Fargo’s F-16s Win William Tell
SEMPER VIPER AWARD
FOR OUTSTANDING AIRMANSHIP

F-16 pilots worldwide are eligible for this Dryden Semper Viper Award. The award pays tribute to pilots demonstrating airmanship skills noteworthy of its namesake, the late Joe Bill Dryden. It is presented annually at the F-16 Viper Driver Reunion held in Phoenix, Arizona. A selection panel from the Lockheed Fort Worth Company evaluates candidates who carry on Joe Bill’s tradition of excellence in airmanship and system knowledge.

The first award was presented to Capt. Robert “Wilbur” Wright for his actions during his 28 February 1994 mission over Bosnia for Operation Deny Flight. Wright downed three J-1 Jastreb attack aircraft after they had bombed a factory in central Bosnia.

Candidate applications for 1995 should be mailed to the Code One editorial office (see facing page for address). Applications should include complete information describing particular missions or outstanding aviation skills demonstrated by the nominee. Receipt of nominations will be acknowledged by the selection panel.

PRESENTED TO

CAPTAIN BOB “WILBUR” WRIGHT

IN RECOGNITION OF YOUR
SUPERIOR AIRMANSHIP
DURING "OPERATION DENY FLIGHT"
ON THE MORNING OF 28 FEBRUARY 1994

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ABOUT OUR COVER
Nineteen thousand feet above the Gulf of Mexico,
an AIM-9 Sparrow streaks from the wing of "Ice
One," the F-16 ADF of Maj. Bob "Pee Wee" Edlund,
captain of the first-place 1994 William Tell team
from the 119th FG, North Dakota ANG. The live
firing took place during Profile I of the prestigious
worldwide air-to-air competition. Maj. Edlund's
missile scored a direct hit on an MQM-107D target
drone six miles away. Painting, titled "Fire and Ice,"
by Price Randel.
FARGO WINS William Tell 1994
An F-16 unit was not supposed to win William Tell 1994. Not only have F-15 Eagle units owned this Superbowl of Air Superiority since 1982, they also outnumbered F-16 units five-to-two. Furthermore, both F-16 teams came from the “part-time” pilots and maintenance personnel of the Air National Guard, whereas four of the five F-15 teams came from active Air Force wings. And these wings had much larger pools of aircraft, pilots, and maintenance personnel from which to carefully select the finest to compete.

Finally, and probably most importantly, the F-15’s larger radar has around twice the range of an F-16. Eagle drivers could see and track their targets long before their Fighting Falcon counterparts knew what was there.

But someone must have forgotten to explain all this to the 119th Fighter Group. Last October, this ANG unit from North Dakota flew down to Tyndall AFB in Florida with its air-defense F-16As and flew back with all the marbles and major bragging rights that go along with top prize at William Tell. In fact, the Happy Hooligans of the 119th and the Green Mountain Boys of the 158th Fighter Group of Burlington, Vermont, (the only other F-16 unit competing) finished ahead of all five competing F-15 teams. These results are making it much harder for F-16 proponents to hold back when talking air superiority.
"The F-15 is the beyond visual range airplane," said Lt. Col. Tom Larson, the operations group commander and project officer for Fargo’s William Tell team. “The F-15 was built for BVR. It definitely has a lot of advantages with radar missiles. But this win proves what F-16 pilots have known all along: the F-16 is as good as any other aircraft in air superiority.”

Col. Michael Haugen, commander of the 119th, will readily admit that he was elated but not all that surprised by the win. “We said from the beginning that we were going down there for one purpose,” he explained. “We did not go down there to show that the F-16 could compete. We went to win.” Haugen and others at Fargo credit preparation most for their success. “We read the rules carefully to see how to maximize our scores,” Haugen continued. “We talked about what we were going to do. We laid out a game plan. And we executed it once we got down there.”

