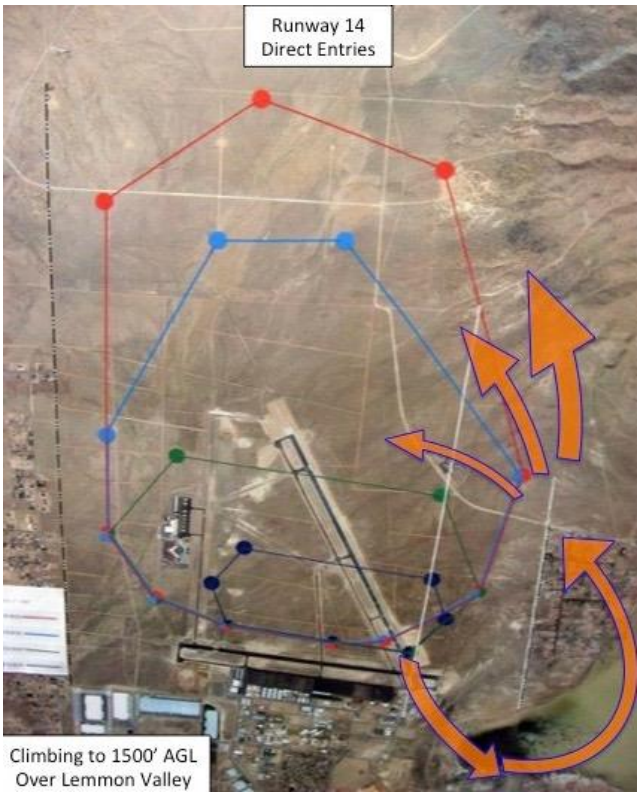


RUNWAY 14 DIRECT ENTRY

Aircraft departing runway 14 will fly upwind, climbing towards 1500 feet AGL. When at a comfortable airspeed and altitude to begin the turn back to the course, turn left, directly towards Outer Pylon #3. Begin the descent onto the course so as to not fly over homes at low altitude.

(Note: the photo to the right does not depict the upwind leg or the initial left turn to scale, due to photo constraints. The upwind leg will be further south, and the left turn will be a bit wider, and should not over fly the Lemmon Valley homes in the photo).

Pilots may turn at Outer Pylon #2 to enter the Medallion Course, at Outer Pylon #3 to enter the Sport Course, or may continue to the Outer Course around Outer Pylon #4. Pilots must use discretion in power setting when descending from the runway 14 Direct Entry to the course, as a full power descent may result in exceeding airspeed limitations.



RUNWAY 32 DIRECT ENTRY

Aircraft departing runway 32 will turn left towards Outer Pylon #7, remain west of the race course line, and fly west of the runway 26 numbers, while climbing to 1500 feet AGL. After passing runway 26, turn left and fly south of (well behind) the grandstands. Approaching the abeam point of the intersection of the runways, make a left turn towards Outer Pylon #2, and begin the descent to enter the course.

Pilots may turn at Outer Pylon #2 to enter the Medallion Course, at Outer Pylon #3 to enter the Sport Course, or may continue to the Outer Course around Outer Pylon #4. Pilots must use discretion in power setting when descending from the runway 32 Direct Entry to the course, as a full power descent may result in exceeding airspeed limitations
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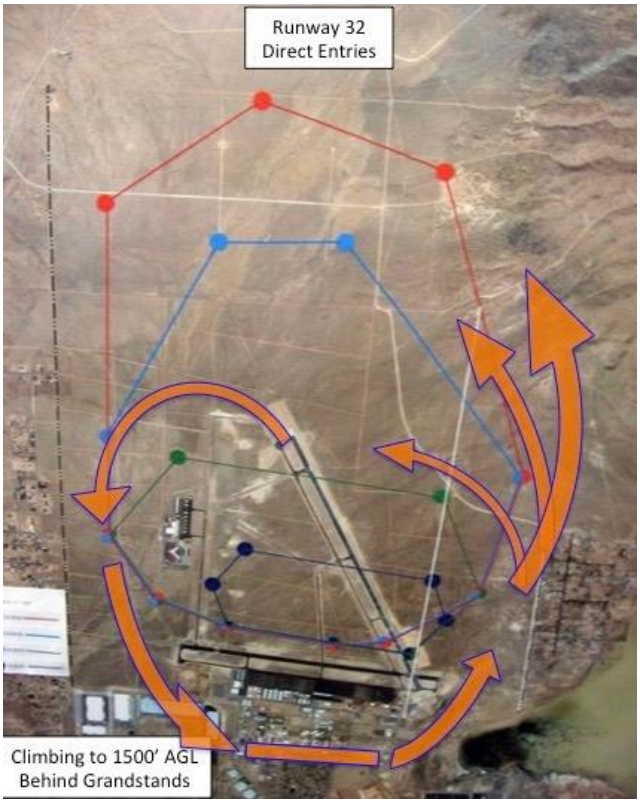


CONTINGENCY AND EMERGENCY PROCEDURES

TAKEOFF ABORTS

INDIVIDUAL AIRCRAFT ABORTS

The aborting aircraft must maintain aircraft control, ensure separation from other aircraft and communicate their actions using the radio as soon as practical. "XX aborting". Once under control, the aborting aircraft should maneuver to the cold side of the runway, to clear a path for any aircraft that has begun its takeoff roll to continue takeoff on the hot side (if practical for that aircraft).

AIRCRAFT IN THE FLIGHT BEHIND THE ABORT

When an aircraft aborts ahead, following aircraft that have already begun their takeoff roll, may continue the takeoff, especially if already at significant speed, and aborting would create separation issues with the aborting aircraft. The decision to continue or abort will be based on speed and runway available (distance remaining and a clear path ahead). Any aircraft that has not started their takeoff roll at the time of the abort, shall maintain position. When the abort is complete and the aborting aircraft ahead has exited, following aircraft may continue the takeoff (runway clear), or may clear the runway (runway obstructed or debris/fluid present).

AIRBORNE CONTINGENCIES AND EMERGENCIES IN THE PRACTICE AREA

Contingency and emergency procedures in the practice area are executed in compliance with the Sport Class Air Racing Formation Guidelines Emergency Procedures section.

