



WOW!

I'm Really messed up

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The next morning I grabbed my gradebook with anticipation to see what impressions my Instructor Pilot (IP) had on my last ride. Much to my surprise, the IP had written a rather benign statement, "big learning curve with poor weather — much experience

gained," on what I considered my scariest flying incident yet. This is the story of how I unknowingly put an F-16 into 90 degrees of bank and couldn't recover the aircraft by myself.

I graduated from UPT the previous September with the op-

portunity to fly the single seat F-16. Immediately, the realization that I would become a single seat pilot caused me to question where my weaknesses were. I began my training at a UPT base that rarely flew during weather, so I'd had little opportunity to experience severe

Spatial Disorientation (Spatial D). By graduation, I could count the number of instrument approaches I had flown in actual weather on one hand. Because of this, I was very leery of my actual instrument experience. Fortunately, I thought, I'm going to Luke AFB in the desert and won't have to worry about Spatial D for a while. I mistakenly thought that, with more experi-

ence (albeit day VFR) and better avionics, Spatial D might never be a problem.

When my F-16 B course began at Luke, we learned that we would be the first F-16 class to train there with Night Vision Goggles (NVG's) as part of the basic course syllabus. The squadron leadership was excited and nervous about this new training. Apparently, some doubted that the Air Force could

send new pilots with only 50 hours of Viper time into the night with NVG's safely. However, because the Air Force operates at night, NVG experience is a critical skill for new wingmen. Using good ORM principles, the squadron leadership trained additional NVG instructors and wisely modified the F-16D models to allow the students to have backseat IP's as safety observers on all flights.



The mission was my second in the NVG training phase and was flown as a 2-ship with one student and one instructor in each jet. We planned to hit a tanker and then practice basic 2-ship tactical maneuvering followed by 1 v 1 intercepts on each other. As luck would have it, we were flying in the middle of the Arizona monsoon season, and the weather forecast called for scattered layers of clouds with thunderstorms in the air-

in route formation while in climbing right hand turns to fly to our airspace. Soon after, it became rapidly apparent that we would re-enter the weather, so lead cleared me to a mile radar trail. I began to weave and slow the aircraft to get spacing while simultaneously selecting the dogfight mode to get an Air Combat Maneuver (ACM) boresight lock on lead. Unfortunately, we entered the weather when I selected the ACM radar mode, which takes the artificial horizon line out of the Heads Up Display (HUD). I had just lost two sources of attitude data, horizon and the HUD. While fumbling in the

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space. It was a low illumination night over the Arizona desert, with no moon or significant cultural lighting, but just the kind of conditions that degrades NVG capabilities.

The ground ops, takeoff, and departure were uneventful. I goggled and was cleared to 1-mile line abreast formation as we climbed into the tanker track. As promised, we ran into several unseen (with NVG's) cloud layers en route to the tanker at FL 260. In fact, I went lost wingman three times with the IP taking the jet to get us rejoined the third time. We finally rejoined on the turning KC-135, degoggled, and stabilized in the observation position. The lengthy tanking (my second night tanking ever) took us through several turns in the Air Refueling (AR) track while flying in and out of the weather. After the extensive time flying formation in turns without a horizon, I didn't feel quite 100 percent as I finished refueling and rejoined onto my flight lead's wing.

I regoggled, and we departed the tanker in Visual Meteorological Conditions

cockpit for an OPS check, I noticed the main Attitude Display Indicator (ADI) telling me I was in about 45 degrees of right bank, significantly different than what I felt. (I probably put this attitude in during the weaving spacing maneuver.) I immediately concentrated on the round dials and placed the HUD back into the normal position. Before I could fight my senses and recover, lead came on the radio announcing that he was in a right hand turn. Despite suspecting that I was Spatial D'ed, I instinctually rolled the aircraft further to the right and placed the aircraft into 90 degrees of right bank. Instead of immediately recognizing/confirming/recovering, I added back stick pressure to maintain my altitude, thus beginning a graveyard spiral which could have ended in collision with the ground 30 seconds later. Luckily, knowing that the increase in G was not right for instrument flight, I finally let go of the controls saying, "I'm really (unprintable) up right now." The whole chain of events took no longer than 10 seconds.