“When a video crew asked us if they could tape one of our preflight briefings during the competition,” recounted Maj. Bob Edlund, Fargo’s team captain for William Tell, “I told them we don’t brief. They thought I was joking. But apart from what we were required to discuss before the flights, we didn’t. We had practiced what we were going to do so many times there was no need to talk about it.”
William Tell is the US Air Force’s foremost air-to-air competition. The biennial event, which began in 1954, tests all phases of air defense and air superiority in realistic air-to-air environments. The eight teams competing in 1994 came from the 9th Air Force (F-15C teams from the 1st Fighter Wing at Langley AFB, Virginia, and the 33rd Fighter Wing at Eglin AFB, Florida), US Air Forces Europe (an F-15C team from the 52nd Fighter Wing at Spangdahlem AB, Germany), Pacific Air Forces (an F-15C team from the 18th Fighter Wing at Kadena AB, Japan—winners of the two previous William Tells), the Air National Guard (F-16As from North Dakota, F-16Cs from Vermont, and an F-15A team from the 122nd Fighter Squadron at New Orleans, Louisiana), and the Canadian Air Forces Air Command (a CF-18 team from the 425th and the 433rd Fighter Squadrons at Bagotville CFB, Quebec).

The competition consisted of four flying events, called profiles, and two weapon loading events—a static load and an integrated combat turn (a timed event in which five team members return an arriving aircraft to full combat status as quickly as possible). Maintenance was judged throughout the competition. The performance of ground-based radar controllers (also called weapons directors) in guiding competing aircraft to their air targets was scored as well in three of the four profiles.

Every team brought five aircraft and five pilots. The fifth was a backup or spare. In three of the profiles, pilots flew part of a two-aircraft element (one lead and one wingman). All four aircraft flew simultaneously in the remaining profile. Teams worked with the same radar controllers throughout the competition. Training for the competition was limited to sixty days before the event and a maximum thirty flying days for every pilot. Teams could bring a maximum of ten people with previous William Tell experience.

From the moment a horn blew to begin Profile IV, teams had about three minutes to get to their aircraft to the runway. The scramble start was a special challenge for Fargo’s 119th because they flew the only aircraft not equipped with a ring laser gyro navigation system.
In Profile I, each two-aircraft element of every team faced two MQM-107D subscale drones flying threat tactics. The lead aircraft of the element fired a live radar missile, either an AIM-7 Sparrow or an AIM-120 AMRAAM, at one drone and the wingman fired a live AIM-9 Sidewinder at the other. Instead of warheads, all missiles carried telemetry transmitters for scoring the shots. Pilots were scored on miss distances and on the time it took to shoot down the drones.

Profile II was a gun attack against an AGTS-36 aerial gunnery target towed by an F-15. In this profile, one pilot tried to get a fast, high-angle shot at the target in less than fifty-five seconds from the initial pass, or merge. Bonus points were awarded for scoring in less than twenty-five seconds. At the same time, the other pilot tried to track the target as long as possible and hit it as many times as possible during the fifty-five seconds following the merge. The pilots reversed roles for a second pass at the target. No weapons director competition was held in conjunction with this profile.

In Profile III, all four of a team’s aircraft had to defend an area against a mass raid of sixteen attackers that included B-1s, B-52s, QF-106s, QF-4s, LearJets, and Canadian Challenger aircraft. Among these attacking aircraft was one F-15 friendly, which the team had to identify and not shoot down. Each team and its associated weapons directors had to detect, identify as hostile, and engage all sixteen bomber threats within a forty-five-minute vulnerability period.

In Profile IV, two-aircraft elements faced four manned QF-106s (these aircraft can also be flown from the ground) flying scripted maneuvers. The profile began with a scramble start. The objective was to detect, sort, and engage the four adversaries and shoot them down within five minutes. This was probably the most dynamic—and, therefore, the most difficult—profile of the four. Results from Profile IV were kept secret until the awards ceremony.

Flying scores from the four profiles were combined with scores from maintenance, weapon loading events, and radar controllers to determine the top team. Flying represented sixty percent of available points; weapons director, twenty percent; maintenance, ten percent; and weapon loading, ten percent. Awards were also given for the first-place finishers of each profile (profile awards included operational, maintenance, and radar controller scores), top operations team (the aircrew team that accumulated the most points in the four profiles), top element (lead and wingman who accumulated the most points in the four profiles), top maintenance team, top weapon loading team, top weapons director team, and top scope (controller within a weapons director team who accumulated the most points).

