**F14 Departure/Spin Recovery Tips**

By Victory 205

**Background**

The F14 in a flat spin was considered unrecoverable, and none of the supposed "magical" recovery techniques that you may have heard were actually proven. Things like sweeping the wings were probably never tried in an actual spinning aircraft. It's online enthusiast's repeating made up baloney, that in reality, got pilots laughed out of ready rooms in The Fleet.

I've lost a squadron mate and friend to a flat spin. The F14 community had every incentive to find a real, demonstrable solution. The recovery procedures evolved as testing was continuous, but because it was so dangerous, spin recovery really wasn't solved. It probably wasn't solvable, all things considered, so avoiding spins was paramount. It wasn't always possible.

Now that I have your attention.

Before each fighter tour, we were required to complete an "Out of Control Flight" flight in the T2C with a trained "spin pilot". As a result, most Tomcat pilots did this flight several times during their careers. The flight included rudder doublet and triplet departures, upright, inverted, and flat spins, even coupled lomcevaks, which usually progressed to an inverted spin and a straightforward recovery. You had to exhibit the ability to analyze and recover from all spin and departure modes, using your own aircraft's procedures. The T2C's cruciform tail made recovery positive and consistent. The fat little Guppy was a fantastic trainer in that regard.

The F14 was not particularly departure prone, and absent poor pilot control input and technique, or thrust asymmetry due to stalled engine (an issue particularly problematic in the F14A), departures weren't common. They still occurred, often with tragic results.

There was some evidence that the aircraft began to exhibit the beginnings of entry to an unstable spin from the stable flat mode at lower altitudes due to denser air. Some believed that the dynamics of the crew ejecting caused the nose to pitch down. Either way, these occurred at altitudes where there was no available altitude left for recovery.

The cool news is that the sim makes us virtually immortal without the massive "eyeball out G" forces that preclude holding anti-spin controls for very long, and we can stay with the aircraft to a lower altitude and effect recovery.

**Conditions**

The aircraft was maneuvered with the Roll SAS off- leaving it engaged exacerbated departure inputs from AFCS horizontal stabilator movement. Turning off Roll SAS was on the Combat Checklist. You may read otherwise in some of the online NATOPS Manuals because they reference DFCS and ARI systems that as far as I can tell, either never made it into the aircraft, or appeared very late in the Tomcat's service life. I'm pretty sure that it isn't in the sim. A friend flew the F14 well into the late nineties, and mentioned that the official policy was still Roll SAS off. Any Tomcat drivers that have further information on DFCS and ARI, please speak up. If this is all gibberish to you, don't worry about it.

Turn the Roll SAS off for combat.

**Important**

The magic number is 100 Knots. Remember.

*Practice finding the Turn Needle.* It is the only way to reliably ascertain spin direction. When the turn needle is pegged during a spin, it isn't easy to see. Only a sliver of the needle will be visible at the side of its case, and the big, fat balance ball is what will catch your eye and lead you astray. Grumman began to paint the turn needles yellow at some point at the Navy's request to make them easier to find under duress.

Why? Can't I just look outside? No. In an inverted spin, or over a blue sky and blue water, your eye will pick up the roll direction, and miss the yaw direction, which is opposite the roll in an inverted spin, and neutral in a flat spin. Yaw is the critical state, and only the turn needle (or when well developed, the Spin Arrow on the HSD in TID mode) are reliable indicators of spin direction.

**Zero Airspeed Departures.**

These result from a botched vertical maneuver, pulling for a kill shot, or looking over your shoulder while maneuvering defensively. If you have been pointed uphill for a long time, and it is getting quiet, check airspeed.

If you are rapidly approaching or below 100 KIAS- Let go of the flight controls. Don't move the throttles. When I say let go, I mean physically take your hands off of the stick and rudders. Let the springs center the controls.

The aircraft may tail slide, it may yaw and fall on its side- doesn't matter, don't touch anything, sit there and enjoy the view. Note altitude and watch the airspeed. The nose will eventually fall through and settle pointing at the center of the earth. After this happens, and airspeed is above 100 KIAS, then you can access the flight controls and gently begin to maneuver the aircraft again. Roll smoothly to the nearest horizon and get back into the fight. If altitude is an issue, use aft stick to set 17 units AOA (medium buffet) to effect a minimum altitude loss recovery.

At 17 units, all control input practices apply. Keep the stick centered and use rudder only to manage roll bank angle. Be gentle with your pitch inputs. You will need around 5000 feet plus or minus to recover to left flight from where you began recovery inputs. Experiment to find the altitude and airspeed required in your typical weapons and stores configuration.

**Aggravated Departures.**

The one way to consistently depart the aircraft is to hold full aft stick and full lateral stick, but due to excessive angle of attack, the aircraft either won't roll, or is rolling opposite the lateral stick. Continuing to hold the stick opposite the roll, hoping that the aircraft will magically respond doesn't work. Time to try something different.

