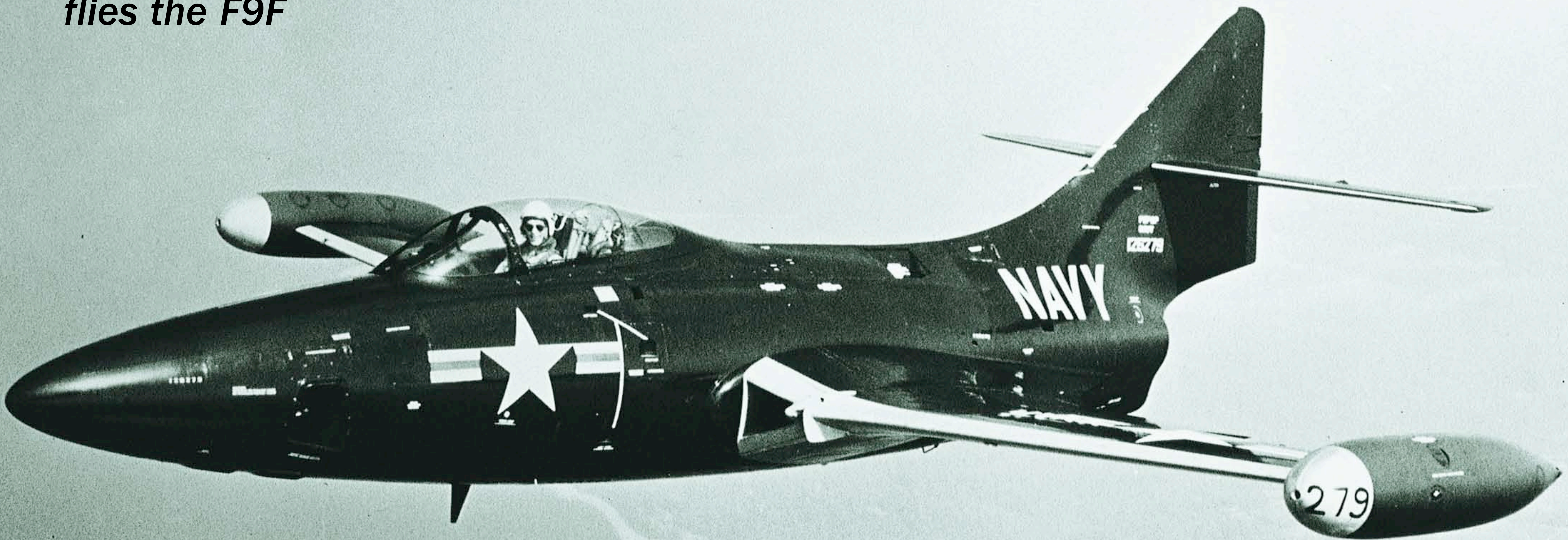
GRUMMAN PANTHER

Test pilot Corky Meyer flies the F9F



BY CORWIN H. MEYER

During the early part of WW II, Grumman's F6F-3 Hellcat was a very timely addition to Naval carrier aviation. Because two production engines were available, the Hellcat progressed from its first experimental test-flight aircraft to 2,543 of them being delivered to the Navy in 17 months! No other fighter aircraft came close to such a record in WW II.

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The first production F9F-2 with four WW I 250-pound bombs during the structural demonstration carried out only a month before the "Police Action" started in June 1950. These bombs were not designed for the speeds of a jet fighter and adversely affected its flight characteristics. They were limited to a maximum speed of 300mph.

In the late '40s, Grumman's first jet fighter, the F9F-2 Panther, was the last in a line of jet-fighter development relative to the Chance Vought F6U-1 Pirate, the McDonnell F2H-1 Banshee and the North American F2J-1 Fury. Like the Grumman WW II Hellcat, however, the Panther also had two reliable engines available to fulfill Grumman's long-standing policy of never equipping a new fighter with a new engine. That policy paid off not only in timely output but also in providing the most reliable Navy carrier jet fighter in the Korean War. Eight Panthers from VF-51 on the CV-45, the USS *Valley Forge*, made the first strike on the Pyongyang airfield only eight days after the "police action" was declared by President Truman. Before the truce at the 38th Parallel was signed two and a half years later, 26 Naval and 16 Marine squadrons had used the Panther in combat—not bad for the last Navy jet fighter to have a coming-out party.

