Biplane Air Racing Class
Pylon Racing Seminar

Roswell, New Mexico

Photo: Kenn Smith

May 2025

Agenda

- Introductions
- BARC Code of Conduct
- PRS Training Objectives
- Requirements
- Racing License
- Tech Inspections
- Intro to Pylon Racing
- Flight Evaluation Profile
- Racing Procedures
- Threats & Emergencies

Introductions

2025 PRS Instructors

Scott Thomson

- Class President, CFI
- Occupation: Pilot
- Co-Owner, Pilot of “Second Hand”

Kevin Harper

- Vice President, DPE, A&P
- Occupation: Pilot
- Owner, Pilot of “Yellow Bomber”

Introductions

2025 PRS Instructors

Andrew McVicker

- Treasurer, CFI
- Occupation: Pilot
- Pilot of “Red Squirrel”, Owner of “Yellow Jersey”

Jeff Rose

- Secretary, Comm/Multi
- Occupation: Biplane test pilot, side-hustle dentist
- 2016 Reno Biplane Gold Champion

BARC Code of Conduct

By signing the BARC Good Conduct Agreement you've committed to upholding the following priorities:

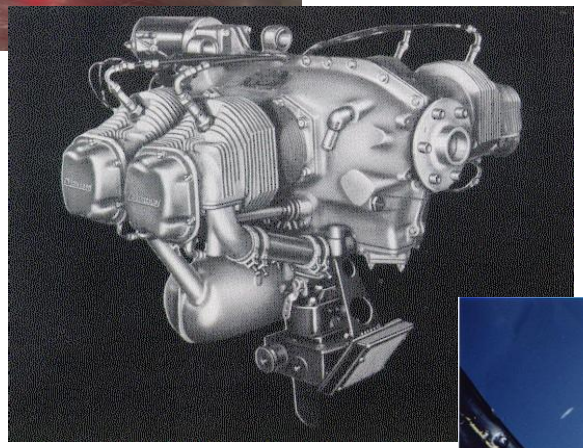
- Safety
- Good Sportsmanship
- Rules Compliance
- Dispute Resolution
- Professional Behavior
- Class Delegate

PRS Training Objectives

- Fundamentals of Low Altitude Flying
- The Proper Course
- Non-cooperative Formation
- Pylon Air Racing Immersion
- Race Course Familiarization
- Lessons Learned
- Safety & the Racing Mindset

Requirements

➢ **Aircraft**



➢ **Engine**

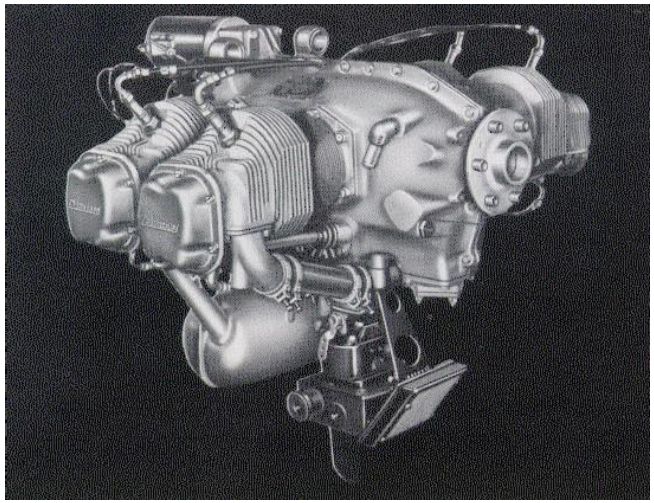
➢ **Pilot**

Aircraft Requirements

- **Fixed MLG & tailwheel**
- **Fixed Pitch prop….C/S ok for 2 seat**
- **Upper and lower wings - approx 50% each**
- **Lower wing - no less than 45%**
- **Upper wing cabane or pylon mounted**
- **Wings 75 sq ft combined horizontal area minimum**
- **Functional two-way VHF radio**

Engine Requirements

- **Single Seat - max 364 ci**
- **Two Seat - max 560 ci**
- **Air-cooled**
- **Direct Drive**
- **Aircraft Piston Engine**
- **Modified Cams allowed**
- **Compression ratio unlimited**
- **Porting & Polishing allowed**
- **Any ignition, must not interfere with radio communications**



Pilot Requirements

- Private Pilot license, Commercial or better preferred
- 2nd Class Medical (minimum), current within 6 months – race only.
- 500 hrs PIC on fixed wing aircraft (May be reduced for time in type)
- 25 hours in type
- 5 hours in last 6 months
- 5 T/O & landings in last 90 days

Rookie applications are screened for this

Race License

- Eligibility:
  - BARC Membership
  - Meet minimum experience requirements
- Awarded upon successful completion of PRS
- Valid for 24 months plus extension to end of calendar year

Race License Duration/Renewals

- Good for 24 Months Plus Extension to End of Calendar Year
  - ➢ Ex: License Issued 21 May 25 Good Until 31 Dec 28
- Revocable Anytime Ops or Pilot Committee Observe Unsafe Flying
  - ➢ Repeat Exam at a minimum before Further Racing
  - ➢ Letter of Reprimand
  - ➢ Probation Period
  - ➢ Lifetime Suspension Possible

We Police Ourselves Strictly. The FAA is watching!

Race License Practice & Preparation

- Fly Your Race Plane Often
- Practice Just Like You Were Racing
  - ➢ Full Race Clothing/Safety Gear
  - ➢ Allowable Tolerance for Takeoff Roll
- Practice Simulated Engine Out Landings
  - ➢ Add Power if Needed
- Be proficient in the entire performance envelope of your aircraft
- Know Your and Your Aircraft's Limits by Heart

Tech Inspections

- BARC Tech Rules
- BARC Operations Manual
- BARC Tech Inspection Procedures

Read and Understand These Documents!

*https://www.biplaneairracing.com//

Tech Inspections

- Biplane Tech Inspection Procedures
  - ➢ “**This document is not controlled and may be modified at any time by the Technical Advisor**.”
  - ➢ “**The items to be checked at any particular race meet will be determined by the Tech Director or his Deputy**”

Pre-Race Tech Inspections

- Documents
- Airframe
- Engine
- Fuel
- Avionics (Including 2 way radio function check)

Required Documents

- Airworthiness
- Registration
- Operating Limitations
- Weight & Balance
- Insurance
- License
- Medical
- Aircraft Log Books
- Evidence of Pilot Currency
- Race License (N/A for 2025)
- Identification

RARA Registration verifies these items..we might too

Airframe Check Items

- Weight (500 lb min)
- CG (8- 25% MAC)
- Wing Area (66 Sq ft)
- Landing Gear
- Brakes
- Visibility
- Cockpit (Freedom, Turnover Protection)
- Canopy (Security/Release)
- Construction (Quality, Materials)
- Propeller (Condition)

Airframe Check Items

- Eng mount (no cracks)
- Fuel System/Vent
- Flight Controls (connected/correct)
- Ballast?
- Harness Condition
- Control Sys “Slop” (Ails, Rud, Elev)
- Proper Safety (prop, controls, etc.)
- Firewall Security (seals)
- Race Number (Legible, 16 inches x 2 inches stroke)
- Engine Retention Cable

Engine Check Items

- Safety Cable (¼”)
- Mags/Elec Ignition
- Exhaust System
- Engine Controls (Throttle/Mixture)
- Fuel System (Cutoff/Pumps)
- Prop Safety (prop, controls, etc.)
- Use/Application of Safety Wire

Avionics

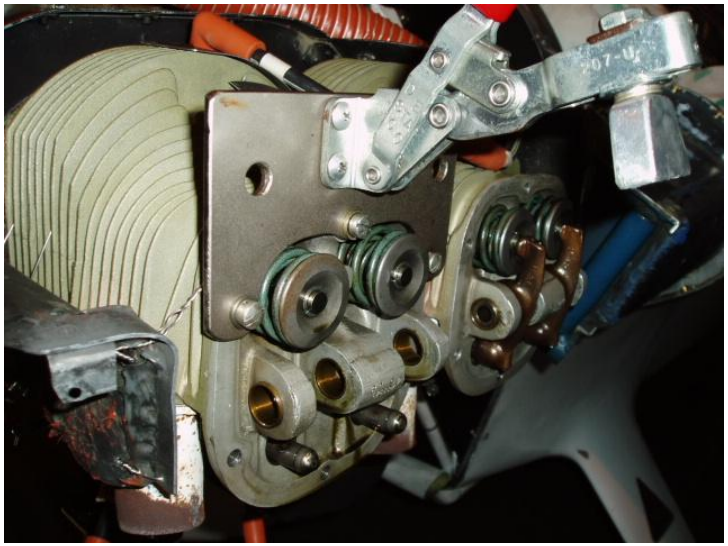
- Radio must Operate on the race course at speed
- Work Antenna & Shielding Before the Race
- Be Alert for Stuck Mic Switches
- Don’t Create A Hazard with Your Radio Installation
  - ➢Batteries
  - ➢Freedom of Movement
  - ➢Projectile During Crash

Flight – New or Modified Aircraft

- 1.1 V_h Dive Demonstration
- 4g pull-up Demo
  - Owner to Provide Recording G-Meter
  - Meter must be Mounted Securely

Post-Race Tech Inspections

- Winners
  - ➢Top 3 Finishers Gold Guaranteed
  - ➢Top Finisher and Possibly 2 & 3 from Silver & Bronze



Tech Inspection Summary

- Verify Compliance with Tech Rules
  - ➢Details available on-line
- Spot Unsafe Conditions
- Goes Better if You Have Checked Everything Before Arriving at a Race Site

Intro To Pylon Air Racing

Fundamentals of Low Altitude Flight

Ref from USAF 11-202v3

NAVAL AIR TRAINING COMMAND
NAS CORPUS CHRISTI, TEXAS CNATRA P-912 (Rev. 04-18)