As it turned out, Fargo’s performance in Profile IV put them over the top for the win. Even though the QF-106s flew the same threat tactics against all the teams, Fargo fielded the only team to have both of its elements shoot down all four QF-106 threats. Being the only unit to achieve eight hits out of eight shots equated to about 2,600 points (out of a possible 14,500) between first and second place in the profile. Fargo’s second element, piloted by Maj. Robert Becklund and Maj. George Lambirth, shot all four targets before the merge, in less than four minutes into the encounter. “We could not have done it any quicker,” explained Becklund, who, perhaps not so coincidentally, was in charge of training his team for Profile IV. “We practiced for the worst-case scenario,” Becklund continued. “We assumed one bandit in every altitude block from the surface to the 45,000 feet. [The upper altitude limit was 50,000 feet.] I don’t think the other units practiced that way.”

“No other team came down as high and as fast as we did in Profile IV,” added Edlund, whose element killed all four targets in just
over four minutes. “We came down from about 30,000 feet and flew the maximum speed for the missile. We came down high and fast so we would have time to sort and kill anyone we missed before the merge. We left the engine at maximum afterburner until we hit the merge. That was the best way to approach the profile.”

These tactics came from a careful study of the rules and group discussions on what to expect as a worst-case scenario in each profile. “We knew there were going to be four targets, but that was about all we knew,” explained Haugen. “So we asked ourselves what can they do to screw us up the most. Everyone said that they can go to the beam and thereby disappear on the radar.

“Well, it turns out that the QF-106s came in fast and went to the beam, which made them invisible for a while,” Haugen continued. “The targets came in as a four-ship cell real fast. Then one went straight up, one went straight down, and the other two went straight left and right. It was like a bomb burst. So the next time you saw them on the radar, one was at 50,000 feet, one at 1,000 feet, and the other two at medium altitude and separated by sixteen miles. And they were all going straight at you at twice the speed of sound, as fast as or faster than you could go. Now you had only a few minutes to kill all four. That’s difficult to do with four targets coming at you at Mach 2 and separated by a bunch of airspace. You can’t catch them unless you’ve figured out how to deploy your force to start with.

“We had to come in high enough and fast enough to shoot the first two with a radar missile and then go after the other two using altitude and speed to our advantage. You can’t kill them all if you’re not prepared for this maneuver. We had the scenario pegged because we suspected that they might use the beam action to screw up all the Doppler radars. Here’s where experience comes into play. We have several people who have seen and used that maneuver to defeat radars before. We looked for the worst-case scenario and we trained for it. We had the airspace at home to practice that profile, too.”

“When we trained for Profile IV, we had good days when we’d go out and smack all four guys and we’d have bad days when we’d get only two,” said Edlund. “To be honest, we could have gone out the next day and hit only three. There is a little luck involved. We played the scenario well and we prepared well. I was quite surprised that at least two F-15 units and the Burlington F-16 unit did not get all four.”

“I’ve been to six William Tells,” Larson said. “In every one, some units did some things better and some things worse. That happens in every competition. Everyone, including us, could have done better. We could have done better in the Profile II, the gun profile. We also got credit for only fourteen of the sixteen targets in Profile III. We shot all sixteen but two were a mile past the BRL [bomb release line—a range limit in Profile III] after the judges took out their micrometers and measured everything. But every team has a story like that.”

Add to Fargo’s perfect performance in Profile IV solid finishes in the three other profiles as well as near-perfect scores for the weapon loading team, maintenance, and radar controllers and you have some idea why this ANG team beat the best of the active Air Force.

“We never had a plane break,” said Edlund. “We never missed one takeoff time. We didn’t have to use a spare. And every missile came off the rail just like it was supposed to. That means maintenance personnel, weapon loaders, and the other specialists did everything perfectly.

“We also had phenomenal radar controllers,” Edlund continued. “We listened to our controllers and we trusted them. We worked with them hard. One of the people watching the ACMII screen during our Profile IV said the difference between our team and others was that we listened to the radar controllers and let them build the big picture.” (ACMI, or air combat maneuvering instrumentation, is an electronic means for viewing air engagements on the ground.)
“Working well with ground controllers is a habit we’ve developed because of our radar limitations,” Edlund added. “We don’t blow off the ground controllers. We’re used to listening to them to get situational awareness outside of our radar coverage.” As proof of Edlund’s accolades for his radar controllers, Fargo’s controllers, from McChord AFB, Washington, finished second in both controller categories of the competition. Burlington’s controllers finished first.

