

Top Gun Debrief

Taking your mission reviews **to the next level**



A collection of Navy Fighter Weapons School aircraft over the Lower Otay Reservoir, Chula Vista, California, 1991.

NSA

BY **JAMES ALBRIGHT** james@code7700.com

By the time I saw the film “Top Gun,” I had met two or three graduates of the U.S. Navy’s Fighter Weapons School, which had inspired the title. I was impressed by each of them for their sober demeanor, no nonsense approach to flying and professionalism. The movie struck me as Hollywood’s attempt to ratchet up the sex appeal for one segment of the audience, and the machoism for another. The movie was all wrong.

A few years after I retired from a flying career in the U.S. Air Force, I had the great fortune to fly several trips with a graduate of the Navy’s Fighter Weapons School. He prefers to remain anonymous, so let’s just call him Gordon. I learned things from him about how Top Gun pilots learn, and I think they can be of use to us flying in the more genteel

world of flying passengers from Point A to Point B.

I first met Gordon in the lobby of the Waikiki Beach Marriott in Hawaii. I had airlined in from the U.S. East Coast and he from the West Coast. Another crew was bringing a Gulfstream GV from New York and we would take it the rest of the way to Australia. Now, Gordon flew contract trips for companies like mine. I heard he had spent most of his pilot life in Navy fighters and was new to the Gulfstream but was a quick study.

The next day the airplane was on time and we blasted off for Brisbane. Gordon ran through the checklist in the right seat competently but was full of questions about the plotting charts and every now and then about an HF position report. During our company’s mandatory debrief he was all ears about

unfamiliar procedures and techniques. But at the bar he was more interested in non-flying subjects. Gordon never talked about his Navy career except when asked. He said he’d flown the F-4 Phantom II off carriers during the Vietnam War. “Nothing too fancy,” was his summation. The return from Australia was more of the same but with fewer questions. After landing in Honolulu, we surrendered the airplane and our passengers to another crew and retreated to the bar at the Waikiki Beach Marriott. The next morning we’d be flying our separate ways home. Unlike our bar time in Australia, Gordon was full of questions about the Gulfstream and oceanic procedures. I have always been a big fan of extensive debriefs at the bar, but Gordon took the exchange to the next level.

I later learned that Gordon earned his Navy wings in the early 1960s and flew two combat tours in the F-4 off carriers in Southeast Asia. He graduated from the Navy's then newly founded Fighter Weapons School in 1969 and returned to the sea aboard another carrier for yet another combat tour. All told he had flown nearly 400 combat missions. His next career was as an airline captain. After retiring from that, he'd become a Gulfstream pilot. I learned all of this from his employment history. As far as he was concerned, all that was "no big deal." I thought otherwise and set out to learn more about the school made famous by the movie of the same name. What is it that gives a Top Gun pilot the ability to learn so effectively?

Lessons from Fighter Weapons School

The early days of aerial combat were said to be a matter of surviving long enough to learn what works and what doesn't. The lessons were hardly scientific. Sometime after the Korean War, U.S. Navy and Air Force pilots started applying science to the art and the early days of the Vietnam conflict appeared promising. U.S. fighter pilots tended to best their Soviet-trained North Vietnamese adversaries about two-thirds of

the time. But then the North Vietnamese caught on and got better.

In the first half of 1968, the Navy's air combat ratio dropped to worse than one-to-one. The service lost 10 aircraft while shooting down nine. That summer Navy pilots were shut out. The three-year bombing campaign known as "Rolling Thunder" came to an end in November 1968 with some concessions from North Vietnam. That meant 1969 was to be a quiet one in the air war and gave the Navy some time to come up with a new idea for training fighter pilots — namely, the Fighter Weapons School. Its purpose was to train fighter pilots in a more realistic environment to increase their success rate in dogfights.

Top Gun instructors played the role of enemy North Vietnamese pilots and engaged students in air-to-air "combat." These trainers, who were known collectively as the Red Force, flew fighter planes that were similar to the Soviet-built MiGs, and used the same tactics employed by the North Vietnamese. They were, for all practical purposes, top-notch North Vietnamese fighter pilots. Top Gun students flew U.S. Navy fighter jets and were collectively known as the Blue Force. They would climb into their planes each day and take off to face the Red Force. They were expected to push their planes — and themselves — right up to the edge of failure in order

to learn what their planes' full capability was and what was required to get that performance out of them. They tried different tactics in different situations, learning how best to respond to what the other guys were doing. But instead of missiles and bullets, their aircraft were equipped with cameras. The dogfights were also tracked by ground-based radar. Everything was recorded to be played back later for methodical, critical and sometimes painful examination.