FLIGHT TRAINING INSTRUCTION

LOW ALTITUDE TRAINING (LAT)

2018

- Time to Impact is less than one second in an overbank from 50’

Overbank and Time-to-Impact from 50'			
Bank Angle	**Gs for Level Turn**	**Overbank/Expected G**	**Time to Impact**
60	2 G	70 deg/ 2 G	0.99 seconds
70	3 G	80 deg/ 3 G	0.81 seconds
75	4 G	85 deg/ 4 G	0.69 seconds
80	6 G	90 deg/ 6 G	0.56 seconds

The Racing Line - Proper Course

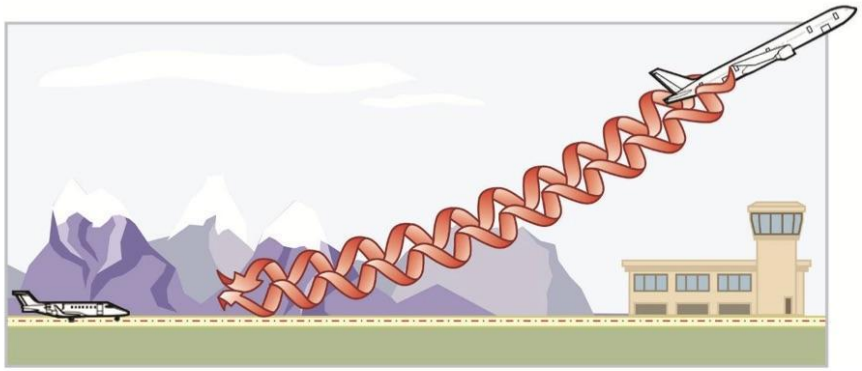
- **“The course an aircraft would *optimally* fly in the absence of any aircraft that follow”**

Wake turbulence awareness

U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Aircraft Wake Turbulence | **Date:** 2/10/14 | **AC No:** 90-23G
Initiated by: AFS-400 | **Change:**



1. PURPOSE. This advisory circular (AC) presents basic information on wake vortex behavior, alerts pilots to the hazards of aircraft wake turbulence, and recommends operational procedures to avoid wake turbulence encounters.

2. CANCELLATION. AC 90-23F, Aircraft Wake Turbulence, dated February 20, 2002, is canceled.

3. INTRODUCTION. Every aircraft in flight generates wake vortices. These disturbances are caused by a pair of counter-rotating vortices trailing from the wing tips in cruise and nominally from the outboard edge of the outboard flap on approach and landing. The vortices from an aircraft can pose a hazard to encountering aircraft. For instance, the wake of larger aircraft can impose rolling moments that exceed the roll control authority of smaller encountering aircraft. Further, turbulence generated by vortices can damage aircraft components and equipment as well as cause personal injuries. Pilots must learn to envision the location and movements of the vortices generated by other aircraft and to adjust their flightpath accordingly.

4. VORTEX GENERATION. Lift is generated by the creation of a pressure differential over the wing surfaces. The lowest pressure occurs over the upper wing surface and the highest pressure under the wing. This pressure differential triggers the rollup of the airflow aft of the wing resulting in swirling air masses trailing downstream of the wing. After the rollup is complete, the wake consists of two counter-rotating cylindrical vortices (see Figure 1, The

“Pylon racing isn’t formation flying…but, it’s formation flying”

Formation Flying Mechanics

- Biplane air racing is non-cooperative formation
- Contract change occurs when a pass has been executed
- “Racing room” completes a pass (4 lengths)

Formation Flying Mentality

- You are part of an 8-Ship “Formation”
  - ➢ Not a Rogue/Solo Pilot
- You are both Lead and Wingman
- Discipline in Your Flying is Required
- There’s A Contract Between Wing and Lead
  - ➢ Always Honor the Contract!

Formation Flying Mentality

Formation Flying References

- Formation and Safety Team (FAST) National Formation Guideline version 1.2
- Navy T-34C Primary Formation Training Manual (CNATRA P-357 (Rev. 09-06))
- USAF Manual (AFMAN) 11-248, T-6 Primary Flying, 10 Oct 2008
- Canadian Bushhawks Liaison Squadron Formation Flight Syllabus, 1994.
- T-34 Association Formation Flight Manual, 1989.
- Team RV Formation Training Guide and RV Supplement to the T-34 manual. (2002).
- “Flying in Formation, The Standard for Group Flight”, by Frank W. Hampson, 1988
- Formation Flight Manual, by Jeff Crutchfield, 1995
- Pitts Special Formation Flight, 11 Sep 2010

Flying Training and Evaluation Profile

Training Maneuvers

- Two Course Laps as Wingman
  - ➢Maintain position within 3 ship lengths/widths
  - ➢Smooth inputs, no erratic flying

Training Maneuvers

- Two Course Laps as Lead
  - ➢Maintain predictable, stable platform
  - ➢Smooth inputs, no erratic flying

Training Maneuvers

- Safe pass (4 lengths minimum)
  - ➢Minimal diving, **smooth is fast**
  - ➢Radio calls “7X Passing 23”

Maneuvers/ Evaluation

- Race Takeoff
  - Full Power, Unassisted Launch from Standstill

    ✓ Track Straight +/- 10 feet

    ✓ Positive Control During Transition to course or climb

Maneuvers

- **Three Course Laps** Solo
  - ➢"Proper Course"
  - ➢Predictable, stable platform
  - ➢50-250 AGL is course Limit
    - ✓No significant Change in Altitude

Maneuvers

- Formation Flying & Passing Techniques on Race Course
  - ➢Line selection
  - ➢Wake turbulence awareness
  - ➢Safe execution

Maneuvers

- **Left Hand Roll**
  - ➢1,500 Ft. AGL or Greater
    - ✓Less Than 50 ft. Altitude Loss
- **Right Hand Roll**
  - ➢1,500 Ft. AGL or Greater
    - ✓Less Than 50 Ft. Altitude Loss

Maneuvers

- Re-Enter Course between 3-4
- Normal race finish to normal landing

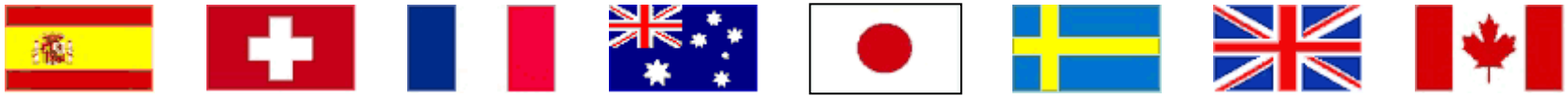
➢Pull Off Course at Home Pylon (Race Finish)

✓ Radio Calls (“RACE 23 OFF THE COURSE”)

✓ Positive Control at All Times

Non-US Pilots

- Must Demonstrate All Race License Maneuvers to Pilot Committee Chair or Designee before Racing Even if Current in Home Country
- Must Be Able to Communicate with Biplane Starters, tower and RARA in English
  - ➢ Complete Comprehension of Rules & Instructions Essential
- FAA Recognizes Medicals & Licenses from Other Countries
- FAA Can Issue a US Pilot License (based on equivalent Foreign Documents) with Relatively Little Hassle
- FAA Accepts Airworthiness Certificates from Foreign Countries – No Additional FAA Inspection Required for Aircraft



Race License Flight Card

1. Complete All Preflight and Pre-Takeoff Checks

1. Race Takeoff

a. Set Takeoff Power/Hold with Brakes

b. +/- 10 ft lateral variation entire roll

1. GREATER THAN 1500'

2. L/H Roll

a. No more than 50 ft. loss in altitude

6. R/H Roll

a. No more than 50 ft. loss in altitude

7. Enter race course on back course

8. 3 Laps or more at race speed

a. Constant altitude in turns

6. Normal landing

a. Runway Centerline

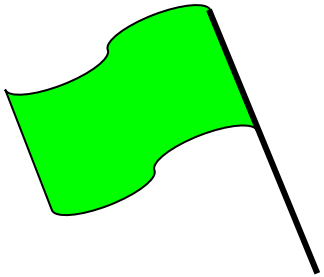
b. Landing Zone -> OFF by Taxiway H

Racing Procedures

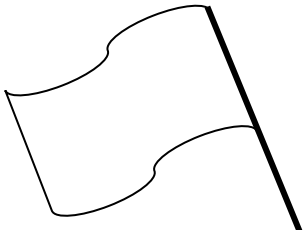
- Flags
- Runway/Launch
- On The Course
- Recovery
- Post-Race
- Speed, Points, & Pairings
- Video Replays

Flags

- Before Race = Less than 5 Minutes to Launch
- During Race = All Aircraft Pull Off Course and Land



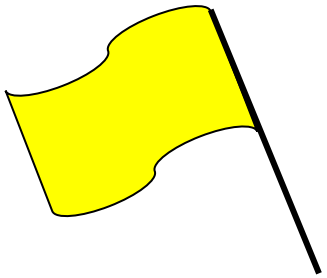
- Before Race = Less than 10 Seconds to Launch
- During Race = Race Has Started (First Lap)



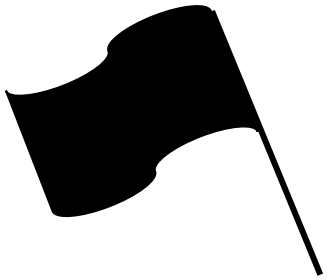
- During Race = Last Lap Has Started

- Checkered Flag During Race = Race Over
- Expect Ops Radio Call in Addition to Flag