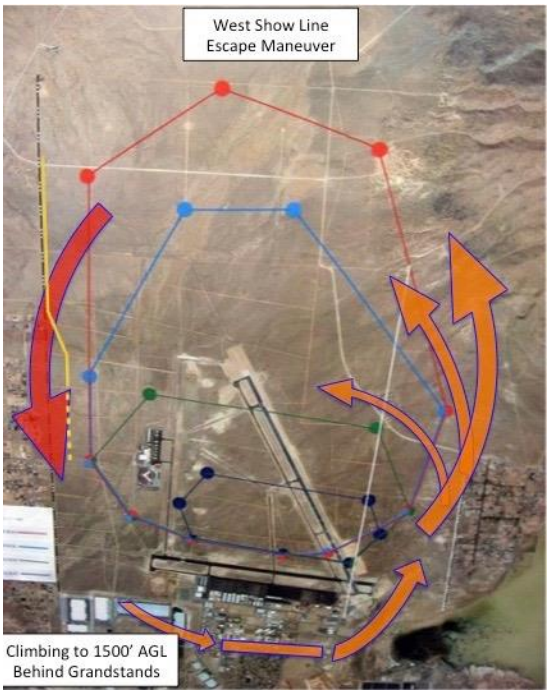
RACE COURSE CONTINGENCIES AND EMERGENCIES

SHOW LINE VIOLATIONS AND THE ESCAPE MANEUVER

A Show Line violation (aka Show Line bust) is grounds for disqualification, unless an Escape Maneuver is performed. If a racer recognizes that a Show Line bust is inevitable, due to traffic congestion or a flight path management error, the only safe "out" is to exit the course with a climb towards 1500 feet AGL, and circle above and outside the race course until a safe race course re-entry can be performed. Each Show Line has a specific path to follow during an Escape Maneuver, and the subsequent re-entry to the race course. The re-entry must be done with caution, to the outside of racers on the course, to ensure safe separation or aircraft at all times, and to ensure that racers on the course are not interfered with during the re-entry. The Escape Maneuver and re-entry procedures for each NCAR Show Line are described below:

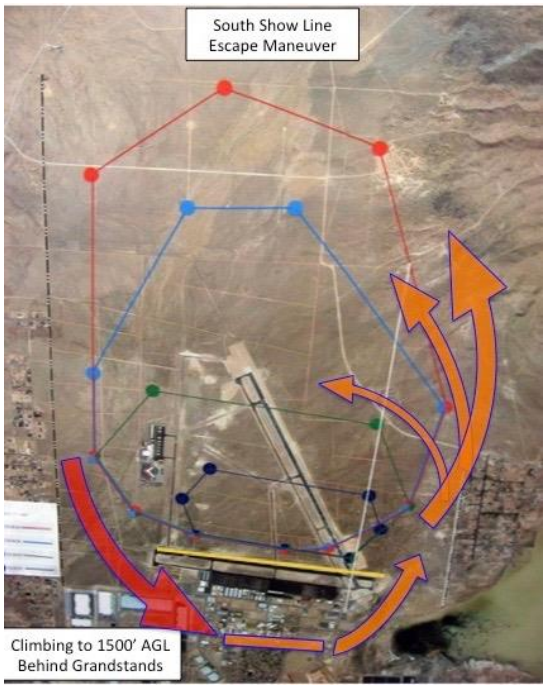
WEST SHOW LINE ESCAPE MANEUVER

If a West Show Line violation is inevitable, the racer must pull up and off the race course, and climb toward 1500 feet AGL. Fly west of the course and the Runway 8 numbers, and circle south of (well behind) the grandstands. Do not fly over the grandstands. Re-entry to the Outer Course is done outside Outer Pylons #3 and #4. Re-entry to the Sport Course is done outside Sport Pylons #4 and #5. Re-entry to the Medallion Course is done outside Medallion Pylons #3 and #4 (on the backside of the Medallion Course). These re-entries are similar to the Direct Entry after departing Runway 26.



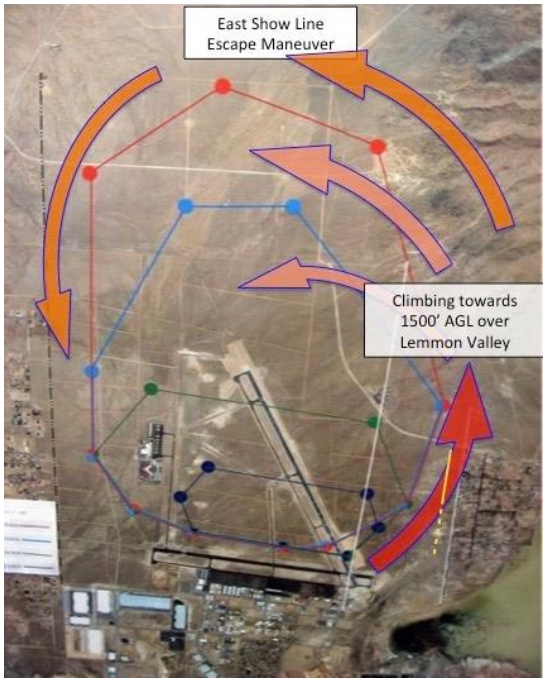
SOUTH SHOW LINE ESCAPE MANEUVER

If a South Show Line violation is inevitable, the racer must pull up and off the race course, and climb toward 1500 feet AGL. Fly west of the course and the Runway 8 numbers if possible, but do not turn right to do so. Minimize overflight of hangars, aircraft and spectator areas by making the decision to execute the Escape Maneuver as soon as the impending Show Line bust is recognized. Circle south of (well behind) the grandstands. Do not fly over the grandstands. Re-entry to the Outer Course is done outside Outer Pylons #3 and #4. Re-entry to the Sport Course is done outside Sport Pylons #4 and #5. Re-entry to the Medallion Course is done outside Medallion Pylons #3 and #4 (on the backside of the Medallion Course). These re-entries This is similar to the Direct Entry after departing Runway 26.



EAST SHOW LINE ESCAPE MANEUVER

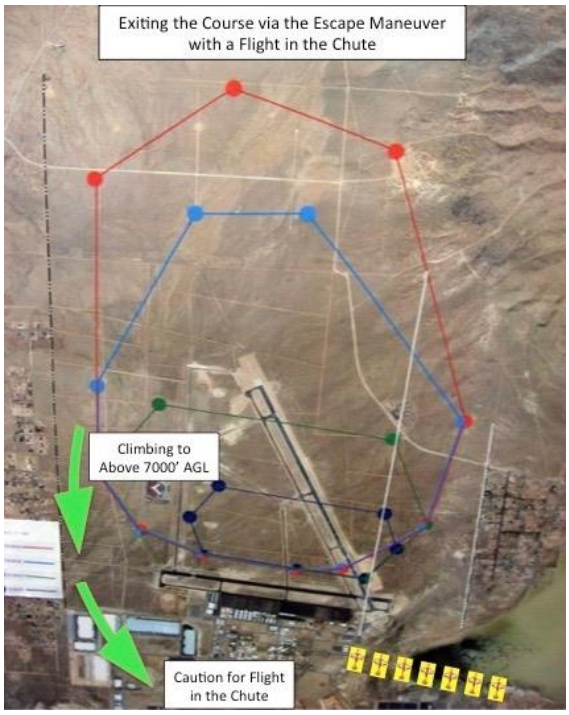
If an East Show Line violation is inevitable, the racer must pull up and off the race course, and climb toward 1500 feet AGL. Fly east of the course and climb so as to minimize over flight of Lemmon Valley homes. Circle outside Outer Pylon #4, and if necessary, due to traffic on the race course, outside Outer Pylon #5. Re-entry to the Outer Course is done outside Outer Pylons #5 and #6, and into the Valley of Speed. Re-entry to the Sport Course is done outside Sport Pylons #4 and #5, and if necessary outside Sport Pylon #6. Re-entry to the Medallion Course is done outside Medallion Pylons #3 and #4 (on the backside of the Medallion Course).



