

ENGEN



One of VAdm. Engen's favorite aircraft, North American's FJ-3 Fury flew with the Navy and Marines in the late 50s and early 60s. Although obviously based on the F-86, the Navy's "Fury From Columbus" was a redesigned aircraft.

One of that large group of combat-tested World War II Naval Aviators, VAdm. Engen received the Navy Cross as a dive-bomber pilot in VB-19, flying the Curtiss SB2C Helldiver. He enjoyed a varied postwar career as an experimental test pilot, and also saw further combat in Korea, flying the first strikes of the war in June 1950 from USS *Valley Forge* (CV-45). He commanded VF-21, and CAG-11 in the early 60s. He was also the CO of USS *America* (CV-66) during its tour in the eastern Med during the 1967 Arab-Israeli War.

After his retirement in 1978, VAdm. Engen manufactured cabin-class Piper aircraft. He then served as a member of the National Transportation Safety Board and as the FAA Administrator for three-and-a-half years. He is now President of the Aircraft Owners and Pilots Association Air Safety Foundation. *Approach* interviewed the admiral in his Washington, D.C., office.

VAdm. Engen: Before we begin, there's something I'd like to talk about – something that characterizes the development of jet aviation. First of all, you have to remember, the good pilots were adventurous. We were building experience, and by the fact that we didn't kill ourselves, we got good. That's a terrible thing for a guy like myself, involved in safety, to say, but it's a testament to how we have developed professionalism in Naval Aviation. When we started flying – and it was really true in the 20s and 30s – the atmosphere was very cavalier, particularly during World War II. We never thought about safety.

I used to fly along the north face of

Molokai in Hawaii. There's a sheer cliff, with a little pinnacle that stuck up. You couldn't go between the pinnacle and the face of the cliff with your wings level. So, I developed the technique of standing on the rudder and going through sideways, between the two rocks. You just did those things. That sounds wild today, but it was characteristic of those days.

Approach: That was commensurate with the mishap rate.

VAdm. Engen: It was, yes. We didn't even understand mishap rates. The first time I woke up to the fact that we needed to improve our flying procedures was when I realized that we killed 10 percent of our squadron in training and workups

before we went to war. It really sank in.

Never take risks that you haven't explored, or haven't thought out. There's nothing wrong with taking risks. In military aviation, we all must take them at times, particularly in war. But you need to think the risks out. You have to plan. Don't fly extemporaneously.

When we got jet airplanes, we really didn't understand what we had. The Navy had two jet fighter squadrons in the late 40s, one on the East Coast, VF-171, and one on the West Coast, VF-51. I joined VF-51 in 1948 as a lieutenant. I was still pretty young.

I tried to help develop a more professional attitude about flying jets. There were a lot of risk-takers in the group. I had been Operations Officer in a night all-weather squadron, and I began developing instrument flight procedures in jets.

For instance, after takeoff in the FJ-1 Fury – the first straight-wing version of that early fighter – you were already a fuel emergency because you only had 45 minutes of fuel. You had to figure out how to get back. San Diego had fog all the time in the spring, and you had to plan for that. Miramar – or Kearney Mesa as it was called then – was still only a bombing range, and we flew from North Island.

An opportunity came to go to the Landing Aids Experimental Station at Arcada, California, in September 1949. I took an F9F-3 Panther to Arcada, which was a CAA contract operation, run by American Overseas Airways. I took the first jet airplane they'd ever seen up there. I landed, and the whole town came out to see this airplane without a propeller. We only flew if the weather was 200 and 1/4 – or less. We never flew unless we had fog, and that was supposed to be one of the foggiest places in the country. We developed the instrument approach to acquire a visual lighting system, and I flew with a measured ceiling of 0-25 feet, and less than 1/16 mile forward visibility. That's only one light down the runway. You never saw two lights.

I wrote up instrument flying procedures for jets. We used that in VF-51, and then VF-52 picked it up. I devised the teardrop letdown – the jet penetration – when we got the F9F-3. First, we had to teach our pilots, then the people on the ground on



Lt. Don Engen in 1944. He was a divebomber pilot in a Curtiss SB2C Helldiver.