Flags



- All Aircraft Fly With Caution



- You're Busted!
- Vacate the Course Immediately

Avoid a Membership in the Black Flag Club

Runway/Launch

- Positioning
- Takeoff

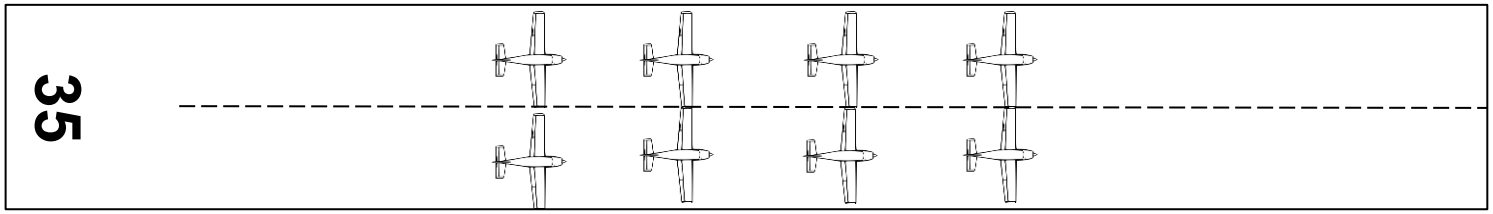
ONE type of Start:

- Racehorse, Row Start

- Sequential
- 4 second handicap per row
- WE ARE THE FLAGGERS

Racehorse Start

- 2 - 2 - 2 - 2 Spacing For 8 Plane Races



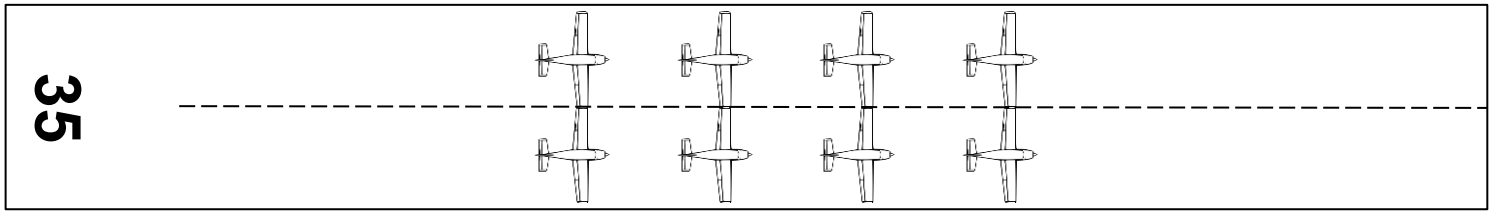
- Aircraft are spaced 400 feet apart
- Position Choice Given in Order of Speed
  - Consider Wind Direction
  - Know/Consider the Competition's Performance
  - Use Your Checklist

Simultaneous Start
Runway/Launch Countdown

- Red flags will come up at T-5 minutes. Hand signals and radio calls will be made for subsequent minutes.
- ACKNOWLEDGE WITH RACE #
- Red Flag will be joined by green flags at T-10 seconds. Drop of the green flag signal the start of the race **for your row**
- The race begins for **you** when the green flag drops for your row. Your starting time will be adjusted by 4 seconds
- Timing begins from the time the first aircraft crosses the home pylon after the start lap

Start

- 2 - 2 - 2 - 2 Spacing For 8 Plane Races



- Position determined by speed
  - Consider Wind Direction
  - Know/Consider the Competition's Performance
  - Use Your Checklist
- Normal interval time will be 4 seconds, but may be between 3-10 seconds, predetermined by Ops Director/Starter

Show Day Start
Runway/Launch Countdown

- The red flag will come up at T-5 minutes. It will be replaced by the green flag at T-10 seconds.
- Each row will be started with subsequent green flag drops for their row.
  - The first drop of the green flag signals the start of row 1 launch.
  - The green flag will be raised again and dropped to signal row 2 launch.
  - The green flag will be raised again and dropped to signal row 3 launch.
  - The green flag will be raised again and dropped to signal row 4 launch.

Runway/Launch “Delay”

- If the start is delayed for any reason, a command will be broadcast on the race frequency “DELAY DELAY DELAY”
- The delay time will be determined and broadcast on the race frequency asap.
- The delay can only occur between T-5 mins and T- 10 seconds.
- Raising of the green flag will cancel any “delays.”
- Any pilot, the ops director, or race control may initiate a delay.

Race “Abort”

- If the start is aborted for any reason, a command will be broadcast on the race frequency “ABORT ABORT ABORT”
- The command to ABORT immediately cancels the race.
- The abort can only occur after T-10 seconds.
- After hearing the command to “Abort”, the race pilot will immediately shut down their engine, and put their stick hand thumb in the top of the canopy.
- Once all props are stopped, green flag will slowly be lowered, the green flag will remain raised until all props are stopped.
- Any pilot, the ops director, or race control may initiate an abort.

Race “Abort” After Start

- Airborne aircraft will hold in the queue until the runway is available to land. If runway is fouled, runway 3/21 will be primary

Mayday

- Got a problem? Call it. RARA brief contains details
- FLY THE AIRPLANE
- “Race XX, MAYDAY”
- “Landing Intentions”
- “Nature of Emergency”

Runway/Launch - Takeoff

Critical part of the race –

Non-Cooperative Formation

- Lack of Visibility over the Nose – Engine Failures Ahead
- Runway Drift/Departure Due to Crosswind
- Prop Wash and Wake Turbulence
- Beginning Turns Near Stall Speed (AOA)
- Look Around and Above Continuously!

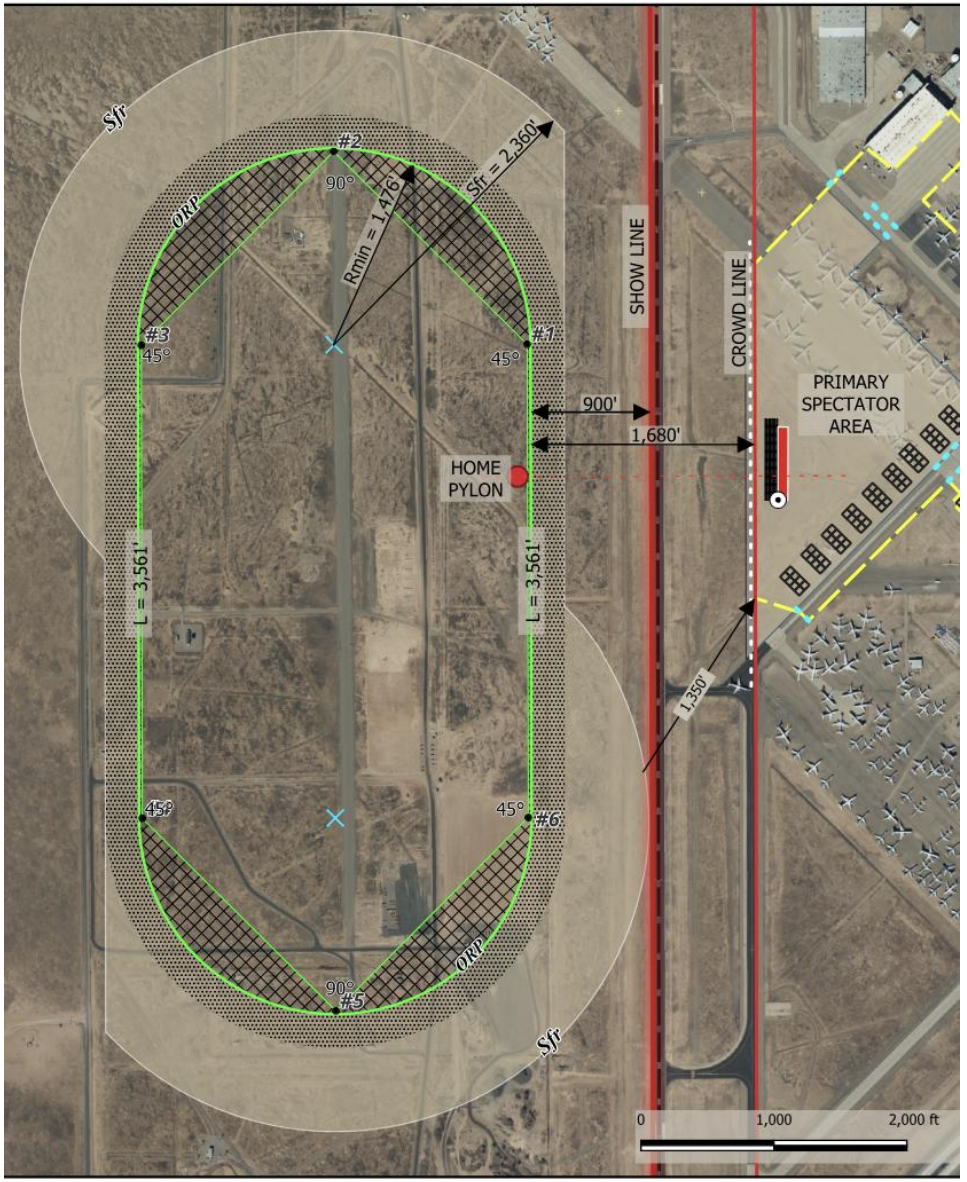
On The Course

- Course Overview
- Consistency
- Altitude Control
- Passing

Bill Rogers Photo

On The Course – example

- Symmetrical Course
- Pylons Well Marked
- Always Fly Counter-clockwise
- Stay West of showline