“Of course, you have to give the airplane a lot of credit,” Haugen said. “We didn’t have any problems. The airplane worked fine. This wasn’t a major surge, though. You’re flying the airplane only four times during the actual competition. The preparation you do for the competition will determine how well you will do. The maintenance that leads up to it is much more important than the maintenance you do down there. Our exceptionally long lock-on ranges, for example, can be credited to the work we did in advance of the competition.”

The performance of Fargo’s APG-66 radars was probably one of the biggest technical surprises of the competition and a tribute to the entire unit. “Our APG-66 radar is underrated,” Haugen said. “If maintained really well, it will surprise you. Our maintenance guys really worked on the radar. They studied it and talked to representatives from Raytheon, Hughes, Westinghouse, and Lockheed. I think we even surprised some engineers with the contact ranges we were getting.”

MSgt. Darrell Nordick, the avionics flight line supervisor for Fargo’s team, said the exceptional radar performance was the result of better communication between the pilots and the avionics shop and a little more attention to detail. “We always keep the airplanes in top condition,” said Nordick. “We didn’t do that much statistical tracking of avionic performance for the competition. We don’t have the assets to throw away antennas or to trade for other ones. Our avionics shop just set its standards a little higher. For instance, we used transmitters with the maximum output and the best antennas. The long ranges we saw down there were the result of eliminating a lot of small things.” The 119th is now incorporating some of these procedures into their regular operations.

Another likely factor in Fargo’s win was a two-week deployment to a National Guard training site in Savannah, Georgia, a month before the competition. In Georgia, Fargo practiced for William Tell with the teams from Burlington and Canada. These three teams took the top three places. “Whatever we did down there, we did it right,” said Edlund.

“Some teams flew at least twice as many training sorties as we did,” continued Edlund. “But that can work against you, too. I think we had the right mix. When we got back from our two-week deployment to Georgia the week before we went to Tyndall, our pilots flew only one or two sorties. We didn’t want to peak early. We wanted to peak down there. You can get burned out.”

Aside from being a little slower than his younger competitors in the seventy-five-yard scramble to the aircraft in Profile IV, Edlund said the part-time nature of the ANG was
more than offset by years of experience. “Their best guys have five years of experience,” Edlund said. “Our best have twenty-five doing the same thing. Every pilot we sent had at least 1,000 hours in the F-16. All were flight leads and two were instructor pilots.”

Any built-in disadvantages for the Air National Guard in the competition were probably misperceptions. “Historically, we may have had fewer deployments and less training in dissimilar air combat,” Larson said, “but that situation has changed as the demands on the Guard have increased. We now go to all the exercises. Last October, we went to Hawaii to support the B-1 bomber weapon school. In February, we went to Red Flag. Last May, we went to Maple Flag. And we went to WSEP in July.” (WSEP, or weapon system evaluation program, is live-fire testing of operational weapon systems conducted at Tyndall.)

“I’ve been to WSEP’s for the last four years,” said Edlund. “I’ve shot five missiles. Most guys in the active force get to shoot zip. So our limited experience with live missiles is probably a misperception, too. But that’s what we like them to think about us. We’ve already shot a bunch of AIM-7s. We shot hundreds of them when our unit flew F-4 Phantoms.”

“Firing missiles is just like dropping bombs—experience really counts,” added Becklund, who fired his first AIM-120 at William Tell. “Firing a live missile gets rid of the butterflies. You actually see it coming off the rail. You learn range procedures. A WSEP teaches you how not to get target fixated, how to perform a breakaway maneuver instead of air scoring a shot. AIM-120 experience would certainly help, but having previous BVR missile experience is also useful.”

That “part-time” perception of the Air National Guard is something that the 119th’s commander would like to see put to rest. “This concept of the Air National Guard member as strictly a ‘weekend warrior’ is totally erroneous,” Haugen said. “We have been deployed in eleven of the last twelve months. The competition in itself took a lot of effort. But at the same time, we were maintaining an air-defense alert at March AFB in California. We also were in the middle of a forty-five-day deployment to Puerto Rico. Our plate was full. And we’re in the air sovereignty mission—we’re supposed to stay at home. What we may lack in a daily training schedule, we make up for in a higher experience level. We have a big pool of talent and experience. We may not get as many sorties during the week, but we have another whole career to draw on.