Hollywood would have you believe these pilots showed up as "the best of the best" and came out even better. I asked a former Top Gun instructor about this and his answer was typically modest. "I don't know what 'best' means or how one would define it. However, one thing is for sure, when they graduated or were transferred out

of Top Gun, they were one of the best. These pilots could not only fly the aircraft to its optimum capability, but more importantly they understood the operational application of air combat tactics and weapons employment. There is no do to a very capable and 'intelligent' operator of the aircraft and onboard weapons system."

The pilots of the Red Force generally won the dogfights. And their superiority only increased over time, because every few weeks a whole new class of students would arrive while the trainers stayed there month after month. For each new class the first few days of dogfights, in particular, were usually brutal defeats for the Blue Force. That was OK, however, because the real action occurred after the pilots landed, in what the Navy called the "debrief."

The debrief would consist of a list of "goods, bads and others." This is a hallmark of Navy and Air Force aviation: Every training flight is followed by an analysis that may take longer than the flight itself. The debrief was a major part of the training sortie. Here is where the airborne encounter was dissected and both the instructor and student were able to provide input into what they saw and why they did what they did. Important aspects of the debrief usually included the following general topics:

- ▶ Spatial awareness — How many "bogies" were there, and where were they coming from?
- ▶ Situational awareness — When did we get a visual "tally ho" and were we able to maintain sight of the bogies throughout the fight?
- ▶ Flight discipline — Mutual support of flight integrity. Did we fight as a team or was the opponent able to break the formation into two separate fights?
- ▶ Energy management — Understanding your own energy state and also the energy state of your opponent.
- ▶ Weapons employment — Was I able to maneuver the aircraft to get a "solution" to fire the onboard weapons?
- ▶ Understanding your opponent's capabilities, both aircraft capabilities and onboard weapons capabilities.
- ▶ Did we stay within the "rules of engagement" — honoring the "hard deck" and airspace boundaries?
- ▶ What did we do well, and where do we need to improve?

Over time, the students learned to ask themselves the questions, and each day they would take the previous session's lessons with them as they flew. Slowly, they internalized what they'd

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Mikoyan MiG-17 shot down by an F-105D, June, 3 1967.

been taught so that they didn't have to think so much before reacting. And slowly they would see improvement in their dogfights against the Red Force. Top Gun graduates returned to the fleet to pass along what they had learned.

The air war resumed in 1970. U.S. Air Force pilots picked up where they left off, with about a two-to-one kill ratio. The results for the U.S. Navy were far different: From 1970 to 1973, Navy pilots shot down an average of 12.5 North Vietnamese fighters for every U.S. Navy plane lost. During the last full year of fighting, in 1972, Navy fighter pilots shot down an average of 1.04 jets per encounter. In other words, on average, every time Navy pilots came in contact with the enemy they would down an enemy plane. Of course, we aren't trying to down enemy planes in our business and commercial aircraft. But we can take a page from Top Gun and learn how to make our debriefs better learning experiences.

the ability to provide meaningful critiques to others.

As civilians flying for flight departments that hope to keep the same set of pilots for years and years, the upgrade chase ends relatively quickly. Pilots become familiar and personal relationships can become lasting. The merciless critique is not only unwelcome, it can be detrimental to the smooth operation of the flight department itself. For example, there is great pressure to ignore another pilot's long landing. "We all make mistakes," becomes the ongoing excuse. However, if we can't expect critique from others, it will have to come from within. If you are in a leadership position, this is especially important. If the boss is unwilling to provide a critical assessment of his or her own performance, nobody else will, either.

There is a right way to do this and, inevitably, a wrong way. In one of my Air Force squadrons we called this "self-immolation," something like the ancient

bad, as if it is just a matter of routine. It also gives your fellow crewmembers a chance to offer their own self-critiques. But how do you remember everything that deserves mention? After a 30-min. hop from Boston to White Plains, it can be easy to forget what happened during the preflight, engine start, or even during the takeoff. Now try to remember all that stuff after a 14-hr. flight to Tel Aviv. As an Air Force instructor pilot I often flew with a kneeboard and kept a running log of notes to remind myself what needed covering during the debrief. You can still do that, but there are easier ways.