On The Course - Consistency

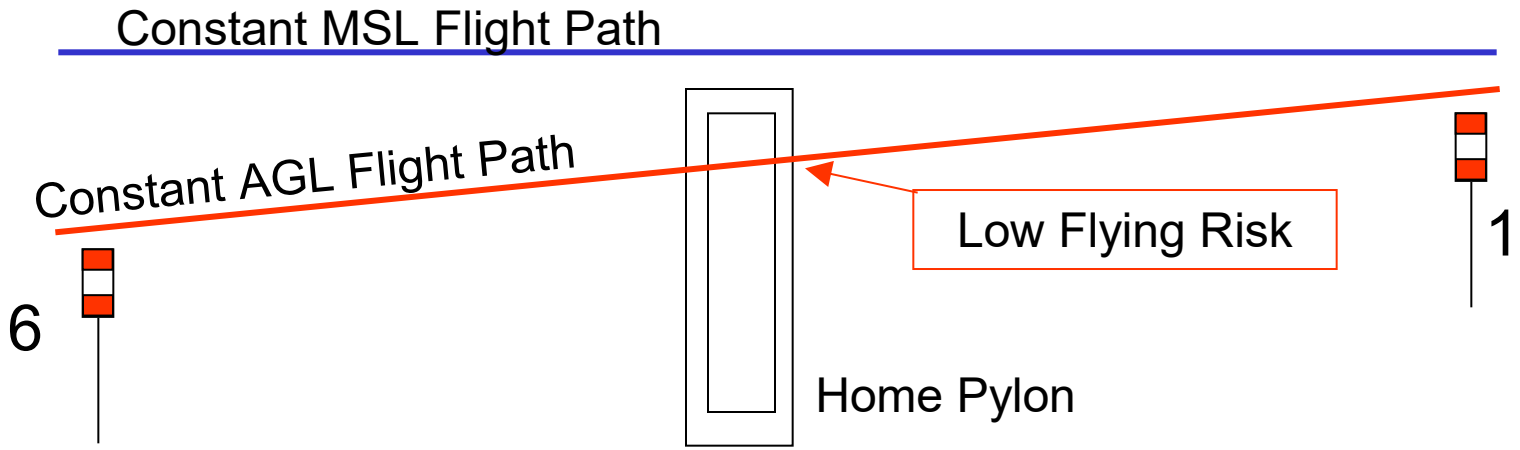
- *Fly a Smooth, Predictable Line*
  - ➢ No Jinking!
  - ➢ Erratic Operation is UNSAFE FLYING
  - ➢ Disqualification/License Revoke for Repeat Offenses
- Look and Think Two/Three Pylons Ahead- Spot turn, set bank, pull to known G
- **Never Turn Right to Avoid a Pylon Cut! (RIP)**
  - ➢ Take the Time Penalty (2-4 secs x # laps) and be Safe
  - ➢ Right turn will result in Disqualification/License Revocation/Death
- Line Changes On Straights Are Possible
  - ➢ Be Positive the Space (Line) You Are Moving To Is Clear!
  - ➢ Use Shadows to Help Determine Traffic

On The Course - Altitude

- Do Not Climb in Turns
  - ➢ Increases Mid Air Collision Potential
  - ➢ Decreases Your Speed
- Do Not Fly Higher than 250 feet AGL
  - ➢ Max 250 ft. AGL at Home Pylon (Out of Timing Camera Field of View)
- Low Line is Fastest if Traffic and Turbulence Permit
  - ➢ Target Wing Tip not lower than Pylon Height (Safety Margin and Avoids Questionable Low Flying Call)
- High Line May be Needed for Traffic/Turbulence
  - ➢ Harder to Fly Tight Course Because You Can't See the Pylons As Well

On The Course - Altitude

- Example - Do Not Climb/Dive with terrain changes
  - Inefficient (Lowers Your Speed)
  - Results From Flying From Can to Can
    - ✓ Cans (Pylons) are Constant Height AGL, not MSL
  - More Likely to be Low at Home Pylon and Get Called for Low Flying



On The Course - Passing

- **Maintain Positive Visual Contact During Entire Pass!**
- Be Absolutely Sure the Space You Are Moving to Is Clear
- Four lengths, this is measurable with cameras
- “Race 3, Passing 8” - Reply not required
- Always Pass on the Outside Unless the other Aircraft is Extremely Wide and not flying proper course - Expect a protest for an inside pass

- Stack High in Turns - Convert Altitude to Speed in Straight
- Do Not Pass on the inside
- Slower Aircraft Has Right of Way but Must Maintain Proper Course

Recovery

- Checkered Flag = Race Over for Everyone
  - ➢Do Not Fly Extra Laps
- Cross Home Pylon (Checkered Flag/Radio Call)
  - ➢Look Left and Up
  - ➢Gently Begin Climbing Left Turn In Trail (No Rolls!)
  - ➢Retard Power
- Cool Down While Scanning for Other Aircraft

Always Be Able to Make the Runway If Your Engine Quits

Recovery

- Collect Yourself Mentally, and BE ON THE LOOKOUT
  - ➢Transition from Race Mode to Landing Mode
- Listen for Active Runway Call on Radio
- Report Base & Traffic on Radio
  - ➢“Race XX Base for 35, 95 in Sight”
- Listen for Maydays/Hazard Alerts
- Be Alert for Landing or Departing Traffic From Opposing Direction (Racers, Helos, etc.)

Always Be Able to Make the Runway If Your Engine Quits

Recovery

- Maintain SA Via Eyeballs and Radio
- Pick Go-Around Point and Use It
  - ➢Go Around if You Get Into PIO

NOT OVER UNTIL ALL SAFE ON DECK

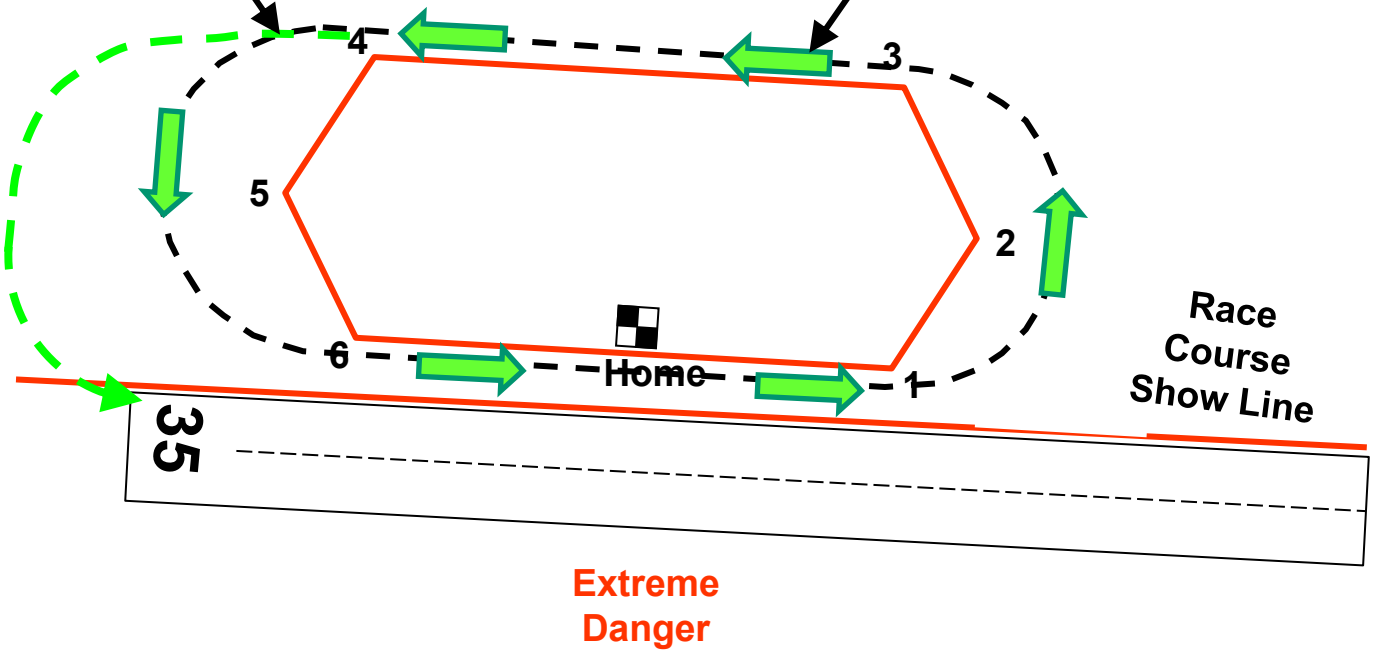
Cool Down – Recovery 35

Descend on Downwind to 4,700 ft MSL for Pattern. (1k AGL)

L/H Turns @ 5,500 ft MSL for Cooldown. Follow racecourse

Cooldown: 1800’ AGL

Pattern: 1k’ AGL



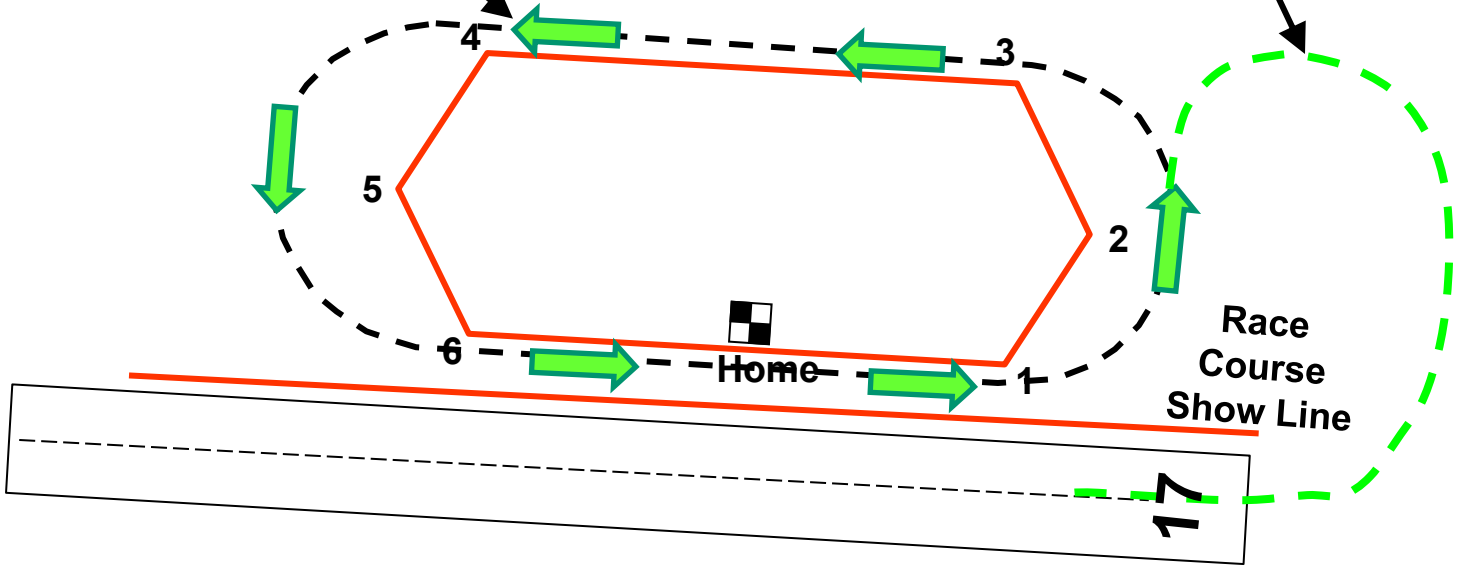
Cool Down – Recovery 17

L/H Turns @ 5,500 ft MSL for Cooldown. Follow racecourse

Descend on Downwind to 4,700 ft MSL for Pattern.