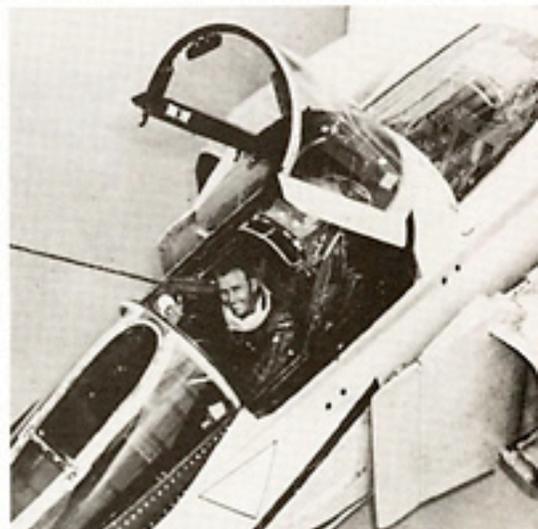
how to relate to us. We had new capabilities, with this rapid up-and-down capability and speed.

We all had devised different ways, but no one had solidified the procedures until then. I think that is what is so characteristic of those early jet days, and what drove us to be more professional, and hence, more safe. Landings and takeoffs from carriers with straight decks and no hydraulic catapults were part of it, but that was all part of reaching forward.

Approach: You made the first night jet takeoffs from a carrier in February 1950, from USS Boxer (CV-21) as part of VF-51. While night operations are commonplace, they are still the most potentially-hazardous form of routine flight operations aboard a carrier. What did you do to prepare for your pioneering flights?

VAdm. Engen: Eight of us made those first night takeoffs and landings in jets, three from VF-51, three from VF-171, and the CAG and his Operations Officer. Everyone was fairly senior. As a lieutenant, I was the "baby" of the group. We had to hone our all-weather skills before we flew aboard. It's this instrument flight training that I mentioned before, something I am quite proud of. We did a lot of night bouncing at San Diego, at Brown Field, to develop our night capabilities. Lt. Tom Mix was the LSO, and he stood with a 24-volt battery between his legs to light his suit, as well as the long, hand-held light bars he used to signal with.

The night was black. We made two day cat shots and traps – to warm up – and



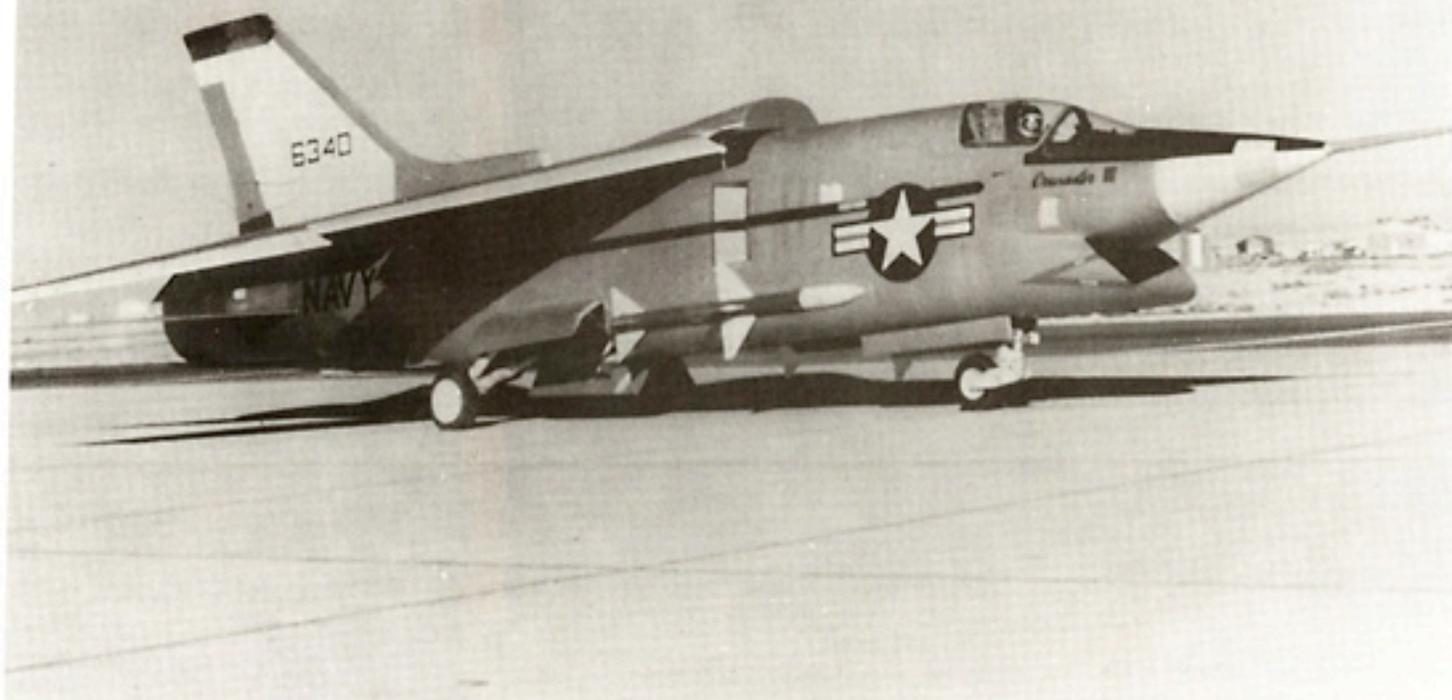
In an F4H cockpit in August 1959.