I previously described the Panther's preliminary design and first flight problems in "Blowing a Panther's Nose" (October 1997 *Flight Journal*), so now I will relate several tales of the unexpected, unwanted and all-too-frequent embarrassing episodes that happened during its early test-flight escapades.

FLAMEOUT FIASCO

My first "escapade" happened during an early Panther test flight—before we had much understanding of jet engine fuel systems. Pratt & Whitney, which was producing the Rolls-Royce-designed J-42 Nene jet engine for the Panther, asked us to check out engine operations during full-throttle switchovers from the normal to the emergency fuel systems.

I started the tests at 5,000 feet. The switchovers were normal until I got to 25,000 feet. Then, when I switched from normal to emergency, the engine began to growl and the tail pipe temperature rose somewhat, but not over the limit. At 30,000 feet, the switch-over showed the engine to have louder aches and pains. The growl now shook the aircraft, and the tailpipe temperatures went to the limit. I should have stopped at this point of the test, but I had been assured by the Pratt and Rolls engineers that I would have no trouble with air-starting the engine—none whatsoever!

During the next switchover at 33,000 feet, there was a series of explosions, the tailpipe temperature went rapidly over the limit, and the engine flamed out before I could yank the throttle back. I was now riding in a very quiet, heavy and descending "glider," whose cabin pressurization was disappearing rapidly. I went through the air-start procedure at the correct windmilling rpm of 10 percent, but nothing happened; silence! The Rolls representative had told me that air starts would be immediate at below 25,000 feet, so I waited. It didn't start at 25,000, 20,000, or 15,000, so I frantically tried 1,000-foot intervals, while getting more apprehensive with each failure. I tried slightly differing engine windmilling speeds, but to no avail.

The author about to depart on a test flight in 1947. We were most fortunate to have the Rolls-Royce Nene engine for our development flights. There was no record of any Nene J-42 engine failure in flight except for the air start mishap in this article. An excellent reason for the Panther's superb production-delivery and combat record.

Before the flight, I had decided that if an engine-off landing was required, I would use a two-mile-long potato field just north of the Grumman airport in preference to Grumman's 5,000-foot runway that had housing developments at either end.

At 3,300 feet, I gave up all starting efforts on that uncooperative Rolls-Royce Nene engine and concentrated on a 360-degree flameout-landing pattern for a wheels-up landing on the potatoes. Without any cockpit help from me, all of a sudden, a great blast of energy shot out of the engine, the tailpipe temperature soared way over the limit, and engine rpm increased rapidly to about 30 percent thrust. Fortunately, it stopped where I had left the throttle after my last air-start attempt. After "things" (mainly me) had settled down, I noted that the engine seemed to be running smoothly enough and with sufficient power for a landing at Grumman. With wheels and flaps down, I made a much less dramatic landing at the Grumman airport than I had planned at the potato field.

After I had shut down the engine, mechanics looked into the tailpipe and found that the two spark-plug-like air-start igniters had been burnt to a crisp and were also so twisted and warped that they could not be removed or tested. They also told me that they had seen the flames, more than 100 yards long, shoot out of my tailpipe when the engine had overcome my vain efforts and had mercifully started on its own.

During our debriefing, the Pratt representatives gave me the usual down-the-nose look implying "pilot error." They couldn't find any "engineering" justification for my near catastrophe. Their inspection report also stated that there was no possibility that the igniters could have started the engine because they had been damaged beyond use. Because of the excessive temperatures generated during the air-start attempts, the engine was removed and returned to Pratt for a complete teardown and inspection. I was later advised that Pratt judged Grumman test pilots incapable of properly conducting an air-start program.