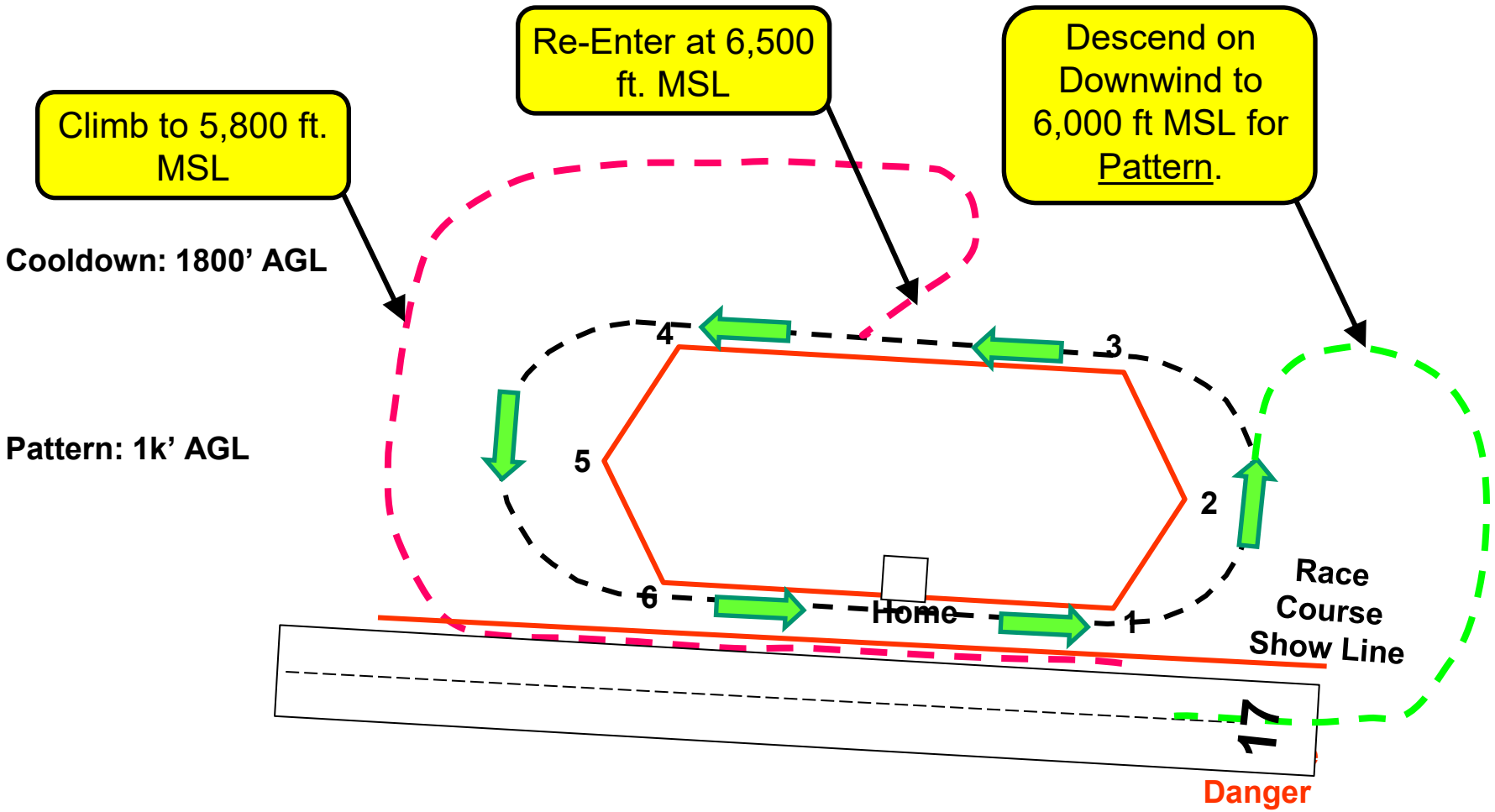
Cooldown: 1800’ AGL

Pattern: 1k’ AGL



Extreme Danger

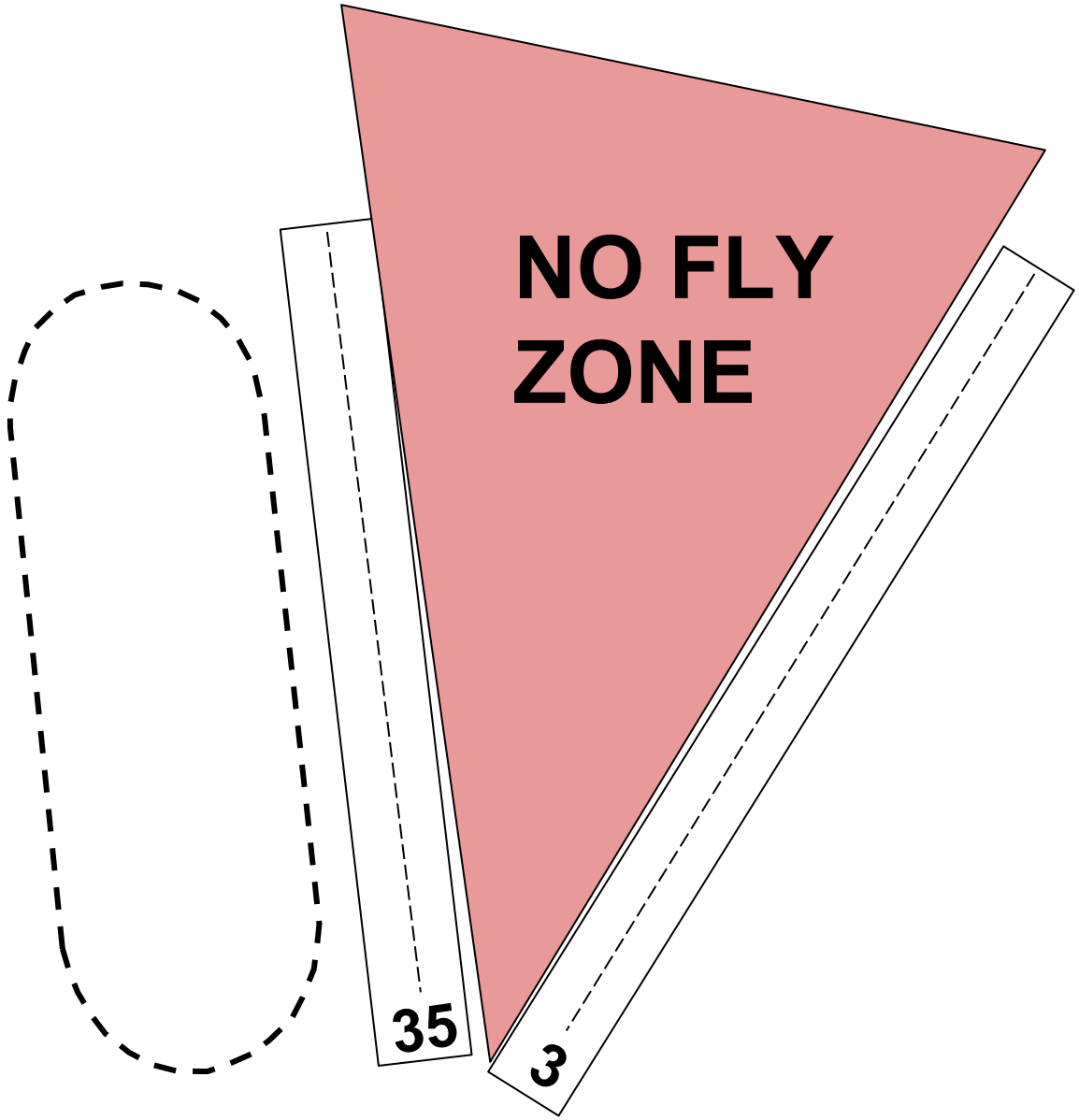
Missed Approach– Runway 17



Dual Runway Recovery - 35/03

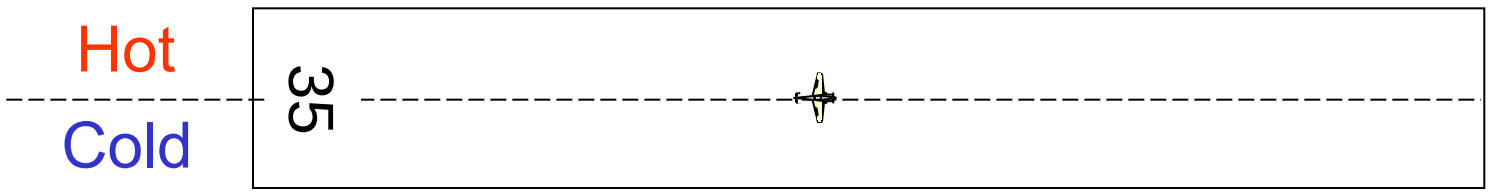
Cooldown: 1800’ AGL

Pattern: 1k’ AGL



Recovery

- Know the pattern, who's where
- **FLY PRESCRIBED GROUND TRACK**
- Clear ahead and Below
- **Single aircraft/runway ops- no hot side/cold side yet (2026 if feasible)**



➢ Hot Side is Always Furthest From Crowd

Always Be Able to Make the Runway If Your Engine Quits

Recovery

- Plan your landing to Taxi **Off the Runway by H**

  Do Not Block Taxiways if At All Possible
- Ensure Switches are OFF
- Wait for Tow Vehicle or Taxi Back if You Can
- Calm Down, Decompress, Breathe

Always Be Aware of Your Emergency Plan

Post Race

- **Post race pilot decompression with pilot committee chair or delegate - Mandatory**
- Refuel
- Debrief with Your Crew
  - ➢Lap Times
  - ➢Unsafe Flying/Lessons Learned
  - ➢Airplane/Engine Performance Issues
- Victory Ride Down the Flight Line
  - ➢Your Adoring Fans (Remember Your Crew)
- Group Debrief in Hangar or Office Area
  - ➢Honest Feedback From All Involved
  - ➢Try Not to Come to Blows Before the Debrief!