“Everybody is looking for something to use to support their branch of the services during these tight budgetary times,” continued Haugen. “Performances like this are becoming real important. Winning William Tell gives the Guard leadership something to point to when anyone starts talking about how the Guard can’t compete or refers to us as a subforce. No one can say that we are not as good as the active Air Force when it comes to putting rubber to the road.”

And after William Tell 1994, no one can point to the F-16 as a less capable air-to-air fighter. 

E. Hehs
Building The Model F-16
For most of us, the thought of building a plastic model kit conjures up frustrations. We remember those incomprehensible instructions, parts that never quite fit right, dizzying smells, plastic webs of airplane glue floating purposely and permanently onto finished surfaces, spilled paint, ripped decals, and the fiery explosions and black smoke that finished off our mediocre efforts.

Undeterred, some few stick with the hobby and slowly gain the experience needed to build models that approximate the real thing. This experience—combined with proper technique, detailed research, the right tools, money, and time—makes the difference between a gray plastic mess and aircraft facsimiles suitable for public display.

Plastic model kits are approached in two basic ways. A neophyte or occasional builder follows instructions, generally, and builds a kit as-is out of the box. A more experienced hobbyist often deviates from instructions to improve a kit. Jim Barr, who built the F-16 model pictured here, falls into one extreme of the latter category. Barr is an award-winning model builder and Lockheed Fort Worth Company employee. Code One observed him and asked questions as he built this display-quality F-16C Block 50 model with markings of the 388th Fighter Squadron from Hill AFB in Utah (the reigning Gunsmoke Bombing Competition champions, as a matter of fact). Some of Barr’s techniques and advice may help you the next time you build a Fighting Falcon.
We chose to build a Hasegawa 1/48th-scale F-16C kit with landing gear down, no pilot, and a more highly detailed cockpit. We added several aftermarket items, including a Verlinden cockpit detail kit, a True Details ejection seat, a seamless wide-mouth intake by Bob Brown, and AIM-9 missiles from a separate 1/48th-scale air-to-air weapons kit by Hasegawa.

The Cockpit Super Detail kit by Verlinden contains an assortment of tiny, delicate brass parts that accurately adorn the pilot’s office. The $20 kit includes an ejection seat, instrument panels, sidestick controller, throttle, head-up display, armrest, and almost all the other bits and pieces that constitute a well-stocked F-16 model cockpit. The True Details ejection seat is a step above what comes with the Hasegawa airplane kit (and, according to Barr, better than the seat in the Verlinden kit). The crisply molded resin seat offers accurate buckles, cushions, and other hardware associated with the ACES II ejection system. Bob Brown’s seamless intake costs about $10. Brown markets a line of seamless intakes under the name “Seamless Suckers.” His two-piece resin-formed F-16 molding not only creates a smooth and accurate intake, but also saves some time and trouble. The AIM-9 Sidewinders in Hasegawa’s bountiful air-to-air weapon kit (about $15) have significantly more detail than the missiles contained in the aircraft kit.

Before ordering these aftermarket additions, our expert offers some preliminary words of warning and fiscal responsibility. While these accessories contain more detail than that provided by the basic F-16 kit, they are geared for the more experienced modeler. The tiny brass parts in the Verlinden kit, for example, require a lot of patience and some miniature tools to bend and form. One wayward drop of glue will ruin a part. One sneeze will launch smaller pieces into the oblivion of your shag carpeting. Also keep in mind that the attributes of an aftermarket ejection seat won’t compensate for a crummy paint job. Nor will the finer details provided by intake and weapons kits. In other words, these extras will only improve your work if you know how to build a sharp model in the first place.

Those seeking higher levels of quality and accuracy are probably better served by investing in some proper tools and supplies. An airbrush tops this list in terms of both usefulness and expense. Nothing improves a model more than a good paint job, for which an airbrush is essential. Some other ingredients to consider: a hobby knife, a supply of No. 11 hobby knife blades, a pin vise, detail paint brushes, clippers, sandpaper, body filler putty, masking tape, vinyl tape, toothpicks, pins, water colors, white glue, superglue, epoxy, decal preparation solution, and paint. A good how-to reference also comes in handy. Roscoe Creed’s How to Build Plastic Aircraft Models (published by Kalmbach Books) is a good choice.