EXITING THE RACE COURSE VIA THE ESCAPE MANEUVER (DURING PRS TRAINING FLIGHTS, NCAR PRACTICE FLIGHTS, AND QUALIFYING)

During PRS training periods, NCAR practice periods, and NCAR qualifying periods, Sport Class subdivides its training time slots into individual flight on-course periods. For example, Sport Class often has a 120 minute slot divided into eight 15 minute on-course periods, or similar. Flight Leads are tasked with managing their course times, and must direct their flight to exit the course at the end of their period, or when the next flight is in the Chute, and about to enter the course. If there is not a flight in the Chute, exit may be done by pulling off at Home Pylon, as would be done in a race. If the next flight is in the Chute, the flight must depart the course via the West Show Line Escape Maneuver. This Escape maneuver may be done from any of the race courses the Sport Class races on. Even if there is not a flight in the Chute, the Flight Lead may direct the flight to exit via the Escape Maneuver, for training purposes.

When the course end-time for a flight is approaching, or when the next flight has called in the Chute, the Flight Lead will direct the flight to exit the course with a radio call, such as, “Sport XX Flight, exit the course next time at Pylon 7 via the Escape Maneuver”. No reply is needed, and each aircraft must comply by executing the Escape Maneuver when approaching Outer Pylon #7.



As each racer pulls up and off the course, they will announce, “Sport XX, off at 7”. Each racer will visually acquire the aircraft ahead, and begin a climb to the Cool Down (above 7000 feet MSL). The first aircraft off the course at Outer Pylon #7 must acquire the flight in the Chute and ensure separation before turning left into Cool Down. The flight in the Chute has the right of way in this scenario. The racers coming off the course may need to extend the flight path southbound before turning into Cool Down, to allow the flight in the Chute to enter the course. Once the flight in the Chute is clear, and the aircraft off the course have entered Cool Down, the Cool Down holding pattern should be adjusted back over the race course. Once in Cool Down, with the next flight entering the course, the entire flight should remain in Cool Down for landing until the entire next flight is completely on the course.

LOST SIGHT / “BLIND” PROCEDURES

Losing sight of Pace, Lead, or any racer/formation flight member for whom a pilot has separation responsibility, is a serious threat to the safety of the race or formation. The actions required in a Lost Sight/Blind situation depend upon the current phase of the race or, in the working area, the formation and maneuvering status of the formation.

BLIND IN THE DEPARTURE REJOIN DURING THE PRS/NCAR WAIVER PERIOD

Should a pilot go lose visual contact and go blind on the formation during the departure rejoin, they should immediately call “XX Blind”, and fly a predictable flight path. Lead will take command of the situation, and will provide directive comm to the Blind Wingman to assist in regaining visual contact, or will direct a turn to clear the formation. Wingmen already joined will follow Lead’s instructions. Wingmen behind the Blind Wingman will stagnate their rejoins and remain clear or the Blind Wingman as the Lead sorts out the formation.

BLIND IN ECHELON EN-ROUTE TO THE CHUTE

Should a pilot lose visual contact and go blind on the race formation when in echelon en-route to the Chute, a Breakout must be executed. Make a radio call, such as “XX Blind, Breaking Out”. The clear area, or “out”, will be up and away from the formation, allowing the formation to pull ahead. Pace/Lead will take command of the situation, and will provide directive comm to the blind racer to assist them in regaining visual contact. If enough distance remains to the Chute, the Lead will provide directive comm to the racer on rejoining the formation. If enough distance to the Chute is not available, the Pace/Lead will direct the racer to remain in trail and follow the formation down the Chute in trail.

BLIND WHILE IN THE CHUTE

Low and Blind in the Chute

Should a pilot go low enough to lose sight and go blind on the formation while in line abreast in the chute, they must hold the low position and reduce power to allow the formation to move forward of them. Make a radio call, such as “XX Blind”. Pace/Lead will take command of the situation, and will direct the racer to hold altitude, allow the formation to pass, then remain in trail and follow the formation down the Chute in trail, or will direct the racer to enter the Queue, if that is the safer action to be taken due to traffic in the Chute.

High and Blind in the Chute

Should a pilot go high, and lose visual contact and go blind on the formation while in line abreast in the Chute, a Breakout must be executed. Make a radio call, such as “XX Blind, Breaking Out”. The clear area, or “out”, will be up and away from the formation, allowing the formation to pull ahead in the Chute. Pace/Lead will take command of the situation, and will direct the racer to remain in trail and follow the formation down the Chute in trail, or will direct the racer to enter the Queue, if that is the safer action to be taken due to traffic in the Chute.

BLIND WHILE ON THE RACE COURSE

Should a pilot lose visual contact and go blind on an aircraft, or a group of aircraft, that they have contract separation responsibilities on, a Breakout must be executed, unless the aircraft involved are communicating their relative position and maintaining separation in a cooperative manner. In the absence of this communication, the Blind aircraft breakout is executed in the same manner as an escape maneuver. The clear area is up and away from the other racers, and racers should clear the area above their aircraft along the lift vector and pull to the clear area. This Breakout must be expeditious, but smooth and not violent, so that racers outside or behind the escaping aircraft are not impacted by the maneuver. Once the Breakout has been executed, the pilot should climb towards the Queue, and may re-enter the course as described in the Escape Maneuver section, or may enter cool down and remain clear of the race course. Lead/Pace may direct the pilot to enter and remain in the cool down, if that would be the safest course of action. Race Control instructions, if given, must also be complied with.

BLIND WHILE IN THE QUEUE OR COOL DOWN

While in the Queue during training or qualifying, or in Cool Down after a race, should a pilot lose visual contact and go blind on the racer they are following, they must remain in a predictable turn, and make radio calls to sort out position. Comm brevity should be used to ensure the Race Control frequency is not blocked unnecessarily. If the loss of visual contact happens during the exit of the Cool Down and entry into the pattern, and visual contact cannot be regained, the pilot may need to climb back into Cool Down and complete another circuit there, and pick up a new aircraft to take interval on and follow. Climbing back into Cool Down must be done cautiously, and to the outside of the Cool Down circuit. Throughout the recovery, good lookout doctrine and good pattern communication should be practiced to ensure separation and a smooth recovery.