Post Race

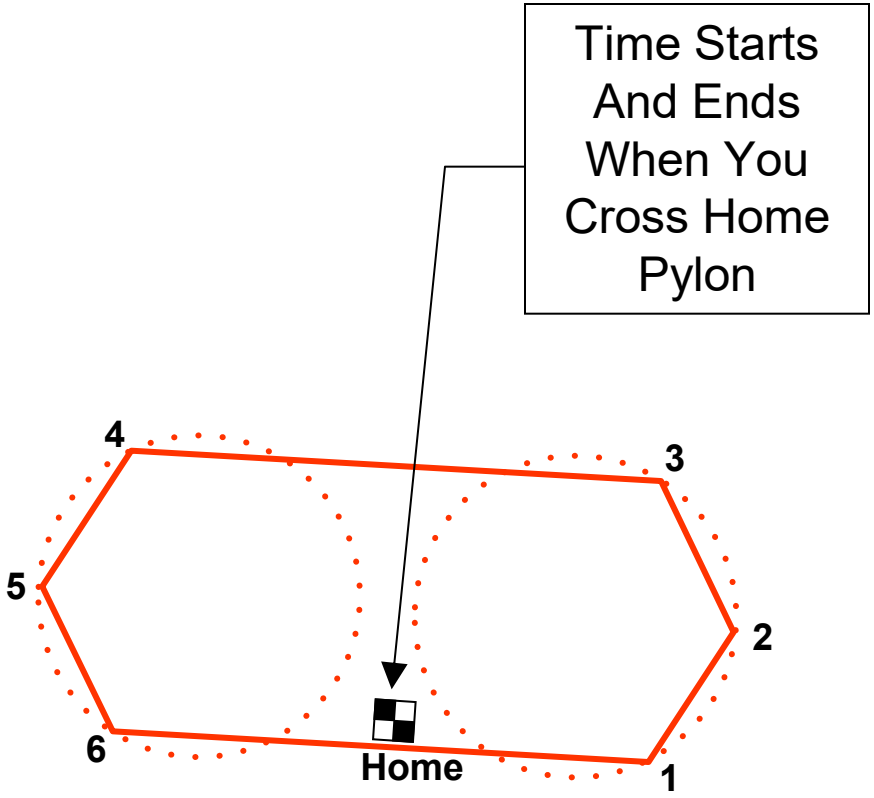
- Conduct Thorough and Detailed Inspection
  - Propeller (Delams, Cracks, Nicks)
  - Engine/Compartment (Anything that Can Become Loose)
  - Use Great Caution when Moving Propeller on Hot Engine
  - Flight Controls/Linkages

Speed, Points, and Pairings

- Speed Computation
  - Qualification
  - Racing
- Points and Pairings
  - Qualifying
  - Heats
  - Finals (Bronze/Silver/Gold)
  - Important Notes

Qual Speed Is Best of 2 Laps

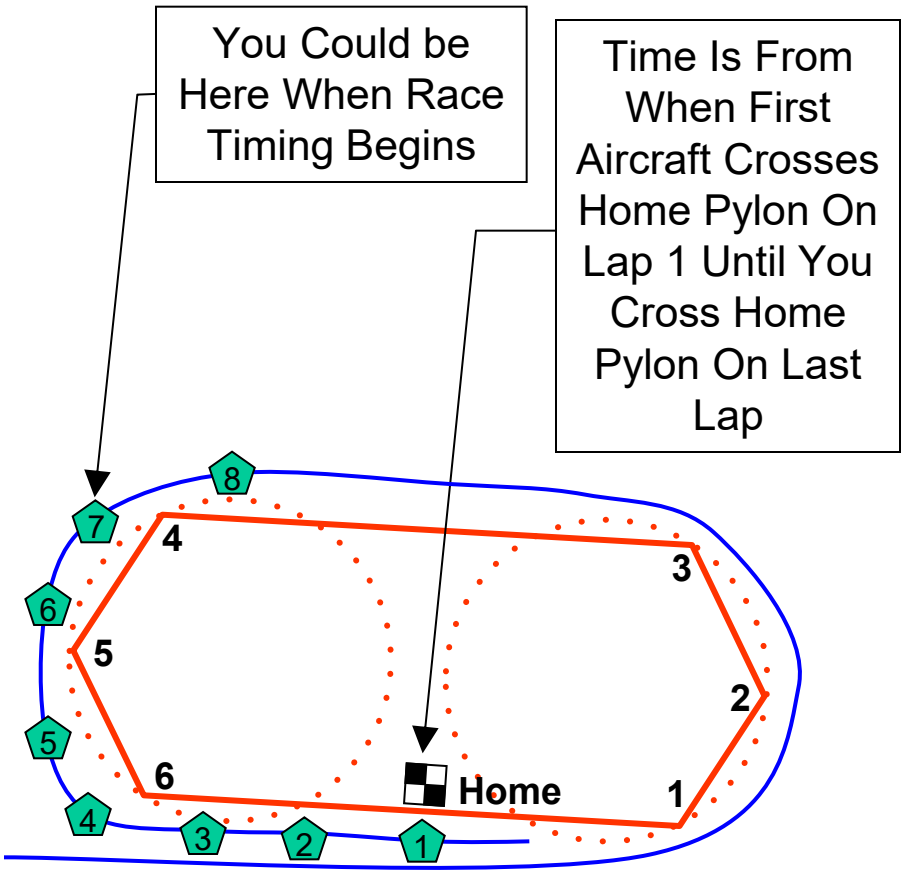
- Warm Up
- Get In “The Groove”
- Radio Call between 3/4
- Green Flag - Verify
- White Flag - Verify
- Checkered Flag – Exit
- Speed = 3.1875 miles / Time for Lap (best of 2)



Extreme Danger

Race Speed Is Average of Laps Completed

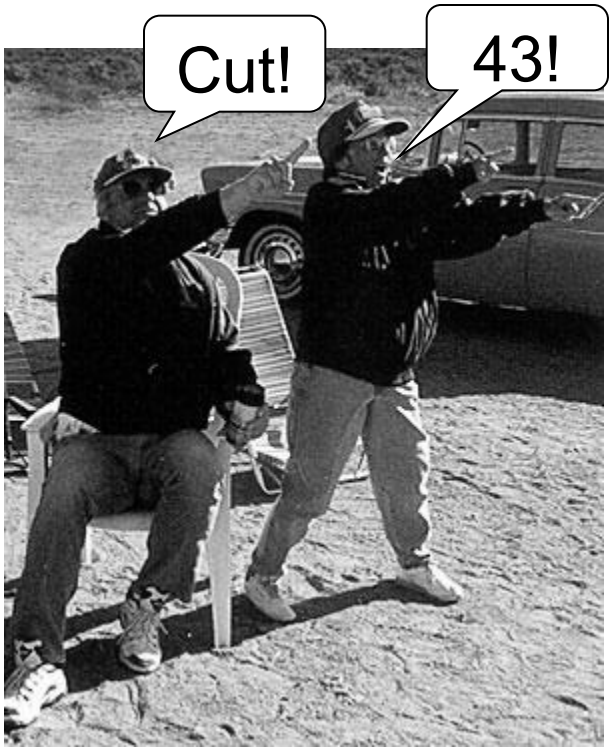
- Speed = # Laps X 3.1875 Miles / Time
- Distance (3.1875) is Arc Length Around Pylons
- First Lap Is “Pace” Lap But Racing Begins At Brake Release – Go As Fast As You Can And Pass When/IF Safely Able
- Pace Lap Is Not Included In Race Speed
- 4 Second handicap per row



Race Aircraft

Extreme Danger

Race Speed Adjusted for Pylon Cuts



- 2 Seconds per Race Lap added to Time
- Example:

  Baseline Race Time = 5 min 55 secs

  Race Distance = 19.125 miles (6 laps)

  Baseline Speed = 193.944

1 pylon cut = 12 second time penalty

Adjusted Race Time = 6 min 7 secs

Adjusted Race Speed = 187.602

Revised Finish Position per race time

Hazards - Emergencies

- What Has Gone Wrong in the Past
- How to Eliminate or Mitigate the Risk
- Consider All the Possibilities and Be Prepared

Hazard/Risk

- In flight structural failure (Wings, Tails, Control Surfaces, Engine Mounts, Control System Linkage)

Consequence:

- Pilot Killed or Severely Injured; Aircraft damaged.

Ever Actually Happen?

- Yes.