When we fly oceanic crossings or over remote areas, we are required to maintain a "master document" flight plan. We either have it in paper form, usually on a clipboard, or in our iPads. Either way, we are supposed to enter times, fuels and other data so as to reconstruct the flight should anyone want proof that we did all this in accordance with International Civil Aviation Organization and FAA guidance. On a domestic flight, we are more likely to tuck the flight plan away once we've recorded our ATC clearance, never to be seen again. In either case, the flight plan provides an excellent place to record notes about the conduct of the flight. Among the things you should make record of:

- ▶ Clearances (including any confusion or challenges with ATC).
- ▶ Forgotten or improperly applied checklist steps.
- ▶ Procedural confusion (with aircraft systems, air traffic control or other standard operating procedures).
- ▶ Mechanical and software problems noted in the aircraft or any loose equipment.
- ▶ A qualitative judgment on how well (or poorly) departure, arrival, approach and landing were flown.

I recommend you make a practice of pulling out this paper or electronic document for every post-flight debrief. Even if you didn't make any notes, it will serve as a reminder of where you flew and when, helping to guide your debrief.

Facts, Procedures and Techniques

Cover problems factually, without editorializing — note "what" happened. Cover the "why" only if you are sure, and preface your explanation with a qualifier like "I think" if you are unsure. Remember that something required by an



USAF Undergraduate Pilot Training student with instructors.

Effective Debriefs

A debriefing in an Air Force or Navy squadron can be merciless. Pilots rarely spend more than three years at an assignment and are usually upgrading from one position to another. Pilots are never static, they are always moving to the next level. In such an environment, pilots learn to critique themselves before anyone else has a chance. This effort at self-critique not only improves "the self" but improves

Samurai warrior pulling out the short sword and ending his shame in front of the shogun. Don't do that. While I am sure there are many ways to conduct a critical self-assessment, what follows is what has worked best for me.

Reconstruct the Flight Chronologically

Covering the flight from start to finish allows you to examine the good and

aircraft manual or government regulation can be thought of as procedure, it isn't optional. But unwritten guidance and best practices are techniques; they are recommended but not mandatory.

Offer corrective advice and solicit opinions — if you made the mistake, offer what you think can solve things in the future. Give others a chance to contribute, but don't reject ideas flatly. (That risks shutting down all further instruction.) If you are the senior pilot, if you have an official role as an instructor or other training officer, or if you have a position of authority where junior pilots look to you for guidance, things change a little. You can give more direct instruction because it is expected (and should be appreciated). But diplomacy and tact are still important.

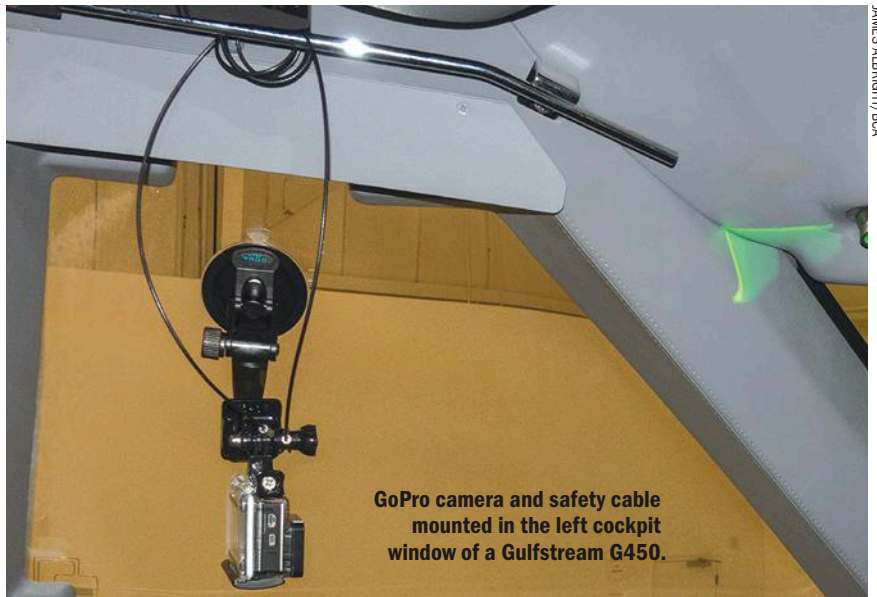
For some issues, a picture can be worth a thousand words. You should unleash your inner Rembrandt since even a hastily drawn image can illuminate the problem and the solution all at once. It can also stimulate discussion. There are times, however, when a video is needed to iron out recurring problems.