Dry Fitting

A small pair of diagonal clippers is ideal for removing parts from their plastic trees.

Our model project began with what’s called a dry fit. We cut the wings, tail surfaces, and fuselage halves from the plastic trees with a pair of clippers and sanded off the plastic nubs where the parts met the tree. Removing the parts with clippers (miniature wire cutters) avoids any twisting or pulling that can extrude the plastic and deform it. Any thin residual plastic from the molding process, called “flash,” was removed from the part with the dull side of a hobby knife blade. The
static dischargers were sanded from the wings and fins because they're inaccurately oversized.

We checked the fit of the fuselage halves and wings, making sure that the seams were tight and straight and that the locator pins fit well into their associated receptacles. (Some modelers file off the locator pins and align the parts by hand.) Everything fit fine. If it hadn't, any warped part would have been unwarped by soaking it in hot water (180°F) for a few seconds and then straightened.

During this early stage of the project, we removed and set aside parts that would not be used in the model. These parts were being substituted with aftermarket kits (cockpit controls, ejection seat, engine intake, and some missiles). We also set aside the pilot, boarding ladder, clear canopy, and Pratt & Whitney engine.

Assembling

Experienced modelers approach each subassembly as its own separate model. They keep an eye out on how what they do in one step affects subsequent steps. We had two basic reasons for deviating from the prescribed steps in the instructions—aftermarket additions and finishing (puttying, sanding, painting) considerations. For example, the intake was attached to the fuselage before the wings to make filling and sanding the intake seams easier.

The cockpit was assembled first, using only the cockpit tub and the instrument panel from the airplane kit. All of the Verlinden parts were painted and installed except for the head-up display, ejection seat, and the canopy latching mechanisms. The head-up display, which sits above the canopy rail, was put aside for the final assembly so it would not be damaged after the cockpit assembly was placed inside the fuselage. The extremely delicate and difficult canopy latching mechanism and handle bars were left off our model because of the time and trouble they require. (These canopy parts are essentially hidden by the canopy frame anyway.) The True Details seat was painted but not installed until the final assembly.

We installed the seamless intake into the lower fuselage half. The installation required some cutting, and the resulting seams had to be filled with putty and sanded to make a smooth surface. We checked the smoothness by airbrushing the surface with neutral gray and then looking closely for imperfections and necessary reworking. Next, the cockpit tub was installed into the lower fuselage half, and the two halves were glued together. The speed brakes were left in the closed position. (They can be cut and left in the open position in this model; the kit includes a pair of speed flap actuators that are installed between the open halves of the speed brakes.) We painted the inside of the seamless sucker white and the lip around the inside of the intake gray. After the paint dried, the intake was taped shut to protect its painted interior from overspray in subsequent painting.

At this point, we installed the forward engine ring, but omitted the exhaust nozzle petals so they could be painted separately and installed in the final assembly.

The wing halves were glued together. We then glued the wings, the vertical tail, and the gun port to the fuselage. The wing and tail seams were filled with putty and sanded to a smooth surface. The horizontal stabilizers were painted separately and installed in the final assembly. The stabilizers are free-moving surfaces and, therefore, create no seam to be filled. Several seams had to be puttied and sanded—two between the wings and the fuselage, one between the intake and the lower fuselage, one between the vertical tail and the upper fuselage, one between the radome and the forward fuselage, one between the engine ring and back fuselage, and two between the ventral fins and the lower fuselage.

We installed the ventral fins and the radome, omitting the one gram of nose weight called for in the instructions. Normally, the extra up-front weight keeps the aircraft from dropping on its tail when displayed with landing gear.
down. However, the denser plastic resin of the aftermarket intake makes the counter weight unnecessary.