Shortly thereafter, the Navy suggested that Pratt borrow the other of our two XF9F-2 prototypes for an air-start program at its plant near Hartford, Connecticut. I was soon vindicated and their assessment of my ineptitude proved wrong. On their first fuel-control switchover test flight, the engine flamed out precisely at 33,000 feet. Their "much more professional" chief test pilot, Harold Archer, worked frantically all the way to the ground without success and, having no potato fields available, was forced to make a very cleverly executed deadstick landing on Brainard Field's 4,500-foot runway. He blew both tires when he skidded off the end of it, however. Pratt officials now pontifically "deemed" the problem to be the result of material failure. A new air-start ignition system called "Shower of sparks" did a great job of giving a reliable air start at more than 25,000 feet for the rest of the Panther's operational life. I'm thankful I was never "blessed" with the need for another air start with a Nene engine.

THE "HOT" EJECTION SEAT THAT WASN'T

In 1947, ejection-seat development wasn't one cohesive effort, but one of jet aircraft manufacturers designing and testing their own seats from scratch. The Bell P-59 jet I flew in 1944 was not even designed to accommodate an ejection seat. I have a few memories of my ejection-seat checkout during two evaluation flights in a Lockheed P-80A at Wright Field on July 24, 1947. Before I taxied to the runway, the plane captain pulled several pins with long red-cloth streamers attached from the seat and said, "The seat is now hot."

After the first two flights in the XF9F-2, I casually asked my plane captain why he didn't have any beribboned pins to pull out to make his ejection seat "hot." His frank answer was that the seat had no propellant system because the engineers hadn't completed the required demonstration test firings, thus, they reasoned that if I ejected, it might injure my back! When I suggested that I would rather have a bad back than a funeral, they installed the propellants promptly, and I completed the test firings as soon as I could.

THE PANTHER WAITED DISCREETLY UNTIL AFTER THE AIRSHOW

On the ninth flight, I was scheduled to fly at an airshow in front of a large number of the New York news reporters. Grumman's custom was to demonstrate the aircraft when top management was satisfied that it had expanded its structural flight envelope sufficiently for a safe public demonstration. Grumman management and the Panther almost didn't wait long enough.

The Panther's first airshow was completely normal and uneventful—the usual high-speed passes, aerobatics, etc.—until I landed and left the cockpit. With the media waiting to interview me, I noted fuel gushing from the Panther's belly as though it were hastily relieving itself!

The experimental XF9F-2 Panther at its first media airshow, during which, just after the engine had been shut down, its fuel streamed out of a parted fuel line—fortunately, after the landing rollout!

The plane was quickly dragged out of sight and inspected. The results were frightening. The two-inch main-fuel-line clamp had loosened at the engine inlet nipple because it had not been properly secured during manufacture. The good Lord had been looking over my shoulder during the first eight exploratory flights by not letting the fuel line part until after my ninth landing rollout. A reinspection of the entire aircraft also revealed several other major defects that had been missed during the previous eight preflights! Even more mind-boggling was that there was neither mention nor a picture of the 20-foot-diameter fuel puddle that appeared in the news reports!

The Panther "shocks" at its second airshow

Idlewild Airport (now JFK)—the grandest and largest (4,900 acres) of New York's three airports—opened to great fanfare on Sunday, August 1, 1948. All the available dignitaries, including President Harry S. Truman, joined thousands of New Yorkers in saluting the aerial might of more than 900 aircraft of the United States Navy, Air Force, Army and Marines. The show was to continue for five days. Navy coordinator Capt. Roy Sempler asked Grumman to stage a solo airshow demo in the Navy's newest XF9F-2 Panther jet fighter.

The 500,000 opening-day attendees were probably treated to the most massive airshow ever seen. During the three-hour afternoon program, the U.S. armed services air armada displayed hundreds of WW II bombers plus the gigantic new B-36 atomic bomber and hundreds of all types of WW II fighters and transport aircraft. All of the 900 war machines were tightly orbiting Idlewild in squadron formations of 50 to 100 aircraft and waiting to be called in to make their low passes over the field. It was pandemonium flying in that unbelievable gaggle, and it was a miracle that there were no midair collisions. For those of us flying, the coordination of the airshow was very time-consuming; I had to loiter in the air for almost an hour after the Navy program had been scheduled to begin before I could do the demo flight.