If you immediately relax aft stick and neutralize the stick laterally, you'll probably regain control.

If you pick up uncommanded roll and yaw rates, then immediately place the stick forward and neutral laterally, ease both throttles to idle, visually find the turn needle and put the rudder opposite the needle direction. If done correctly and will alacrity, you will likely recover.

This should look familiar, it is the first three steps of the NATOPS departure spin recovery procedure. The procedures are included at the end of this document.

If you delay recovery controls, or leave in the lateral and aft stick for an extended period, or have an thrust asymmetry, or get an energetic nose slice that is unchecked- you may notice that the yaw rate is increasing, the nose is essentially on the horizon, the bank is flat and stable with the turn needle and AOA pegged, airspeed stuck below 100 KIAS. Welcome to the challenging world of a flat spin.

If you let go of the controls, the aircraft will probably continue merrily in the spin. If you simply input full opposite rudder, the aircraft will also continue merrily in the spin. Spins are complex combinations of aerodynamic and inertial coupling, things get very weird, very quickly.

Jet fighters are fuselage loaded creatures- ie. mass located primarily in the fuselage, so inertia tends to dominate, meaning that a spin likes to go stable and flat, and continue forever. That's also why sweeping the wings aft doesn't work in real life *or in the sim.*

**Spin Recovery**

Continuing with the NATOPS spin recovery inputs that we described earlier.

Hold the stick forward and neutral laterally, with rudder opposite the turn needle. Now add stick INTO the turn needle. That’s means as much lateral stick as you can get while holding the stick forward in the same direction of the spin as displayed by the turn needle.

Check altitude (which is a “time to impact” indicator) and airspeed (recovery indicator). If you are below 100 KIAS, hold the controls in and watch the attitude. If after a turn or so, the nose begins to pitch slightly below the horizon, watch the airspeed. Recovery may be coming. If the airspeed spikes above 100 KIAS and the nose pitches down, then take the recovery controls out, address the roll with rudder and a little lateral stick, roll to wings level, and recover at 17 units AOA. The higher you are, the less aggressive you need to be. Don’t over pull and depart again.

If the nose is still stable on the horizon with the same spin parameters showing on the instruments, then leave the stick into into the turn needle, and ease it aft while still holding full lateral stick in the direction of the turn needle or HSD Spin Arrow. The Spin Arrow pops up about the time lateral stick into the yaw direction and aft is effective.

This should result in the nose slicing below the horizon within a turn or two, followed by airspeed abruptly “breaking” above 100 KIAS, and a fairly straightforward recovery.

If the airspeed is above 100 knots, then you are not in a spin. Let go of the controls, see if the aircraft will recover and settle nose down with airspeed increasing. If the nose points well below the horizon, then gently access the controls as recover as described above, using proper control inputs for your present AOA value, all described in my F14 Handling Tips Paper.

**Caution.**

Inputting anti-spin controls in while the aircraft is in a post departure gyration and not in a spin is the same as inputting pro spin controls. I had squadron mate eject from a perfectly fine, brand new F14A because he applied spin recovery controls in an aircraft that wasn't spinning. They jumped out above 200 KIAS. The aircraft was simply rolling in response to his "anti-spin" controls. You guessed it, he came from F18's, where the spin recovery system held his hand.

In the F14, or in any out of control airplane, an analytical approach is in order.

The simulator will come out of a spin using these procedures within several turns. Be patient. I recommend that you get some altitude, pull the nose up at idle power, let the aircraft decel to below 100 KIAS, and instead of letting go, hold the stick aft with AOA pegged, then rapidly input full lateral and full aft stick and hold the control inputs. The aircraft will roll opposite the stick, gyrate, and usually settle into a flat spin.

Practice your recovery scan and procedures.

**Real World Differences**

*So you will be tempted to say, "what's the big deal?", in the simulator, the F14 recovers from spins consistently.* In the real world, the pilot, being at the end of a longer moment arm than the RIO, can experience up to 6.5 eyeball out G's. This makes seeing engine instruments, moving throttles and holding stick and rudder inputs in for more than 20 seconds or so unlikely.

*Why not use asymmetric thrust to help recovery?* It may not be available, or the spin may have been induced by asymmetric thrust in the first place. Throttle transients in this extreme AOA regime can cause stalls even with the GE engines. Moving throttles will almost certainly cause stalls if they haven't already occurred with the TF30s' in the F14A. If you get the thrust backwards, then you are going to create an enormous, unrecoverable asymmetrical force that will be your epitaph for eternity.

Centrifuge training demonstrated that the pilot had great difficulty holding full recovery controls as eyeball out G increased. Even worse, the TF30's would stall and spin down towards zero RPM, meaning that hydraulic pressure was lost and recovery control displacement was no longer available. If one stalled before the other, then asymmetric thrust was present, at least for awhile, complicating yaw and diminishing chances for recovery.