REVIEW OF BLIND PROCEDURES DURING WORKING AREA TRAINING MANEUVERS

Note: The following is a review of the Lost Sight/Blind procedures while conducting training in the working area:

BLIND IN CLOSE FORMATION

Should a pilot lose visual contact and go blind on the formation when in close formation, a Breakout must be executed. Make a radio call, such as “XX Blind, Breaking Out”. Lead will call a Knock-it-Off and take command of the situation, and will assist the Blind Wingman in regaining visual contact, and rejoining the formation. The other Wingmen in the flight will follow the Knock-it-Off instructions from lead, and await further Lead guidance.

BLIND DURING A REJOIN

Should a pilot lose visual contact and go blind on the formation during a rejoin, they should immediately call “XX Blind, Knock-it-Off”, cease maneuvering, and fly a predictable flight path. Lead will take command of the situation, and will provide directive comm to the Blind Wingman to assist in regaining visual contact, or will direct a turn to clear the formation. Wingmen already joined will follow Lead’s instructions. Wingmen behind the Blind Wingman will stagnate their rejoins and remain clear or the Blind Wingman as the Lead sorts out the formation.

BLIND DURING EXTENDED TRAIL MANEUVERING

Should a pilot go lose visual contact and go blind on the formation during Extended Trail Maneuvering, they should immediately call “XX Blind, Knock-it-Off”, cease maneuvering, and fly a predictable flight path. Lead will take command of the situation, will cease maneuvering, and provide directive comm to the Blind Wingman to assist in regaining visual contact, or will direct a turn to clear other aircraft, if required. Wingmen will all cease maneuvering, will increase lookout doctrine, and will follow Lead direction as the they sort out the formation.

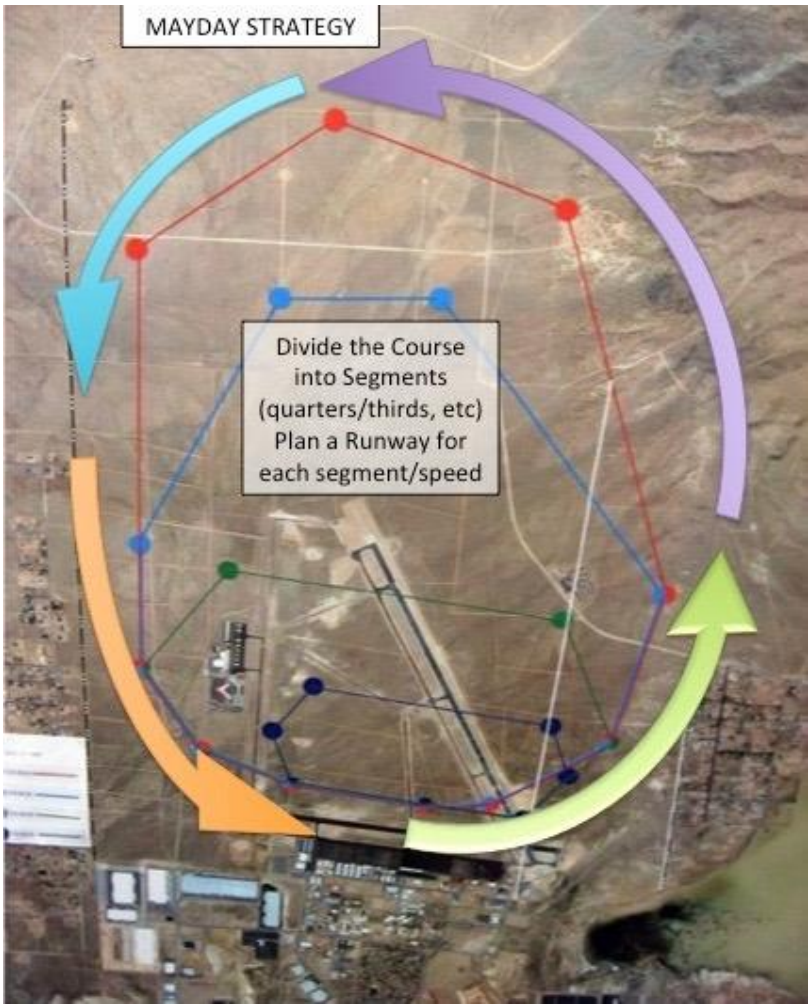
MAYDAY PROCEDURES

An aircraft emergency on the racecourse requires immediate action on the part of the racer. There is absolutely no time for a racer to safely diagnose major aircraft malfunctions while racing at low altitude among other aircraft. Once the pilot recognizes the emergency, the MAYDAY procedure must be executed, by visually clearing the area ahead and above, and smoothly pulling up and away from the racecourse. As the MAYDAY is executed, the pilot should, as soon as possible, make a radio call, “Sport XX, MAYDAY”.

If the emergency requires troubleshooting and diagnosing before landing (such as a flight control problem, or a post mid-air assessment where an immediate landing is not required and a controllability or system check is warranted), the pilot should climb into the Cool Down, and request assistance from Pace or Race Control/Aircraft SME (Subject Matter Expert), as needed. Lead/Pace will act as Chase, if requested, per the standard Sport Class Chase Aircraft procedures.

If the emergency requires an immediate landing (such as an engine failure or smoke/fire), during the climb the pilot should make a turn towards the center of the course, choose their landing runway, and begin maneuvering for the landing. If possible, the pilot may make a radio call stating which runway they intend to land on, to alert Race Control and Crash/Fire/Rescue. Fly the aircraft first, handle the emergency, and make radio calls, in that order.

A MAYDAY that requires an immediate landing requires a well-planned strategy to be successful. Pilots should have a plan for which runway they will land on for any immediate-landing emergency, based on where such an emergency happens. Each pilot must know their aircraft speed range, zoom-climb capabilities, and glide capabilities, and develop a strategy for a failure anywhere on the race course. One such strategy is to divide the course up into segments (quarters or thirds, for example, and have a plan for a failure in any segment. The diagram below depicts one such division into segments. Below that several scenarios of failures in these segments are discussed. These are examples, and each pilot must develop their own strategy, based on their aircraft performance characteristics.