The Navy was given only half an hour for its complete revue, which consisted of smoke-bomb raids on the field by five squadrons of Hellcats and Corsairs, launching and

Corky Meyer shakes hands with Navy Capt. Roy Sempler after the first fantastic Idlewild airshow on August 1, 1948, in which the Navy's half-hour revue totally eclipsed all of the hundreds of Army and USAF aircraft flying about in massive formations.

retrieving Bearcats on a simulated carrier deck equipped with catapult and arresting gear, a very short JATO takeoff and steep climb by a Lockheed P2V Neptune, and a daring ground rescue by a Piasecki twin-rotor helicopter. Mine was the last act, and I was to make a single, low-altitude pass in front of the President's stand. The new Panther jet was to be the crème de la crème of the Navy's segment.

With the unknown help of heat and humidity from ocean-fed water areas around Idlewild, a massive white, visible shockwave completely enveloped the rear of the Panther during my 625mph (0.82 Mach) very low pass over the President's stand. It continued until I had disappeared in a steep climb-out. I wasn't aware of it until I was told about it after landing.

I still have a copy of the following day's issue of *The New York Times*. The front-page headlines declared: "Truman Dedicates Idlewild Airport; Hails it as the 'Front Door' for the UN." Right under that was, "Navy Steals Show. Navy Experimental Jet in Spectacular Run. Eyes Can Scarcely Follow it"—and much, much more. I ate it up—humbly, of course.

Early the next day, Grumman received an urgent message from Washington that the Navy's premier test pilot, Capt. Fred Trapnell, would fly the remaining airshows instead of a "civilian" pilot. I was un-delighted. A few hours later, the Navy relented because Trapnell told them that he had no Panther flight experience. He recommended that I continue to perform the remaining four shows, and this I did with great pleasure. What an ego trip!

The Panther's "fortunate" carrier-test accident

Because the Navy had previously conducted all carrier-suitability demonstration responsibilities, one of the XF9F-2s soon went to Patuxent for preliminary trials. On his first arrested landing, Navy project test pilot Cdr. "Butch" Davenport received the cut and snatched the wire easily with his arresting hook. The rear half of the fuselage with the fin and stabilizer immediately parted company with the rest of the aircraft at the engine-removal/fuselage-disassembly juncture. That part of the aircraft remained hooked to the arresting wire. Thinking his hook had missed the single-wire arresting gear, Butch immediately applied full throttle to go around the pattern to make another arrested landing. Fortunately, a fast-talking ground-crew member immediately radioed his situation to him, and the accident was not further compounded by his trying to fly without the back half of his Panther. The entire tail-assembly joint was subsequently redesigned, and the Panther program never suffered another structural failure during the rest of its 20-year Naval career.

Meyer Park number two

In April 1950, two months before the Korean War started, Grumman was given high priority by the Navy to demonstrate the Panther's maximum load of external stores: six, five-inch HVAR rockets, two 1,000-pound bombs and a full internal and tip-tank fuel load.

In my hurry to save taxiing an extra 3,000 feet to get to the runway entrance, I elected to taxi across a 30-foot strip of grass to the runway. Just before I got onto the runway, my airplane came to a sudden stop. Over my plane captain's frantic suggestion to the contrary, I called for the tow bar to be attached to the nosewheel to pull the plane onto the runway. The tow truck pulled, the nosewheel drag-strut broke, and the nose promptly crashed to the runway. The Navy's priorities suddenly disappeared. When I climbed out, I saw that the wheels were buried up to their hubcaps in the mud without having dented the ground for the first 28 feet across the sod. The catastrophe had just begun.

The runway had to be closed to the 14 Grumman Panthers undergoing production test flights. They had to be diverted to the overloaded runways at Republic Airport three miles away. Navy delivery flights were canceled for the rest of the day. Our new and untested emergency crane was attached to the Panther's nose. When it tried to lift the Panther, it showed a definite proclivity to topple—onto the Panther. Twenty-five Grummanites, including top management who had come out for the fun, had to be assembled and tightly positioned on the back of the crane before we could remove my broken Panther from the runway.