Therefore, the NATOPS procedure was when a flat spin was confirmed by *"flat attitude, increasing yaw rate, increasing eyeball out G, and lack of pitch and roll rates"*-

"Canopy Jettison"
"RIO Command Eject."

The trajectory in a flat spin is essentially a vertical free fall (definitely not heading out to sea). The canopy tended to hover over in the low pressure void above the aircraft that was created by the falling airframe, so using the normal ejection sequence didn't give the canopy time to clear the ejection seat's path. Additionally, the RIO ejected both crew members because the pilot couldn't reach or actuate either handle due to being forced forward.

If you are in the RIO's Office during a spin, note altitude, airspeed and if the spin display comes up on the TID, the Spin Arrow. Give the pilot altitude and spin direction calls, ensure he has the rudder opposite and stick into the Spin Arrow if you have the presence of mind.

You have to make a contract before leaving the ground with your pilot as to what altitude you are going to jump out at. 10,000 AGL was in most SOP's. Passing 10K is time to notify your pilot that it is time to jettison the aircraft.

*What about inverted, like Maverick and the Mig 28?* The good news is that I just don't think that we are going to see them in the realm of DCS. It takes a sustained, full forward stick from a decelerating climb with full crossed controls to generate an inverted departure.

You'll also likely get dual engine stalls. Full aft stick and rudder opposite the turn needle (don't pick up on the roll direction, it will be opposite the yaw in an inverted spin. Use the turn needle)

Full aft stick usually induces an immediate recovery, but you'll be in a world of hurt without engines in the F14A

**Bottom Line**

Avoid Spins

*Pay attention to buffet cues.* Heavy buffet is not someplace you want to be unless in last ditch maneuvers.

Read my F14 Handling Tips Paper.

Don't hold sustained lateral stick against an opposite roll and you probably won't see a spin.

Be gentle with throttle movements. In the F14A, maneuver at high alpha at Mil or Zone 5 afterburner. Do not move the throttles until angle of attack is reduced.

Let go of all controls if decelerating below 100 knots.

If you depart controlled flight above 100 knots, then get the stick forward and neutral lateral, and go from there as described above.

**If it All Goes Wrong**

Memorize the following NATOPS Procedures. The procedures are different depending upon the F14 variant.

If in your travels you come across an F14 pilot, ask them if they can recite the spin recovery procedures- I'll bet that most will be able to recall them by heart after 25 years. We had to recite these perfectly before every Air Combat Maneuvering flight.

The recovery procedures work beautifully in the Simulator.

You have a valuable training tool in your hands, the Heatblur F14 Module. Go practice.

# F14B

### Upright Departure/Flat Spin

*1. Stick — Forward/Neutral Lateral, Harness Lock.

*2. Throttles — Both IDLE.

*3. Rudder — Opposite Turn Needle/Yaw/Spin Arrow.

If no recovery:

*4. Stick — Into Turn Needle.

If yaw rate steady/increasing or spin arrow flashing or eyeball-out g sensed:

*5. Roll SAS — ON, Stick — Full into turn needle and aft.

If recovery indicated:

*6. Controls — Neutralize.

*7. Recover at 17 units AOA, thrust as required.

If flat spin verified by flat attitude, increasing yaw rate, increasing eyeball-out G, and lack of pitch and roll rates:

*8. Canopy — Jettison.

*9. Eject (RIO command eject).

### Inverted Departure/Spin

*1. Stick — Full Aft/Neutral Lateral, Harness Lock.

*2. Throttles — Both IDLE.

*3. Rudder — Opposite Turn Needle/Yaw.

If recovery is indicated:

*4. Controls — Neutralize.

*5. Recover at 17 units AOA, thrust as required.

If spinning below 10,000 feet AGL:

*6. Eject (RIO command eject).

## F14A

### Upright Departure/Flat Spin

*1. Stick Forward/Neutral Lateral, Harness–Lock.

*2. Rudder– Opposite Turn Needle/Yaw/Spin Arrow.

If no recovery:

*3. Stick Into Turn Needle.

*4. If engine stalls Both Throttles IDLE.

If yaw rate steady/increasing or spin arrow flashing or eyeball–out g sensed:

*5. Roll SAS On, Stick – Full into turn needle and aft.

If recovery is indicated:

*6. Controls Neutralize.

*7. Recover at 17 units AOA.

If flat spin is verified by flat attitude, increasing yaw rate, increasing eyeball out g, and lack of pitch and roll rates:

*8. Canopy Jettison.

*9. Eject (RIO command eject).

### Inverted Departure/Spin

*1. Stick Full Aft/Neutral Lateral, Harness Lock.

*2. Rudder– Opposite Turn Needle/Yaw/Spin Arrow.

*3. If engine stalls Both Throttles Idle.

If recovery indicated:

*4. Controls Neutralize.

*5. Recover at 17 units AOA.

If spinning below 10,000 feet AGL:

*6. Eject (RIO command eject).

Dual compressor stalls/engine overtemps should be expected in an inverted spin.