My IP immediately recovered the jet, informed lead we were Spatial D'ed, and we let the autopilot fly for a good 5 minutes while we recaged our gyros. Once we got to the airspace we quickly decided to terminate and come home because the weather wouldn't allow tactical maneuvering. This was probably a good call because it wasn't until after the recovery, instrument landing, and even touchdown that I felt "normal" again.

Being a human factors major, this incident piqued my curiosity. To find answers, I looked no further than Chapter 22 of AFMAN 11-217. Its opening paragraph states that "the potential for spatial disorientation increases dramatically with the introduction of high performance, single seat fighters in the Air Force inventory." A quick check with the Air Force Safety Center revealed that 30 percent of the 190 Class A mishaps of F-16's (1975-1993) had spatial disorientation and channelized attention listed as primary causal factors. Clearly this is not an uncommon occurrence in the F-16.

According to AFMAN 11-217, as a new pilot I was set up for Spatial D. My general flying inexperience with the F-16 cockpit (50 hours) had not allowed me to become comfortable in the new aircraft. Additionally, since this was my third night ride, my NVG cross-check was not yet routine, causing me to go heads down in the cockpit often. Not surprisingly, pilots with less instrument time are also more susceptible to Spatial D. Therefore, my lack of real instrument time in pilot training aided the onset of Spatial D. Similarly, 11-217 says that Spatial D usually occurs with pilots with limited night proficiency in the past 30 days. Again, this was only my third night ride in 45 days. Clearly, I wasn't proficient.

In addition to the inexperience issues, the formation phase of flight increases the likelihood of Spatial D. It is difficult to suppress the vestibular sensations when in formation because the focal vision is not concentrating on a primary attitude reference. Instead it is focusing on a moving aircraft that may or may not provide reliable information with respect to the aircraft's attitude in relation to the horizon. Because the eyes do not receive reliable attitude information there is no way to counter the vestibular sensations the

body feels. Hence, 20 minutes of formation flying with the KC-135 in and out of the weather probably degraded my sense of a horizon making me more susceptible to Spatial D.

A final contributing factor to Spatial D is workload in the cockpit. During night or instrument flying, the body cannot rely on the subconscious sensory information because the peripheral visual information is not present. Instead, a person relies on attitude instruments to maintain visual dominance. NVG's do not add any peripheral vision and require an active cross-check to maintain visual. The tasks of finishing post refueling checks, changing frequencies, maneuvering to a new formation, and working the radar at the same time channelized my attention and disrupted my cross-check, causing me to lose the horizon. Unfortunately, with weather and lack of horizon in the HUD, I lost two instruments that provide focal vision to counter my incorrect perception that I was in straight and level flight. The excessive head movement while searching for switches probably exacerbated these sensory misperceptions. If I had stayed on instruments during the weave/spacing maneuver, visual dominance would have been maintained. Instead, a case of the leans gradually developed to the point where I felt straight and level despite being in 45 degrees of right bank.

As fighter pilots, we continually prepare for emergencies with EP's of the day and monthly SEPT's. Accident reports show that the physiological aspects of flying can kill you just as easily and should be reviewed frequently as well. According to AF Safety, there have been 31 F-16 engine failures from 1998 to March 2003 with no fatalities. During the same period, six F-16 pilots have died after becoming spatially disoriented. Clearly, the regular review of engine emergencies has paid great dividends to safety. Equally, pilots should not become complacent and ignore the dangers of spatial



Photo by Lans Stout

disorientation as this kills more often than engine emergencies.

Refresher academic training should be more than a simple, "Yes, Spatial D is going to happen, just simply recognize, confirm, recover" briefing. Rather, specific task saturating aspects of flight should be identified and briefed to prevent channelized attention and breakdowns in cross-checks. Experience and proficiency levels for both flight leads and wingmen need to be evaluated on every flight to prevent

two susceptible pilots from flying with each other. A "knock-it-off" and fly the jet first mentality should be stressed at the first hint of Spatial D. Finally, the immediate actions of recovering the aircraft should be chair flown to maintain familiarity with procedures.

As less experienced people are introduced to NVG's, the dangers of Spatial D cannot be over-emphasized. In my case, I was fortunate that I recognized the Spatial D and had 25,000 feet to figure it out with the help of a guy in my backseat. ▶