My boss, Bob Hall, the vice president of experimental engineering, came out to the gala event with a large grin that he declined to explain while enjoying the episode. I later

The Panther's slow genesis

Aviation historians have long speculated about why Grumman was the last major U.S. manufacturer to embark on jet-fighter production. Among their theories are:

- The company was too busy making vast profits fulfilling production orders for the F8F Bearcat, the F7F Tigercat, AF-1, 2S-ASW Guardian and JR2F/SA-16 Albatross amphibians.
- Grumman engineers lacked the research talent required for the move from propeller-driven to jet-propelled aircraft.
- Grumman's top management was convinced that jet propulsion was only a passing fad.

The real reason: the long-term Grumman policy of caution in its approach to all new challenges. Having been the project test pilot for the F6F Hellcat, F7F Tigercat and F8F Bearcat, I was privy to many decisions that affected the design of new fighters.

Grumman's policy when selecting a powerplant for a new model was to use the very latest squadron-reliable engine currently in production. The management didn't want new-engine problems to complicate the normal gestation trials of an experimental airframe.

The Grumman philosophy was derived from and reinforced by all the company's top-management test pilots: Roy Grumman, Bob Hall, Bud Gillies and Cdr. Dave Rittenhouse USN (Ret.). Their judgment and guidance produced remarkable results. From startup in 1930 until 1980, in testing more than 100 experimental types and 34,000 production aircraft, Grumman lost only two prototypes. No other military aircraft company ever came close to this record.

Gestation gymnastics for the final Panther design

At the Joint Army/Navy Fighter Conference at Patuxent in October 1944, I and several Grumman test pilots flew and evaluated America's first jet-powered fighter: the Bell YP-59A. Because of our discouraging flight reports, John Karanik, head of the Grumman propulsion department, had studied all of the U.S. jet engines under development: the Westinghouse J-19 and J-34 engine, General Electric's 1-40 centrifugal-flow and J-35GE7 axial-flow engines and Allison's J-33. By Grumman standards, they all lacked the degree of reliability required of a single-engine carrier-based fighter.

Karanik went to England to investigate the Rolls-Royce Halford, Derwent and Nene engines. The 5,000-pound-thrust Nene had 1,000 pounds more thrust than any American jet engine. Karanik was convinced that Rolls-Royce had a better record of trouble-free ground- and flight-testing and RAF squadron use of all the other jet-engine manufacturers he had reviewed. Congress had dictated that no foreign engines could be imported into the United States for production aircraft; the Navy, therefore, induced Pratt & Whitney to obtain a license to build Nenes in the U.S.

XF9F-1: A four-engine night fighter

The single-engine XF9F-2 Panther didn't just spring out of the fountain of Grumman's preliminary-design team. The Navy requested a proposal for a jet-powered, two-place night fighter that would be capable of detecting an enemy jet at 40,000 feet, and 500mph and a distance of 125 miles. Grumman presented the four-engine Westinghouse-powered XF9F-1, in competition with Douglas, Curtiss and Fleetwings, to the Navy, while Karanik searched for the ideal jet engine. Grumman's effort on this four-engine monster Panther began in September 1945, and it was rewarded with a contract on April 11, 1946. But with afterthought, the Navy deemed the Douglas proposal superior and canceled the XF9F-1 contract. It also canceled the Douglas contract shortly afterward.

Grumman already had a second team working on a single-engine aircraft powered by the Rolls-Royce Nene. It convinced the Navy to revise the existing XF9F-1 contract to accommodate the single-engine XF9F-2. The contract was amended on October 9, 1946; three single-engine prototypes, a structural ground-test and design data for a sweptwing version were requested. The engines in the experimental aircraft were to be the 5,000-pound-thrust British-built Nenes with the 4,000-pound-thrust American Allison J-33s production backups in case the Pratt & Whitney J-42 Nene production was delayed.

The Navy inspected the mock-ups of the two XF9F-2 prototypes in January 1946 and didn't require any changes. I conducted a very satisfactory first flight of the 5,000-pound-thrust Rolls-Royce Nene-powered fighter on November 21, 1947.