MAYDAY SCENARIOS REQUIREING IMMEDIATE LANDING

The following diagrams depict a strategy for executing an immediate landing following a major emergency on the racecourse. In every case, the pilot must execute a MAYDAY procedure by:

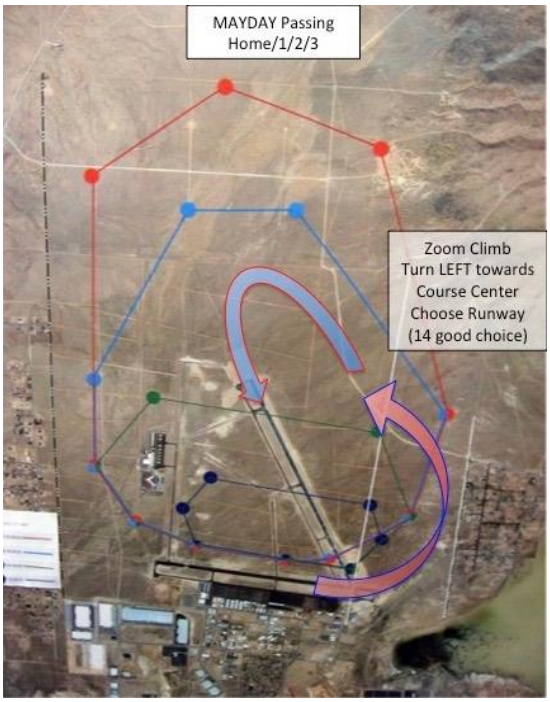
- Pulling up and off the racecourse, while calling (if able) “XX Mayday”
- Climbing and turning towards the center apex of the racecourse
- Choosing a runway to land on
- Handling the emergency procedures as required
- Making radio calls as able and appropriate

In any engine failure scenario, the pilot should plan the flight path and turns to initially aim halfway down the landing runway, to account for high descent rates. Gear and flap extension should be executed when landing is assured. Aircraft systems characteristics and limitations must also be considered by the pilot in planning for an immediate landing scenario.

The following 4 sets of diagrams depict MAYDAYS executed in 4 quadrants of the racecourse. These divisions are used as an example, and the runway choices are examples that have historically resulted in successful outcomes during actual MAYDAY events. Each pilot must develop their own strategy, based on their aircraft performance characteristics.

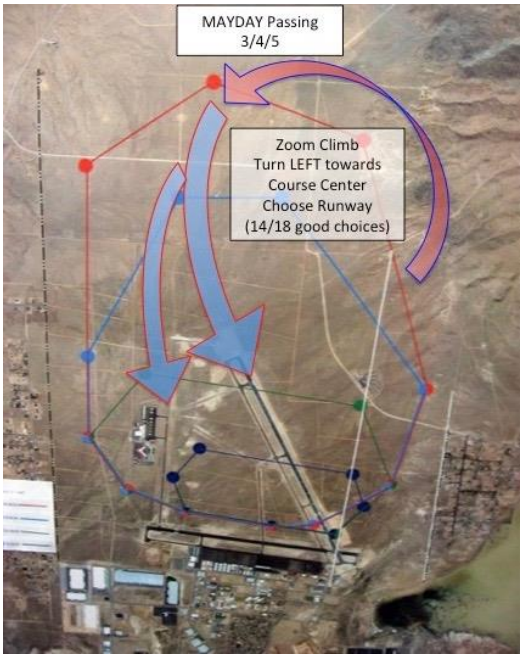
MAYDAY passing Home Pylon through Outer Pylon #3 (Home/1/2/3)

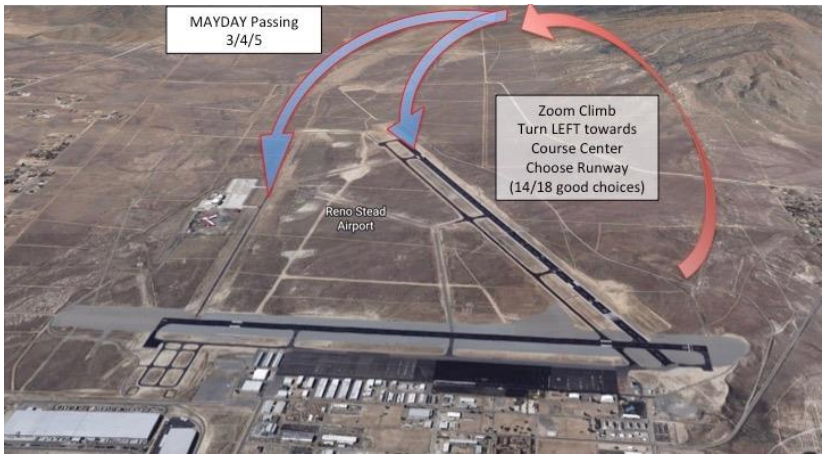
- Zoom Climb
- Turn left towards the center apex of the racecourse
- Turn left downwind for Runway 14
- Aim halfway down the runway in an engine failure scenario
- Make radio calls as able and appropriate



MAYDAY passing Outer Pylon #3 through Outer Pylon #5 (3/4/5)

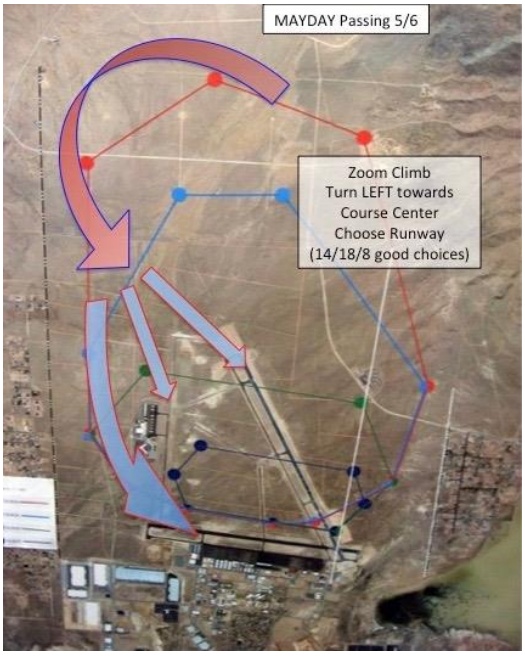
- Zoom Climb
- Turn towards the center apex of the racecourse
- Turn Left (base or final) for Runway 14 or Runway 18 (speed and zoom altitude dictate selection)
- Aim halfway down the runway in an engine failure scenario
- Make radio calls as able and appropriate





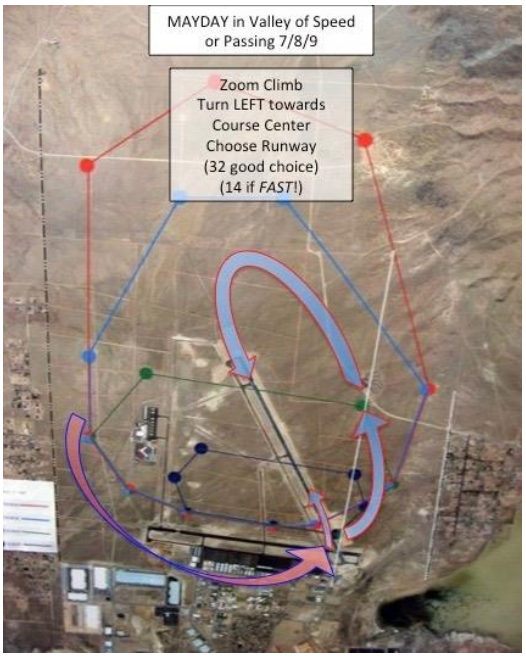
MAYDAY passing Outer Pylon #5 through Outer Pylon #6 (5/6)