Risk Mitigation

- Inspect Structure Thoroughly & Frequently
- Eliminate/Minimize Hinge Free Play
- Avoid Turbulence (Wakes, Dust Devils)
- Evaluate Load Paths

Hazard/Risk

- Engine Malfunction (Untested Mods, Plug Gaps, Timing, Cam Profile, Rings, Lifters, Fuel/Oil Starvation, Pistons Burn Through, Connecting Rods Fail, Loss of Oil Pressure, Mags Come Loose, Props Delaminate, Props Crack, Oil Caps Come Off, Spark plugs Come Loose, Mags/Components Fail, Mixture Cable Slips/Breaks)

Consequence:

- Flight (Qual or Race) Abort
- Aircraft Damaged in Off-Airport Landing

Ever Actually Happen?

- Yes. A lot.

Risk Mitigation

- Test Modifications (at Power and Speed) Before Arriving
- Be Wary Of Advice From Other Racers
- Have a Plan for a Failure at Any Point on the Race Course
- Perform Thorough Pre-flight Inspection, Especially After Each Hard Run
- Practice Emergency Procedures Often – Land Before Complete Loss of Power

Hazard/Risk

- TFOA (Things Falling Off Aircraft) [Wheel Pants, Exhaust Stacks, Cowling, Spinners, Fairings, Speed Tape Peels, Oil From Other Aircraft]

Consequence:

- Vibration, Flight abort; FOD to Fellow Racers' Planes; Debris on Runway (landing hazard)

Ever Actually Happen?

- Yes.

Risk Mitigation

- Careful Maintenance and Preflight Inspection
- Monitor Radio for Ops Alerts
- Discontinue Flight if Unusual Vibration Occurs…Do Not Continue Until TFOA Occurs

Hazard/Risk

- Animal Encounters (Insects, Tarantulas, Birds, Coyotes, etc.)

Consequence:

- Pilot Distracted, Aircraft Damage if Birds/Coyotes Struck
- Pilot Injury If Bird Penetrates Canopy

Ever Actually Happen?

- Yes.

Risk Mitigation

- Careful Preflight to Remove Unwanted Pax
- Pre-Think Response
- Monitor Radio for Ops Alerts
- Use Helmet with Visor

Hazard/Risk

- Brakes Fail (Won't Hold/Won't Release)

Consequence:

- Loss of Directional Control; Aircraft Damaged.
- Possible Collision with Other Aircraft/Objects/People

Ever Actually Happen?

- Yes.

Risk Mitigation

- Inspect and Test Brake System Before Reno
- Perform Full Power Run Ups to Verify Brakes Hold
- Bleed Brakes to Remove All Air
- Insure Hydraulic Fluid is Serviced

Hazard/Risk

- Canopy Issues (Comes Open In-flight, Totally Separates (TFOA), Shatters Due to Contact with Helmet)

Consequence:

- Flight Abort.
- Vision Impacted due to 200+ MPH wind blast; Landing Challenge

Ever Actually Happen?

- Yes. Too Often!

Risk Mitigation

- Use Checklist to Ensure Canopy Closed and Latched
- Use Redundant Canopy Latches
- Use Helmet with Visor

Hazard/Risk

- Runway Collision (Improper Hot/Cold Side Procedure, Loss of Control Due to Severe Crosswind, Engine Failure on Takeoff, Poor Formation Takeoff Skills, Aircraft Overtaken on Takeoff Roll, Aircraft Landing in Opposing Directions on Same Runway)

Consequence:

- Pilot Killed or Severely Injured; Aircraft damaged/destroyed.

Ever Actually Happen?

- Yes.

Risk Mitigation

- Maintain SA – Know Your Competition & Performance
- Anticipate Drift on Takeoffs With Crosswind
- Raise Tail When Able on Takeoff
- Monitor/Use Radio During Recovery
- Look Down Entire Runway Landing & Transitioning to Cold Side

Hazard/Risk

- Prop Strikes People/Crew (Engine Fires While Timing Mags in Hangar, Prop Man is Hit, Engine Fires When Prop is Turned, Mags Get Turned On, P-Leads Break)

Consequence:

- Severe Injury to People.

Ever Actually Happen?

- Yes.

Risk Mitigation

- Always Remove Plugs When Timing Engine
- Know and Practice Correct Propping Technique
- Ensure Brakes, Tie-Down, Extra Crew Keep Aircraft From Moving (Redundancy is Good)
- Always Assume Prop is “Hot” Even with Switches OFF
- Establish Strict Rules About Who May Touch Propeller
- Install a starter

Hazard/Risk

- Wind/Prop Blast Cause Loss of Control During Tow

Consequence:

- Aircraft damaged.

Ever Actually Happen?

- Yes.

Risk Mitigation

- Be Observant When Towing Behind Aircraft Running or Starting
- Pre-Plan Actions During Tow in Strong Winds if Control Loss Seems Possible (Disconnect Tow, Stop Towing, Increase Wing and Nose-Walkers)
- Do Not Fly With Unresolved/Assessed Damage!

Hazard/Risk

- Hit Telephone Wires During Landing Approach

Consequence:

- Pilot Injury (Possible Fatality); Aircraft damaged.

Ever Actually Happen?

- Yes.

Risk Mitigation

- Do Not Fly Long, Low, Drag-In Approaches
- Practice Close-In Approaches
- Always Be in A Position to Make the Runway If the Engine Quits

Hazard/Risk Midair Collision (Scatter Pylon, Passing, Landing)

Consequence:

- Pilot Injury (Probably Fatal); Aircraft damaged/destroyed.

Ever Actually Happen?

- Yes.

Risk Mitigation

- Maintain SA
- Know Your Competitor's Flying Styles – Watch Everyone
- Always Maintain Visual Contact During Passes
- Do Not Push a Bad, Decaying, or Uncertain Traffic/Passing Situation
- Use Wing Rock and Clearing Maneuvers on Appch/Landing

Hazard/Risk

- Run Off End Of Runway

Consequence:

- Pilot Injury; Aircraft damaged.

Ever Actually Happen?

- Yes.

Risk Mitigation

- Pick Go-Around Point During Approach
- Ensure Proper Touchdown Speed (Plan Appch, Slip, etc.)
- Have Excellent, Reliable Brakes
- Be Aware of Runway Slope and Density Alt Effect on G-Spd
- Consider Ground Looping if Departure Inevitable

Hazard/Risk

- Ruts/Grooves or Bumps in Runway Cause Loss of Control

Consequence:

- Pilot Injury; Aircraft damaged.

Ever Actually Happen?

- Yes.

Risk Mitigation

- Transition to Cold Side with Tail Up if Possible
- Locate/Inspect Grooves When Positioning for Takeoff
- Cross Ruts at Max Angle Possible if Tail is Down

Hazard/Risk

- Seat Belts (Shoulder Straps) Cut Into Neck During Turbulence/Accident.

Consequence:

- Pilot Injury/Bloody Flight Suit.

Ever Actually Happen?

- Yes.

Risk Mitigation

- Position Shoulder Belts Carefully (5 deg below to 30 deg above horizontal at shoulder)
- Separate Belts With Something Other than Your Neck (Spacer at Fuselage Attach)
- Cushion Belts Where they Cross Your Body

Hazard/Risk

- Fumes (Carbon Monoxide Poisoning, Gasoline Vapors from Leaks or Tank Splits)

Consequence:

- Loss of Pilot Alertness/Consciousness; Possible Injury/Accident; Aircraft damage.

Ever Actually Happen?

- Yes.

Risk Mitigation

- Check Your Aircraft Before Reno with a Sensitive, Digital CO Monitor
- Ensure All Fuel Connections Are Secure
- Install Fresh Air Source or Oxygen System (Mandatory for Unlimited Racers)
- Consider Possibilities if You are Upside Down Off the Runway Awaiting Rescue

Hazard/Risk

- Stall/Spin (High Speed Stall, Landing Approach, Dealing with IFE)

Consequence:

- Severe Pilot Injury (Possible Fatality); Aircraft damaged/destroyed.

Ever Actually Happen?

- Yes.

Risk Mitigation

- Know Your Airplane's Low Speed Handling Thoroughly
- Know Best Glide and Vso Before the IFE
- Know Your Airplane's Feel/Warning When Stall is Imminent
- Practice Emergency Approaches at Home

Hazard/Risk

- Tow Vehicle and Aircraft Make Hard Contact (Tow Too Fast/Can't Stop, Tailgate Hits Vertical Tail, etc.)

Consequence:

- Aircraft Damage; Unable to Repair to Compete
- Tow Vehicle Damage

Ever Actually Happen?

- Yes.

Risk Mitigation

- Taxi Instead of Tow (Not Practical for Launch)
- Tow Slowly
- Design and Use Tow Dolly (Extra SE on Start not Good)

Hazard/Risk

- You or Crew Fall out of Tow Vehicle

Consequence:

- Severe Injury (Possible Fatality)

Ever Actually Happen?

- Yes.

Risk Mitigation

- Do Not Sit In Open Beds (Gate Down) w/o Aircraft in Tow
- Do Not Sit On Fenders of Moving Pickups
- Hold Onto Safety Strap to Keep From Falling Out When Towing

Hazard/Risk

- Failure to Declare a Mayday When Appropriate

Consequence:

- CFR Teams Delayed in Reaching You
- Injury/Death
- Severe Ass-Chewing from BARC and FAA, Potentially Including Expulsion from Air Racing

Ever Actually Happen?

- Yes.

Risk Mitigation

- Declare a Mayday Anytime You are Ending a Race/Flight Prematurely (vibration, low oil pressure, smoke, RPM rollback, something doesn't feel right, etc.)
- Declare Mayday Regardless of How Under Control You Think You Have The Situation

Emergency Summary

- You Will Have Emergencies!
  - ➢ There Aren't Enough People for them to Always Happen to "The Other Guy"
  - ➢ Think Ahead and Rehearse Your Emergency Actions Before Takeoff – Be Prepared!
  - ➢ Declare Mayday Immediately!