To show how late Grumman entered the Navy's jet-fighter arena, the McDonnell Phantom I, with two 1,600-pound-thrust Westinghouse J-34 engines first flew on January 26, 1945; the North American Fury, with a 3,820-pound-thrust Allison J-35 engine flew on September 11, 1946; and the Vought Pirate flew on October 2, 1946, powered with a 3,000-pound-thrust Westinghouse J-34 engine.

learned that shortly after he had come to Grumman, he had landed Mr. Grumman's personal G-21 Goose amphibian wheels-up twice in one day! It was great to work for leaders whose experiences allowed them to understand an underling's public embarrassment.

Without any attempt to mitigate my excruciating exhibition, I'll add that it was later revealed that the shear link in the Panther tow bar had never been structurally tested. That's why the nosewheel down-lock mechanism broke long before the designed shear link in the tow bar. Only the most diligent engineering test pilots test tow bars and crash cranes!

The XF9F-5 Panther's first "Grumman Ironworks" airshow

As the project pilot of the more powerful XF9F-5, I was asked to demonstrate its capabilities to a visiting group of admirals. On my first low pass along the Bethpage runway, I was unintentionally 50 knots over the maximum airspeed that I had attained at altitude during the flight-envelope expansion, but I was still below the preliminary engineering-approved sea-level airspeed limits. I pulled 5G for a vertical climb-out. For a split second, the stick forces were normal. Then they almost immediately reversed at about 2G, and it took a two-handed push force to avoid exceeding 8.5G. This was 1G over the wing structure's limit load! Fortunately, I soon slowed to below 300 knots in my vertical climb, and the maneuvering stick force returned to normal. I was a very wide-eyed test pilot because the speed of my pull-up was 100 knots less than what I had used in many airshows when flying F9F-2/3 series Panthers. I ended the performance and landed immediately for a complete aircraft inspection.

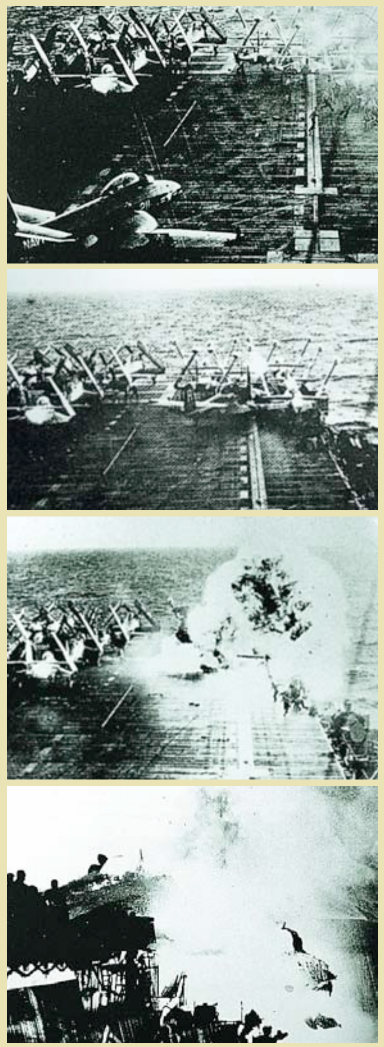
When I asked the aerodynamic and structural engineers what caused this frightening phenomenon, they speculated that it was probably the result of the wings' lower torsional strength, as the XF9F-5 was designed to have a much thinner wing section than the F9F-2. They also told me that under G-forces, the wingtip tanks aggravated the situation. They were guessing, however, because they had only just begun the F9F-5 wing structural tests. They went back to the drawing board and did some masterful wing-torsional redesigning before they completed the structural tests; this provided the thinner-wing F9F-5 Panther with the same maneuvering structural flight envelope as the F9F-2 Panther.

Two years later, in 1952, the Air Force experienced a rash of complete wing failures on the tip-tank-equipped F-89C Scorpion night fighter during low-level, high-speed maneuvering. The failure was attributed to severe torsional aeroelastic problems. After several crashes—one into a gas storage tank in a Los Angeles residential area during an airshow—all F-89Cs were grounded and returned to the factory for a structural redesign of the wing. Grumman was fortunate to discover this defect before production deliveries of the F9F-5 had begun.