Cdr. Don Engen set a world altitude record with the F4H in September 1959.

two night launches and recoveries. We had actually left the USS *Valley Forge* (CV-45) on February 20, and came out to the Boxer for the tests a couple of days later.

We flew a flat pass, at 175 feet altitude, at about 122 knots, with 35 knots of wind across the deck, until we picked up the LSO at the 90-degree point in the pattern. We continued to perhaps 800 feet from the ship, and took our cut from him. Our engaging speed was well below 100 knots. The deck was cleared, but during our landings it was fouled at times. With those axial-deck carriers, we did have



Many consider Vought's F8U-3 Crusader III the ultimate single-seater. However, the impressive fighter lost out to the Phantom in a 1958 competition.

barriers to keep us from going up the deck and crashing into these aircraft spotted forward.

The key point on safety I want to make about this phase is the *professionalism* we developed in learning how to fly the aircraft on instruments *first*. You can't fly at sea without flying on instruments. Our training gave us the confidence and the capability to make those first night carrier landings.

Safety involves limiting your exposure to risks you understand, knowing what you're doing. I spent my whole career as a test pilot living with risk. You have to measure it; there are some times you should say, "No!" Test pilot or not, don't go out there and blindly *do* something dumb.

A good skipper knows when a crewman is not ready to fly. It's far better that the skipper leads and understand his people, rather than having someone rebel and say, "I can't do this." The skipper's experience is vital to the morale and safety of the squadron. He has to make these judgments. It would be a funny outfit if everyone started saying, "I can't."

You can't have an A Team and a B Team. You have to bring the squadron along together. True, some people have

greater capabilities than others. And a good schedules officer will schedule people within their abilities. But, the skipper has to know his people, and bear the responsibilities.

Approach: You were also involved in early work with the mirror landing system. How does that system compare to today's carrier landing aids?

Vadm. Engen: The mirror landing system was interesting because it led to a whole new concept in carrier operations. I was the first pilot to fly aboard a ship using the new system, during my exchange tour at Britain's Empire Test Pilot School at Farnborough in 1953. I flew a De Havilland Vampire, one of their early single-seat jet fighters, aboard HMS *Illustrious*.

The bingo procedure was to continue making landings until you had 50 gallons – we used gallons, not pounds. If we were airborne when we reached bingo, we climbed as high as possible until we *flamed out*. We shot a flameout approach to the bingo field, and made a dead-stick landing. This may sound hairy, but that was how things were done.

We developed the procedures at the Royal Aircraft Establishment (RAE) at Farnborough. The RAE trucked the lens

to Southampton, and put it on board *Illustrious*. I flew out to the ship at sea.

There was no radio to communicate with the LSO – or batsman as the British call him. I was on my own. The LSO was there, but only to observe, in case I hit the ramp.

I couldn't see the mirror because the datum light wasn't on. So, I eyeballed it and landed on board. We didn't make cat shots, and they pushed me back until the Vampire's twin booms hung over the aft end of the deck. Then, the flight deck officer gave me three nonchalant waves of his flag and turned his back on me, leaving me to launch with a deck run. I made three landings before they could figure how to turn the datum light on. By then, it was time for lunch.

They finally found the "o-n/o-f-f" switch, and got the mirror going, and I made a series of landings. Clearly, the mirror provided flexibility and accuracy. I recommended its adoption for the U.S. Navy. Later, we bought a mirror from the British and installed it in USS *Bennington*. It was two years after I had flown on board *Illustrious* before the mirror trials were held on board *Bennington*.

As a historical sidenote, Royal Navy Commander Nick Goodhardt developed

the mirror by using his secretary's compact mirror and lipstick. He screwed her lipstick up until just the red tip was showing, set it on a book in front of her mirror on the desk, and he held it. His secretary walked around his desk and followed the lipstick up and down. He noted that her chin touched his desk at the same place everytime. That's how the approach using the mirror was developed. We flew the mirror for years, then went on to the lens which is a superb system.

As far as comparing the system to today's landing aids, it's identical, except that the LSO used to have a rag to polish the mirror. Now, he only has to wipe off the lens. We've come light years, although we've killed a lot of people in the development of these devices. Our earlier cavalier attitude has given way to a more professional outlook.