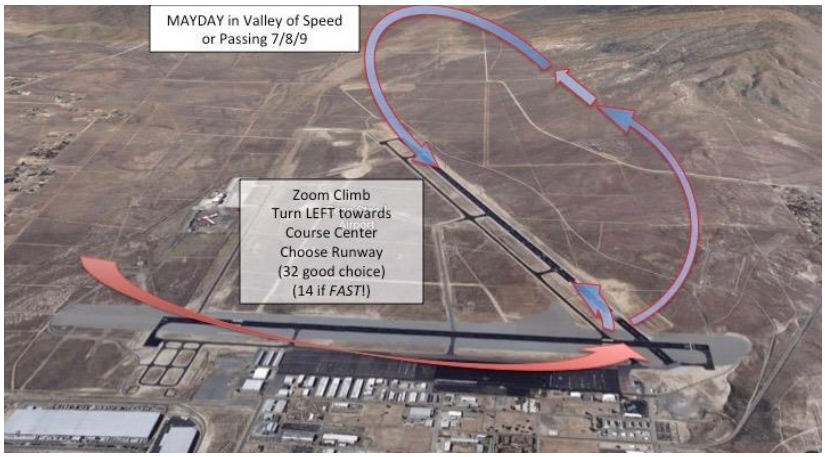
- Zoom Climb
- Turn towards the center apex of the racecourse
- Turn final for Runway 14 or Runway 18, or left base for Runway 8 (speed and zoom altitude dictate selection)
- Aim halfway down the runway in an engine failure scenario
- Make radio calls as able and appropriate



MAYDAY in the Valley of Speed, or passing Outer Pylon #7 through Outer Pylon #9 (7/8/9)

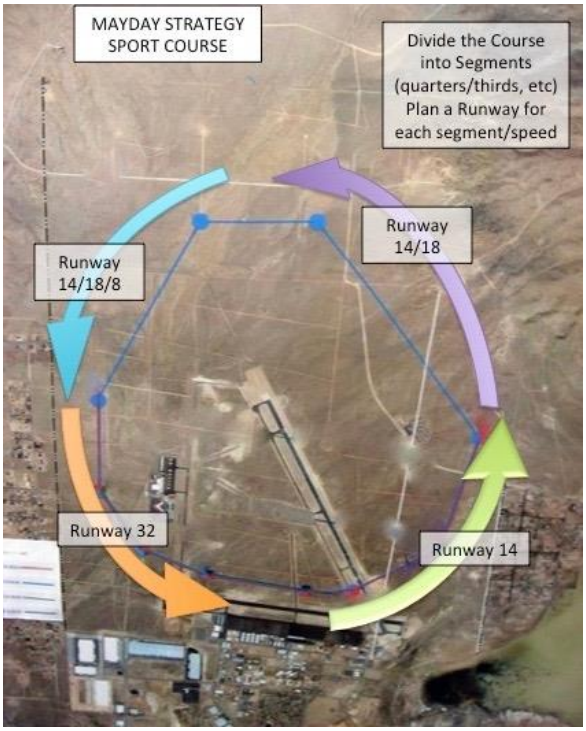
- Zoom Climb
- Turn towards the center apex of the racecourse
- Turn left base for Runway 32, or left crosswind/downwind for Runway 14 (speed and altitude dictate selection)
- Aim halfway down the runway in an engine failure scenario
- Making radio calls as able and appropriate

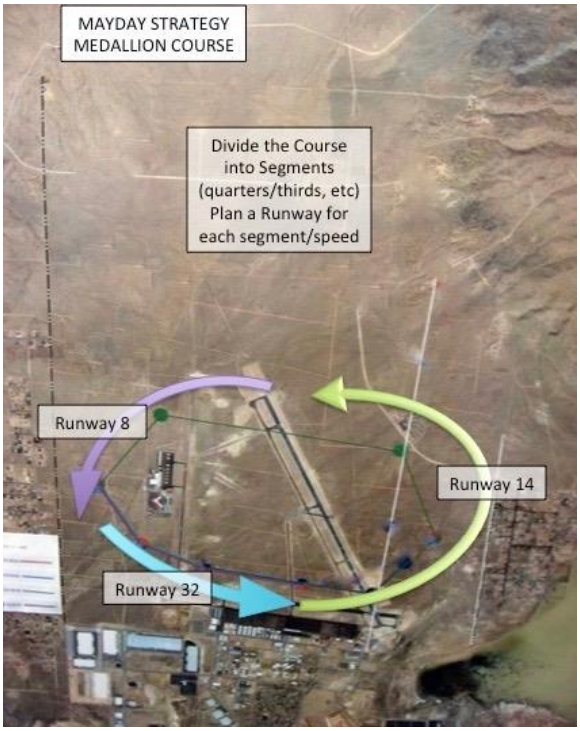




MAYDAY STRATEGY FOR THE SPORT AND MEDALLION COURSES

MAYDAY strategic planning for the Sport Course is very similar to that of the Outer Course. Slight changes due to geometry of the course or speed of the aircraft should be considered. MAYDAY strategic planning for the Medallion Course will differ slightly due to the course layout and the slower speed and zoom climb capability of the aircraft. Below are two sample MAYDAY strategies for the Sport and Medallion Courses. Each pilot must develop their own strategy, based on their aircraft performance characteristics.





MIDAIR COLLISIONS

A midair collision, or aircraft to aircraft contact of any degree, requires immediate and measured action on the part of the pilots involved. Whether the contact happens in the Chute or on the racecourse, the pilots must declare a MAYDAY and carefully separate from the formation (if in the Chute), or carefully climb above the racecourse. If controllability is in question, the pilot must use all available controls (including power and trim as necessary) to maintain aircraft control, and maneuver for a landing. If making it to a runway is in question, an off-runway, or off-airport landing under control is far better than a loss of control trying to stretch the glide to a runway. If controllability is not an immediate factor, and the pilot desires a visual check or other mutual support, climb to Cool Down, and request chase aircraft support. Lead/Pace will assist as able, as systems or controllability checks are conducted. The decision to extend, and the timing of extension of, flaps and gear must be weighed against aircraft damage assessment and controllability concerns, as well as power available and aircraft positioning for landing.

TERMINATION OF A MAYDAY/EMERGENCY EVENT

Upon successful completion of a MAYDAY/Emergency event, the pilot must choose whether to roll out straight ahead and stop the aircraft on the runway (such as with landing gear emergencies), or exit the runway. The pilot must also choose whether to immediately exit the aircraft (smoke/fire/aircraft damaged during landing), or whether to remain in the aircraft. The nature of the emergency will dictate the proper courses of action. Consideration of clearing the runway for follow-on use or subsequent emergencies (other aircraft) may be applied, but only after all factors for the current emergency are considered. If the aircraft is exited, the pilot must be cautious of Crash/Fire/Rescue vehicles that approach the aircraft to assist. Whether exiting the aircraft or remaining with the aircraft, when the pilot feels the emergency is terminated safely, a thumbs-up should be given to Crash/Fire/Rescue personnel.