Panther deploys during carrier's highest landing accident rate

VF-51 was the Navy's first Panther squadron deployed on the USS *Essex* (CV-9) into the Korean conflict. This was in early June 1950—just one week after President Truman had declared this four-year war to be a "police action." Panther fighter and fighter-bomber sweeps were required two or three times a day because North Koreans had advanced to within a few miles of the southern tip of the South Korean peninsula.

The Essex also had several McDonnell F2H-2P Banshee photorecon aircraft in its complement to record the progress of the North Korean advance south. One day after squadron VF-51 had finished landing, Lt. John Moore, the last Panther pilot to land, taxied over the retracted barrier in the parking area on the forward end of the carrier deck and started to exit his Panther. He was standing in the cockpit, (see the far right side of the carrier pack in the photo on the left), when a Banshee (seen in the foreground) landed much too fast and bounced high over the now erect barrier and headed toward the pack of Panthers.



Left: the Banshee is about a second away from hitting Lt. Moore's Panther. The third photo from the top shows the initial fireball that erupted as the Banshee collided with Lt. Moore's Panther and the one next to it. In the bottom photo, the fireball is visible over the side of the carrier as Moore and five of the burning Panthers were bashed into the sea below. Fortunately, Moore was picked up by the helicopter after its pilot had blown the fire aside to see him in the water. He was immediately deposited on the afterdeck, seriously burned over 50 percent of his face and body. He spent more than six months recovering in a Japanese hospital, but he continued his Navy career as a test pilot at the Patuxent Naval Test Center. He then became a test pilot at the North American Navy plant in Columbus.

The death toll for this accident was three dead, four missing and presumed dead and 15 injured. Eight new jet fighters had been totally demolished! This tragedy was not the worst to happen during this time. In 1950, 752 Naval aircraft were destroyed in accidents that cost $216 million. This was almost the highest accident-rate-year for the Navy, but 1954 exceeded that with 776 aircraft destroyed. In contrast, in 1998, only 33 aircraft were destroyed, but it cost $771 million to replace them!

HOORAY FOR THE BRITISH

If it had not been for the three British carrier inventions already proven in the Royal Navy, carrier aviation would have vanished as a weapon in the world's navies. These inventions were: the angled deck that eliminated the need for a barrier and permitted the storing of landed aircraft on the forward deck in complete safety; the mirror landing system that gave the pilot a continuous visual signal for his approach path to the carrier deck (one that he could see from a mile aft of the carrier); and the steam catapult that allowed the much higher speeds and weights required of the jet aircraft coming into inventory.

Pratt & Whitney J-48 engine headaches

The more powerful Pratt & Whitney J-48 engines installed in the F9F-5 Panther displayed two very interesting "growing pains" after delivery to Grumman. When I had flown our XF9F-5 airplane for more than 100 hours, the Grumman instrumentation department routinely recalibrated the cockpit tailpipe temperature indicator. It showed that an incorrect bias had been installed in the test instrument prior to the first flight. This error had caused the cockpit instrument to measure 760 degrees Centigrade in the tailpipe at full power while only indicating 700 degrees on the cockpit instrument! Sixty degrees Centigrade is 140 degrees Fahrenheit!

After reviewing the complete past Grumman flight-test program on the J-48, Pratt & Whitney promptly increased the 150-hour ground-test limit of 700 degrees to 760 degrees without any further ground or flight tests!—unbelievable, but fact.

The second engine problem was a little more shocking to the Navy, Grumman and me. I had just landed after attempting a full-power speed run to determine the max speed of the J-48-powered XF9F-5 Panther at sea level. I stopped the run and returned to Grumman long before accelerating to top speed because the air was extremely rough and shook the aircraft so much that it blurred the instrument panel and my stomach. During lunch, my plane captain, Rudy Winscher, came in to inform me that my aircraft now had a hole in the bottom of the fuselage that was large enough for him to see a very damaged engine inside! When the engine was removed for further inspection, it was found that the brazing joint had failed in the 90-degree fuel-nozzle fitting within the bottom burner of the engine. The nozzle had then rotated 180 degrees downward in flight and blow-torched its way through the bottom of the burner and the aircraft structure, thoroughly charring the main fuel line as it progressed. This engine was ahead of its time in demonstrating "vectored thrust."