- Recognize the Potential For Emergencies and Take Steps to Mitigate Risks
  - ➢ Learn from Other People's Experiences

- Make Sure You and Your Equipment Are In Top Condition for Each Flight
  - ➢ Inspect After Each Run
  - ➢ Use Checklists
  - ➢ Use Aviation Grade Equipment and Approved Maintenance Practices
  - ➢ Arrive at Roswell Confident in Your Ability and Equipment

Pitts Accident Investigation Report Summary

Compiled for Race Pilot Training

Pylon Racing Seminar

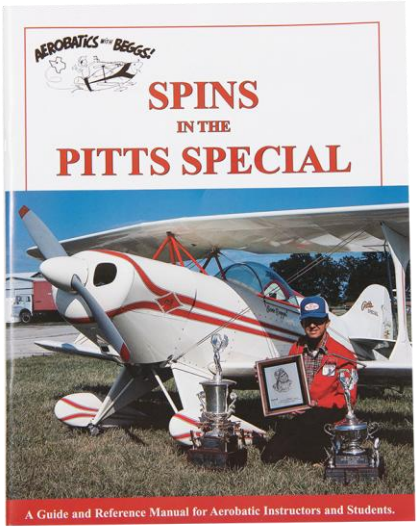
- 20 Fatal Events in last 40 years
- 1985-2025
- S-1 & S-2

Pitts Accident Investigation Summary

- **20 Fatal Accidents in the USA since 1985**

- **0** Mechanical Failures
- **90% Loss of Control** (Low Level Aerobatics and Stall/Spin
- 1 Midair, S-2 cut the tail off a 172. S-2 Landed.
- 1 Fuel Exhaustion, impact zone indicative of stall/spin

Spins in the Pitts Special



Racing Logistics

- Credentials and Ramp Security
- Ground Runs
- Towing/Taxiing
- Fuel, Oil, & Spark Plugs
- Spare Parts/Hardware/Tools
- Daily Briefings

Wear Your Credentials to Avoid a Hassle

- Pilot ID and Crew Wrist Bands to Enter Pit from Parking Lot
- Wrist Bands Plus Crew Line arm bands (for Crew) to Pass Crowd Line

Ground Runs

- Always Tow Out to Flight Line Past “Prop Turn” Line
- Perform Ground Runs After
  - ➢ Oil Change to Verify No Leaks
  - ➢ Carburetor Work
  - ➢ P-Lead Work
  - ➢ Cylinder/Piston Work
  - ➢ Prop or Spinner Change
  - ➢ Spark Plugs Changed/Regapped
  - ➢ Timing Adjusted

Make Sure Everything Works BEFORE
You Get To the Starting Line!

Towing/Taxiing

- Use Wingtip Walkers to Prevent Injury and Damage
- Observe The No Prop Turn Line Religiously
- Taxi Back is Very Helpful During Practice/Qual
- Dollies Reduce Risk of Damage During Towing

Fuel, Oil, & Spark Plugs

- Refuel After Each Run/Race on the Way Back to Hangar

  - ➢ Dump Used Oil in appropriate disposal repository
  - ➢ Use Separate Barrel for Solvents
  - ➢ Get Plugs Cleaned and Checked prior to the event

Daily Briefings

- **Normally Briefings are at 7:00 AM or as published**
- **You Must Attend the Briefing if You Want to Fly That Day**
  - **No Surrogates**
  - **No Mercy for Oversleeping**
  - **No excuses**
- **Normally Mandatory Briefing on Sunday AM Before Race Week starts**
  - **Be sure you Know the Schedule and Requirements**
- **Class Presidents Debrief at 1700 Each Day**
  - **Voice Your Issues Through the President**

Don’t Miss Flying Because you Missed the Briefing

Social Skills on the Runway/Ramp

- Competition Starts on Push Out!
  - ➢Everyone Will Get to Fly – Don't Be Pushy
- Limit Practice Laps
  - ➢Especially After You Are Qualified
- Do Not Damage Your Buddy's Plane!
  - ➢Avoid Canopy FOD and Nicks From Prop Blast

Prize Money

- Offsets Some Financial Costs of Racers
- Proportional to Finishing Position (points)
- Earned Progressively from Qual to Final
- Distribution Provided in Advance to Racers & RARA
- Your Fines Distributed to Other Racers

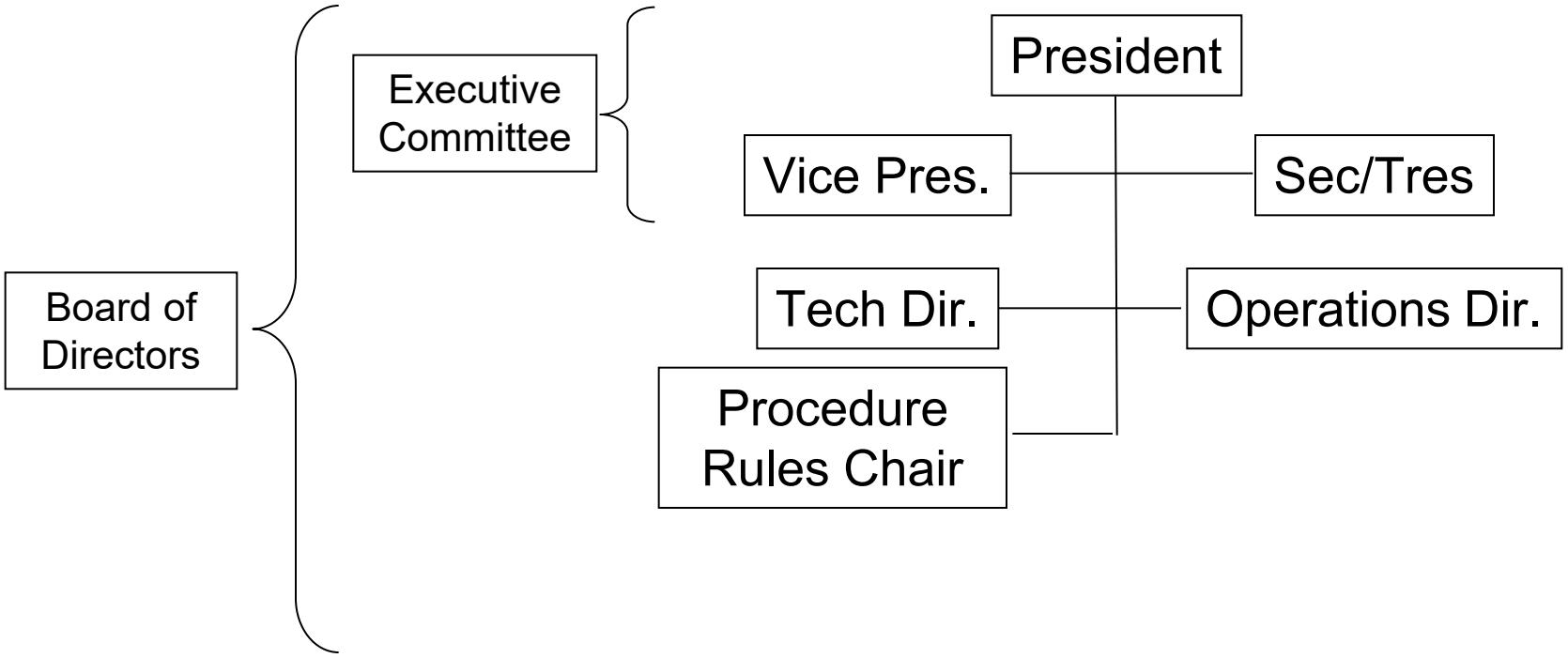
Prize Money

- Progressive Purse Payout
- 1st Place Gold no more than 10% of total purse
- Last Place No less than 1.5%
- Last place Gold > First place Silver
- Total purse value changes for every event
- Direct from RARA
- Lucky if it covers your insurance. Not a big payout

BARC Organization

- Formal Structure
- Identities/Duties
- Contest Committee

BARC Organization



All These Positions are Filled by Election IAW Bylaws*

*Bylaws available online

Identities & Duties

President – 2 yr

- Represents BARC to RARA
- Presides at All Meetings of BoD
- General Supervision of BARC Corporation
- Communicate with Directors
- Signs BARC Contracts Authorized by the BoD

Vice President – 2 yr

- Supports President/Acts in His Absence
- Performs Duties as Assigned by BoD

Identities & Duties

Sec/Treas - 2 yrs

- Provides Agendas for All Meetings
- Documents Meetings with Minutes
- Provides Notices on Behalf of BARC Corp
- Keeps Financial Records/Accounts of Corp.
- Establishes Purse Distribution
- Maintains Membership Database
- Receives Income and Makes Payments
- Conducts Nominations/Elections/Rule Voting
- Submits Corporate Tax Returns

Support Your All-Volunteer Organization and Step Up to Run at Election Time

Identities & Duties

Ops Director -1 yr

- Responsible for BARC Flight Ops at Races
- Clarifies Race Rules
- Responsible for Race Parings/Grid Arrangement
- Responsible for Pylons, Flags, Radios
- **May Disallow Racers to Fly if Unfit** (e.g. Hung Over, Sick, etc.) **and Withdraw a Racing License**

BARC Pylon Air Racing

Summary

- Technical Requirements Defined for Airplane, Engine, & Pilot

- Previous Emergency Events Provide Valuable Lessons for Us

Come to race with Top Equipment, Excellent Skills, and a Safety-Oriented Attitude and You'll Have A Great Time!

PRS 2025 Plan

- Fam Rides where able
- Flight Ops (3 rookies max on course)
- Solo launches (Static)
- Simulated Race Start
- Certified Racers need 3 laps
- Rookie Evaluations w/ maneuvers
- Pylon Tour (if possible)
- Guest Speakers
- Airport familiarization