PILOT AND AIRCRAFT RETRIEVAL AFTER A MAYDAY/EMERGENCY EVENT

The return of the pilot and the aircraft to the Sport Class staging and parking area will be coordinated by NCAR Operations and Crash/Fire/Rescue. Sport Class Ramp Crew will be the first class interface in the recovery effort, and race crews may be escorted to the site for retrieval. Sport Class personnel will not be allowed to independently proceed to or approach the aircraft, and all recovery/retrieval efforts must be coordinated with NCAR Operations. Medical attention, if necessary, will also be coordinated by NCAR officials.

PILOT/CREW CARE AND AIRCRAFT DISPOSITION AFTER A MAYDAY/EMERGENCY EVENT

Sport Class Air Racing will support the pilot and crew following a MAYDAY/Emergency event. Each situation is unique, and Class Officers will take all appropriate measures to support the parties involved. The class Ramp Crew will support aircraft handling, and the class Tech team will support post-emergency technical investigation and documentation, if required.

NCAR QUALIFYING PROCEDURES

This section will cover qualifying procedures during NCAR. Pilot qualification/credentialing is completed during Pylon Racing School (PRS). All pilots who complete PRS and are issued a Sport Class Racing License are eligible to enter the National Championship Air Races (NCAR). Aircraft qualification is conducted in the days prior to racing at NCAR. It is conducted utilizing a very specific procedure, and determines the Sport Class heat structure and starting order for subsequent racing.

Qualification is governed by the NCAR Official Rules of Competition and the Sport Class Air Racing Class Rules. All Sport Class formation and racing procedures, and all course limitations, are in effect during qualification periods. During qualification periods, Sport Class is scheduled for class course times, and the class divides those course times into smaller periods for flights of 4. The class flight schedule is published each evening for the next day's morning qualification period, and the afternoon period is adjusted as race aircraft qualify and are slotted into the heat structure. The final heat structure is not determined until all Sport Class aircraft have qualified, or the qualification periods have been completed.

All qualifying is flown on the Outer (Sport Gold) Course. This is to ensure a common course for all aircraft and an apples to apples comparison of qualifying speeds for ranking the Sport Class qualifiers.

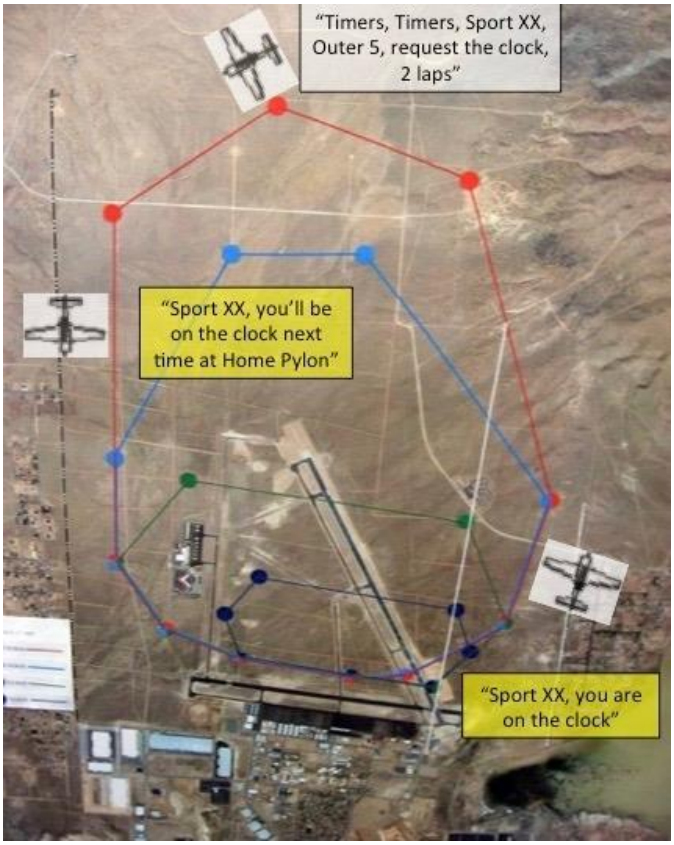
During qualification, most flights enter the course via a direct entry. This does not preclude a flight from launching early and entering via the Chute or via the Queue. However, the launch and course entry must be planned and executed so as not to be late, or to interfere with other flights' qualification periods.

Once on the course, pilots will fly the course, accelerate to race/qualification speed, and prepare to request their qualification laps. It is recommended that each flight brief a takeoff order, and a positioning strategy on the course, that allows the aircraft to spread out around the course, so as not to interfere with each other while on their qualifying laps. Up to four aircraft are allowed on the course while any aircraft is on the clock during qualifying, and up to four aircraft are allowed to be on the clock at the same time.

QUALIFYING LAP PROCEDURES

Any aircraft that wishes to request timing for qualification laps (call for the clock), must complete at least one full level lap at course altitude. Diving onto the course from the Chute or the Queue and immediately calling for the clock is not allowed, and will result in disqualification. The qualification time and speed will not be recorded in such a case.

Timing is done from Home Pylon to Home Pylon, and a speed is assigned based on the elapsed time. The NCAR Timers must be given notice that a racer desires to fly their qualifying laps when they next pass Home Pylon. After completing at least one level lap, when ready to qualify, at a point about halfway around the course (Outer Pylon#5), a racer should call for the clock on Race Control Frequency. The radio call is, "Timers, Timers, Sport XX, Outer 5, request the clock, 2 laps". The NCAR Timers are monitoring the frequency, and the call alerts them to the request for the clock. The Timers should acknowledge the request for the clock, with a call such as "Sport XX, you will be on the clock the next time past Home Pylon". The Timers will attempt to notify a racer that they are on the clock after passing Home Pylon, with a call such as "Sport XX, you are on the clock". However, the Timer's calls may be blocked by other transmissions, or may be missed, so a racer that calls for the clock should fly as if they are being timed when they pass Home Pylon. The diagram to the right depicts the approximate location of the radio calls in a typical qualifying attempt.



A qualifying attempt may be flown as one lap or two laps. If one lap is flown, that time/speed become the racer's qualifying speed. If two laps are flown, the best time/speed of the two laps becomes the racer's qualifying speed. There is no advantage to flying only one lap, as a racer may not turn down a one-lap time and request another lap. An attempt is an attempt, whether flown as one lap or two.