Approach: *Among the aircraft you flew was the Vought XF8U-3 Crusader III. While this advanced fighter lost out to the McDonnell F-4 Phantom II, many people consider it to be the ultimate single-seater. In fact, the plane's performance was never fully explored. What were your safety considerations in flying such a powerful aircraft?*

VAdm. Engen: Wonderful airplane. Without a doubt, one of the finest aircraft I have ever flown. Let me give you a little philosophy about flying aircraft, and how man and machine need to come together. You need to be an extension of that machine; you need to know it cold, its capabilities and its limitations, and to feel absolutely comfortable with it. Another fine aircraft, one with beautifully harmonized controls, was the North American FJ-3 Fury. I could do an Immelman on takeoff.

In a clean FJ-3, if I had 210 knots when I crossed the fence after takeoff, I could do an Immelman, come across the top at 2,600 feet with about 125 knots, 4 knots above stall speed, and fly away. I had that down cold. I didn't do that maneuver without practice, a lot of practice. I did it on takeoffs so it would look spontaneous, but it wasn't. I knew exactly what I was doing.

Approach: *That certainly is interesting, Admiral, but you couldn't get away with something like that today.*

VAdm. Engen: No, of course not. But, again, you have to understand the system

at the time, and the mishap rate showed it. It was a mindset of those times. The people were not necessarily less responsible; it was just the way we flew.

I'm probably coming across as a little too cavalier. But, I repeat, those were different times and we developed our attitudes as we progressed. It's important that you understand about the period, and I have to be truthful. We've come such a long way from those previous days in aviation safety.

Getting back to the F8U-3, it flew like the FJ-3, except that the Crusader III had tremendous thrust. But, there were really bad duct problems. The duct would go critical, and you could feel this burble coming underneath your seat; it sounded like a 40mm cannon right between your legs. Dust would fly around the cockpit as you went Mach 1.6. We were limited to an IMN of 2.2. In a great engineering feat, Vought worked out the duct rumble in six weeks.

We were warned that if the plexiglas canopy turned milky, we should quickly slow down. If we didn't, the canopy would melt. The aircraft was accelerating as fast at 2.2 IMN as it was at 1.7 IMN. I think it would have gone 3.0. The fastest I flew the dash-3 was Mach 2.32, 700 KIAS, at 35,000 feet, on November 17, 1958.

There may have been risk involved in some of our test flying of the F8U-3, but we had to identify that risk. For instance, I was always wary of high "Q" – high dynamic pressure, or high airspeed at low altitude. I lost too many friends to that risk. High-speed flying below 10,000 feet is not very smart in my book. As we de-



After retiring from the Navy, VAdm. Engen served as the Administrator for the FAA. He often flew the FAA's Lockheed Jetstar.

veloped aircraft with high-speed capability, we lost a few people. I think we are smarter today; certainly, our aircraft are stronger.

I have always treated high Q with great respect. During one test flight in an F-4, I hit 935 knots at 9,000 feet. I was scared pea-green. I came down from 26,000 feet in a split-s and full burner. The risk was high and I didn't enjoy it very much. But, I had to do it to see if the Phantom would meet its design criteria.

Approach: *With all that, Admiral, how do you relate your testing experiences in those advanced types to today's high-performance aircraft?*

VAdm. Engen: You have to talk in terms of controllability and the part of the envelope you're working in. If you operate in the upper right-hand corner of any envelope, you increase the risk. Your time to react to an unusual situation is shorter, because the airplane is operating at the extreme end of its capabilities. If anything goes wrong, your chances of survival are diminished. Unless I was in combat, I would not operate in that area of the envelope, especially below 10,000 feet. High dynamic pressure can be very unforgiving.

Approach: *What about low-level operations, where your mission takes you down that low?*

VAdm. Engen: Well, I'm talking about flying at high subsonic and supersonic speeds. You've got dash capability, though, and if you have to go supersonic, you have to accept that risk. The odds of something going wrong increase, like a birdstrike, and you're operating in the part of the envelope that gives you limited flexibility. Now, I must stress the value of knowing your capabilities and limitations. Every pilot must know them. I spent my first years learning how to calibrate myself. I literally learned about flying in Test Pilot's School, even after eight years of flying in the fleet, in peacetime and in two wars.

I don't believe you achieve safety by being a timid pilot; you achieve it by being professional. Do not be afraid of the airplane. Know your airplane and its limits, and don't exceed them. Operate with confidence. Exceeding those limits is dangerous.

— Peter Morsky