'Gun' Cameras

Fighter aircraft have been using gun cameras for almost as long as they've been using guns. Moves and counter-moves in the air combat arena happen quickly and without camera footage it may be impossible to reconstruct and really nail down what happened during the seconds and minutes of an engagement. Fighter pilots are well schooled at looking back at a "1 v 1" (one aircraft versus another), "2 v 2" or even a "2 v many" to see what went wrong, what went right and where things could have been improved.

For us, flying jets onto stationary slabs of asphalt and concrete, the task is simpler but the opportunity for improvement remains. Take, for example, the need to put the airplane down onto the touchdown zone, on speed, on centerline, off a stable approach. The 10 sec. before and after touchdown happen so quickly we can miss the errors. An inexpensive "GoPro" type of camera can be safely mounted over the pilot's shoulder and can provide invaluable feedback you may not be able to get otherwise. But you have to look at the results with an analytical (and critical) eye.

There are several models of self-contained cameras with wide-angle lenses that are suitable for the task of recording your takeoffs and landings. Most of



GoPro camera and safety cable mounted in the left cockpit window of a Gulfstream G450.

JAMES ALBRIGHT/BCA

these are classified as "action cameras" as opposed to video cameras. The distinction isn't important, except that the former usually is limited to 20 min. of record time, while the latter will record for as long as the memory card and battery last. But before you embark on your cockpit filmmaking career, a few cautions are in order.

Ensure the camera is securely mounted. I've seen various clamp set-ups that seem to work. The most popular solution is a suction cup that affixes to the side windows to look forward.

No matter how you mount the camera, add a strap to catch the camera in case it falls. You want to ensure a falling camera doesn't hit anything to activate a switch or button or, even worse, jam a control. There have been a few accidents over the years where a larger camera became lodged against a control stick. I worry about the camera getting in the way of the nose-wheel steering tiller. Plus, a good strap can limit the damage to the camera itself.

Keep the "big picture" in mind when framing your shot. The purpose of this camera is not to show your fan club how you are able to land that massive airplane on that small little runway. The purpose is to record a stable approach

that ends in the touchdown zone of the runway with a controlled deceleration; and if the results fall short of that, the video should help you figure out why.

Once you have your video you need to look at it with a critical eye. If you have a Runway Awareness and Advisory System (RAAS), you will be able to apply science to your analysis. Here are a few things to look for:



Gulfstream G450 Capt. Jon Cain 2 sec. prior to touchdown.

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- ▶ Is the aircraft on the correct glide-path, on extended centerline?
- ▶ As the aircraft crosses 100 ft. above the landing surface, it should be one-third of a nautical mile from the touchdown point (about 2,000 ft.). If you have a 1,000-ft. displaced threshold, for example, you should just be crossing the start of that overrun.
- ▶ As the aircraft crosses 50 ft., you should be just crossing the runway threshold.

- ▶ At 10 ft. above the runway, you should have a good look at the touchdown zone right in front of you.
- ▶ The time between that 10-ft. call and touchdown should not exceed 3 sec. At 120 kt. you are covering 202 ft. per second. A 3-sec. flare consumes 606 ft. at that speed and can take you well beyond the touchdown zone.
- ▶ The flare should be one smooth, continuous pitch up for most aircraft.
- ▶ The roll-out should be on centerline.

Even the best fighter pilot can miss “the big picture” when dealing with other aircraft in a dynamic air-to-air engagement. A ground-based radar is often used in training ranges to help pilots dissect a battle from start to finish, providing an invaluable and objective lesson for all participants. Technology has improved since the early days of Top Gun so that airborne radar platforms provide the same ability for actual engagements with an enemy.

Having a radar plot of every flight where things don’t go as planned would be a great learning tool for us flying transport category airplanes, but obviously that’s impossible to pull off logistically. But we do have the next best thing.

The ‘Radar’ Tape

A Flight Operations Quality Assurance (FOQA) system extracts data from your flight data recorder (FDR) and provides an in-depth analysis of any events that exceed established parameters or for flights where you request the data. Of course, it is up to you to read the report and come up with your own conclusions. Even without a FOQA system, you can find very good data at many flight tracking websites, such as FlightAware.com. Other websites, such as LiveATC.net, can provide useful replays of ATC communications.