If a racer begins their first lap on the clock, and decides to abort the attempt, they should pull smoothly up and off the course prior to passing Home Pylon on the first lap. A call should be made such as "Sport XX is aborting the qualifying attempt". If an emergency caused the aborted attempt, a MAYDAY should be executed. If the aborted attempt is due to traffic or poor course line or another non-emergency reason, the racer may re-enter the course, fly another level lap (or more), and call for the clock again. Course time remaining in the period becomes the constraint in making a re-attempt to qualify.

At the conclusion of the one or two lap qualifying attempt, racers should fly past Home Pylon at course altitude, and then pull up and exit the course using normal course exit procedures. Racers should be careful not to pull up prior to Home Pylon, as video is used by Timers to get exact times when passing Home Pylon. If a racer pulls up and off the course early, and are out of view of the cameras, a time and speed may not be captured, and the qualification attempt is not successful.

After the qualification run is complete, the Pylon Judges report whether the run was clean, or there were pylon cuts. If there were any pylon cuts, the run is disqualified, and the qualification attempt is not successful.

During Qualifying, Race Flags of various colors are waved by personnel at the base of Home Pylon, to signify various Qualifying Lap situations. The flags are waved as each qualifying aircraft passes Home Pylon. The meaning of each flag are as follows:

- Green Flag
  - Qualifying Lap 1 has started for the aircraft passing Home Pylon
- White Flag
  - One Qualifying Lap to go for for the aircraft passing Home Pylon
- Checkered Flag
  - Last Qualifying Lap complete for the aircraft passing Home Pylon

Yellow, Red and Black Flags will be waved during Qualifying, if required due to Emergency or Abnormal situations. The meaning of these flags, and the radio calls that accompany them are identical to those used during PRS and NCAR training and racing flights:

- Yellow Flag
  - Emergency in progress. All non-emergency aircraft remain on the race course
  - Radio call: "Emergency in Progress" (this Race Control call follows the emergency aircraft's "MAYDAY" call)
- Red Flag
  - Major Emergency in progress. All aircraft exit the race course.
  - Radio call: "Red Flag, Red Flag, all aircraft exit the race course"
- Black Flag
  - A major safety violation has been committed by a specific racer, or a racer has demonstrated erratic, unsafe flying. If a Black Flag is given to a specific racer, that racer must exit the race course. All other racers remain on the race course
  - Radio call: "Black Flag, Black Flag, Sport XX"

The NCAR Official Rules allows up to 5 qualification attempts per race aircraft. Sport Class Air Racing Class Rules limit qualification attempts to two, due to the number of racers in the class, and the limited course time available to qualify. A second attempt by a Sport Class racer is only allowed after all other Sport Class racers have achieved one successful qualifying attempt.

SPORT CLASS HEAT STRUCTURE

When NCAR Qualifying is complete, all entered Sport Class race aircraft that successfully qualify will have earned a qualifying speed, based on their fastest lap time. Sport Class aircraft are then placed in 4 heats, based on speed order. These heat groupings are named Gold / A, Silver / B, Bronze / C, and Medallion / D. During preliminary heat racing, the racing heats are shown on the NCAR schedule and results pages as:

First Race Heat:	Sport Heat 1A, 1B, 1C and 1D
Second Race Heat:	Sport Heat 2A, 2B, 2C and 2D
Third Race Heat:	Sport Heat 3A, 3B, 3C and 3D
Final Race:	Gold Final, Silver Final, Bonze Final and Medallion Final

SPORT CLASS RACE COURSE SELECTION FOR VARIOUS HEATS

The race course to be flown for each Sport Class Heat are designated as follows:

- The Gold/A Heat will race daily on the Outer Race Course
- The Silver/B Heat will race daily on the Sport Course
- The Bronze/C Heat will race daily on the Sport Medallion Course, provided all aircraft in that heat qualified at 275 mph or slower
    - Should any Bronze racer qualify faster than 275 mph, the Bronze/C Heat will race on the Sport course.
- The Medallion/D Heat will race daily on the Sport Medallion Course, provided all aircraft in that heat qualified at 275 mph or slower
    - Should any Medallion racer qualify faster than 275 mph, the Medallion/D Heat will race on the Sport course

At the completion of qualifying, when the Bronze and Medallion courses have been selected, based on qualifying speed, those Heats will remain on the specified course for the duration of the NCAR, and will not cycle or change between the Sport and Sport Medallion Courses on subsequent days.

SPORT CLASS RACE PROGRESSION

As racing progresses from heats 1 through 3 and into the finals, the results of each heat are posted on the NCAR website, and the next day's heat/race pairings (start order) are generated by the NCAR Official Scorer, and posted. The finish order of each heat, after penalties (pylon cuts), and disqualifications are considered, determines the next day's start order. That start order is as follows:

- Fastest to Slowest aircraft in previous heat finish with penalties applied, then
- Any aircraft that started, but Did Not Finish (DNF), in order of most laps completed, then
- Any aircraft that Did Not Start (DNS), in order of latest to earliest withdrawal, then
- Any aircraft that was Disqualified

During preliminary heat racing, if two separate heats are racing on the same race course, the speed of the racers in each heat are compared. If the speed of the fastest racers in the lower heat are faster than the slowest racers in the higher heat, displacing between heats will occur. For example, if the Silver (B) and Bronze (C) heats are both racing on the Sport Course, and the #1 Bronze finisher in Heat 1C is faster than the #8 finisher in Heat 1B, the two aircraft will be switched for the Heat 2 pairings. In other words, the faster Bronze racer will have displaced the slower Silver racer. Such displacement may include more than one race aircraft in each heat in such a situation, based on relative speed. Displacement is not allowed when two heats are racing on different courses. For example, displacement is not allowed between heats that are racing on the Outer Course and the Sport Course, or between heats that are racing on the Sport Course and the Medallion Course. Displacement is only allowed based on relative speed of racers, and is never imposed on any DNF, DNS, and DQ aircraft. DNF, DNS, and DQ aircraft are placed at the bottom of the heat in which they were DNF, DNS or DQ.

At the end of preliminary heat racing, the pairings for the Finals in each heat are generated, and that becomes the start order for the Gold, Silver, Bronze and Medallion Finals. The finish order, with penalties imposed, and any aircraft that is DNF, DNS or DQ becomes the NCAR Sport Class Final Results.

PRIZE MONEY AWARDS

The Sport Class Air Racing Purse is set and paid by the Reno Air Race Association. The division and payout of the Purse is determined by a system developed by Sport Class Air Racing. Each racer that qualifies receives a payout that includes an amount for qualifying, and an amount based on their finish position in each racing heat, and their finish position in the finals. Payout for each heat increases as the race heats progress through Race Week. Incremental heat payout is not awarded to DNF, DNS or DQ aircraft in each heat. The final payout for each racer is the sum of all qualifying, heat, and finals payouts earned. Checks for all prize money earned are presented at the NCAR Awards Banquet at the conclusion of racing.