The Pratt representatives declared this an "isolated case," and another engine was installed in the XF9F-5 to allow the continuation of the flight-test program. During the next few weeks, five F9F-5 squadrons reported five similar events during which five Navy pilots died in fiery crashes. The Navy then "convinced" Pratt & Whitney's top management that these six "isolated" events were their direct responsibility. All F9F-5s were grounded for engine inspections and the replacement of the nine nozzles on each.

I have never spent much time wondering just what might have happened if the air had been smooth for my full-power speed run at sea level. Looking back, I'm pleased that I was able to attend lunch that day.

A simple solution to a major F9F-5 carrier-suitability problem

When the F9F-5 finally passed its carrier-qualification tests at Patuxent with flying colors, we at Grumman thought that the Navy's glowing report would be the end of the Panther development program. It wasn't.

Shortly after the F9F-5 squadrons started carrier qualifications, Grumman received a very curt but clear Naval message that stated, "The F9F-5 stall speed must be decreased by 12mph or it will be removed from carrier operations." The future production potential was clear. That the North American FJ-2 (Navy version of the USAF North American Aviation F-86E Sabre jet) was making its debut in Navy squadrons had Grumman put the Naval message on top priority to find a fix. The aerodynamics department was at a loss for a simple fix to decrease the F9F-5s' stall speed. After I told him of one of my previous aerial investigations, boss Bob Hall then directed me to have the Skunk Works' experimental shop personnel try a possible solution.

During several of my flights in the F9F-5, I had been concerned about a large area of possibly turbulent airflow behind the discontinuous intersection of the leading-edge "droop snoot" and the engine air ducts when the flaps and the droop snoot were extended for landing. To satisfy my curiosity on one flight, I had taped many six-inch pieces of yarn around the affected areas so that I'd be able to see the airflow. I was amazed to see such a large area of turbulent flow—it extended to the wing's trailing edge—and also the instant reversion to smooth flow when the flaps and droop snoots were retracted. The Panther aerodynamicist had pooh-poohed my supposition that lift might be lost because of the turbulence. I had almost forgotten that conversation.

I then slid a piece of cardboard into the droop-snoot slot at its inboard end, drew a fence outline for a template, had a stiff aluminum fence designed and installed and flight tested it in our instrumented F9F-5 test aircraft. This was all accomplished within two hours of Bob Hall's authorization.

The fence demonstrated a 9mph decrease in stall speed! We then sealed several other places in the flap and wing-fold hinges where it appeared that airflow leaks might not be appropriate. We also rendered inoperative the large flap cutout door—designed for a very long, special-missile clearance—except when the atomic missile was to be carried. These changes showed a further reduction of 4mph in the stall speed. We now met the Navy requirement.

At NATC Patuxent, Cdr.—now Admiral—"Whitey" Feightner and I, flying standard F9F-5s, flew more than 70 formation stalls from 15,000 feet to 5,000 feet. He soon agreed that we had indeed decreased the F9F-5's stall speed by the required 12mph.

A few months ago at the annual meeting of the Golden Eagles, I had the pleasure of reminiscing with Whitey regarding this experience of 50 years ago.

All production and operational F9F-5s were provided with this "fence" package. It was considered such a good idea that all of the F9F-2 and -3s were also retrofitted with it. This small change avoided many likely carrier accidents and gave the Panther a 2,000-pound increase in external-stores carrying capability.

During my 1997 flights in the F/A-18B, I noted a similar droop-snoot configuration that was accompanied by a lot of buffeting when the snoots and flaps were extended. I sent a very detailed letter with Panther fence pictures to the Commander Naval Aircraft Atlantic regarding our Panther fence success and received absolutely no response—not even a politically correct, "We will consider it" reply. Sic semper tyrannis.

Competing against three other Navy jet-fighter contractors, Grumman's prudence caused it to come in last place in fielding a carrier-based jet fighter. Its patience, however, eventually provided the Navy with a jet fighter that totaled 78 percent of all the carrier and land-based jet fighter and jet fighter-bomber aircraft deployed in the Korean War. Not bad for a late bloomer. +