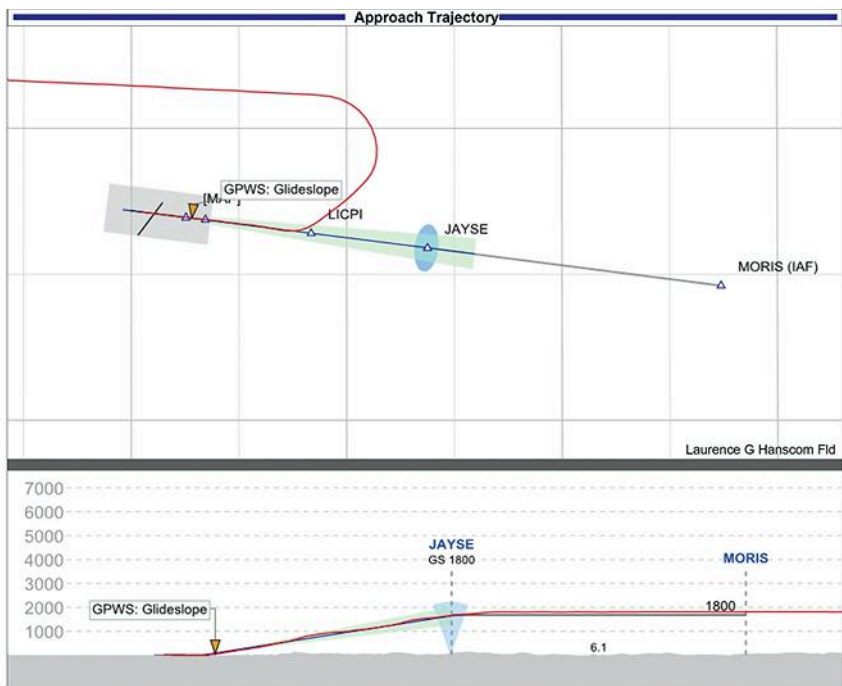
Over the years the FOQA system taught us that we were not flying stabilized approaches when flying visual patterns, that we often ducked under a stabilized glidepath on shorter runways, and that sometimes we stop more abruptly than we need to. In each case, we thought we were doing everything right, but FOQA showed us where we needed to improve. Perhaps the best way to illustrate this is with an example of the very first FOQA report we got after initial installation.

If you’ve ever flown a visual approach to Runway 29 at Hanscom Field, Bedford, Massachusetts (KBED) you will have seen the three towers abeam a 2.5

nm final, just to the north. I had always flown my base just inside the towers, allowing me to roll out at 2 mi. and about 600 ft. for a nice, stable final approach. Or so I thought.

Everything has to be just right to make a roll-out at 2 mi. and 600 ft., and things rarely work out “just right.” I heard from another Gulfstream operator that the FOQA didn’t like you joining the ILS below the glidepath so your choices were to ensure the ILS wasn’t tuned or to ignore the FOQA report. So that was my plan until I got our first report.

It revealed we were actually joining



the glideslope at 400 ft. and sometimes as low as 300 ft. The effort often ended up in a very sloppy looking pattern. We worked this through our Safety Management System and came up with the conclusion that flying outside the towers only added a half mile but made the entire pattern much safer. We no longer have a problem getting a stable approach on a visual to Runway 29 at KBED.

The experience taught us to be more open to looking at what we have always assumed was the safest way to do things, especially when FOQA begs to differ.

No matter how much technology you use to guide your debriefing, you should end on a high note. “We’ll never do that again!” works better than “we sure blew it today!” Keeping things positive keeps everyone motivated and encourages participation in the future.

Building a ‘Top Gun’ Debriefing Culture

A thorough debrief is the best way to ensure hard experience is turned into valuable lessons learned. You can elevate your debrief to Top Gun status by using your printed or electronic flight plan to take notes and to jog your memory about the events of the flight. You can take advantage of technology such as FOQA to provide a dispassionate critique. And you should never hesitate to critique your own performance, the good and the bad, to ensure your lessons

Bedford Airport, Runway 29, FOQA example.

learned are shared. Finally, allow the rest of the crew the same opportunity and try to keep things positive.

I flew with Gordon a few more times, once to China and a few times to Europe and the Middle East. Each flight revealed he learned very quickly, was keen on self-critique and was always open to instruction. In my role as the seasoned Gulfstream pilot and his as the fledgling contractor, I was the instructor and he the student. But as the pilot always looking for a better way, he was my professor. Over the years I had already learned to appreciate the value of excellent instruction. But my Top Gun instructor taught me to raise the debrief to the top of my most important learning tools. **BCA**