All of the small bumps, pointy bits, and other protuberances to the airplane were added as the final step before painting major surfaces of the airplane. These pieces included the navigation lights, pitot tube, radio antennas, inlet and exhaust ducts for the aircraft self-protection jamming system and engine compartment, air temperature probe, radar homing and warning antenna covers on the nose, and the “beer can” RHAW antennas on the wings. Some of these parts were made from scratch. The pitot tube was fashioned from a pin inserted into steel tubing. The angle-of-attack sensors were cut off pin points. The RHAW antennas were made from sprue (plastic from the tree that holds the pieces together).

Painting

Before firing up the airbrush, we scrubbed the model’s surfaces with a toothbrush dipped in warm soapy water and dried the model with a clean towel to remove dust, fingerprints, and any residue from the molding process. Since darker colors cover light colors more easily, painting normally proceeds from lighter to darker colors. Accordingly, we painted the white of the wheel wells first. After they dried, the wheel wells and the cockpit were masked off to protect them from overspray.

The F-16 has a relatively simple paint scheme. The majority of the top surface is dark gray (gunship gray or federal standard color number 36118). The underside is a light ghost gray (FS 36375). The upper nose area, most of the vertical tails, and the outside surfaces of the ventral fins are a neutral gray (FS 36270). A drop of the dark gray was added to the neutral gray to get the right shade of gray for the radome. The areas requiring the most time and care to paint were the three places where the grays overlap—the side of the fuselage below the cockpit, the side of the inlet, and around the lower part of the vertical tail.

Following the light-to-dark rule, the light gray underside of the aircraft was painted and then the neutral gray nose area and vertical tail. After these areas dried, we painted the dark gray of the upper surface after masking off the lower, light gray side to avoid overspraying it. The final airbrush passes on the gray overlaps were done with the darker gray. After the main surfaces dried, we taped off the nose to paint the radome and masked the upper and lower portions of the aft fuselage to paint the neutral-gray side areas where the horizontal tails attach. After these areas dried, the fuselage surface around the refueling receptacle was taped off and the receptacle was painted steel gray. The engine ring was painted black. Outline areas, like the refueling receptacle, were masked with strips of vinyl tape 1/8th inch wide. Paper-based masking tapes tend to leave a ragged edge. The plastic tape also conforms better to curved areas without wrinkling.

While waiting for the paint to dry on the rest of the aircraft, the parts for final assembly were put together and painted. These parts included the landing gear, engine petals, missiles, canopy frame, inlet heater strut, wheels, and tires. After painting the landing gear, we attached small wires to simulate the brake lines. The AIM-120 launchers were reshaped and fitted with two small, flat pieces of sprue to make them look more like the real thing. With a small drill bit held in a pin vise, we drilled out exhaust nozzles for the missiles and hollowed out the front end of the Sidewinders to make room for a drop of epoxy to simulate the seeker head. The glass of the projector lens for the head-up display was simulated with a drop of epoxy as well. These detail tricks set great models apart from good ones.

Using brush-on paints to accentuate panel lines and other parts is another way to add detail. Black watercolor applied with a fine brush and an extremely steady hand, for example, was used to accentuate the leading edge flap and aileron lines. Once a line was complete, the work was sealed with a fine coat of clear flat paint. We used two common painting techniques—washing and dry brushing—to
give the ejection seat and cockpit instruments a more realistic appearance. Washing adds shadows. To create a wash, modelers first darken the base color slightly by adding black. Some use watercolors for this effect; others use oils. With either media, the color is both darkened, thinned, and then allowed to flow into the crevices to produce a shadowing effect. Alternatively, dry brushing adds highlights. To dry brush, modelers lighten the base color by adding white. They then drag the color across prominent surfaces with a small stiff brush containing almost no excess paint (almost dry). Some modelers dry brush in successively lighter steps or layers. The subtle effects produced by these techniques approach fine art. In addition to the cockpit, we used these techniques on the tires, in the wheel wells, and on the engine petals.

**Decaling**

Decals do not adhere well to the microscopically rough surfaces of the flat paints used for military aircraft models. When applied directly to a flat paint, a decal will tend to show its clear carrier film when it dries, especially on the outside edges of the insignia. The phenomenon is called “silvering.” A preliminary coat of clear gloss paint lessens this effect by creating a smooth surface for the decals. After the decal is applied, a second coat of clear gloss softens its edges. A final coat of clear flat finish restores the surface to a non-glossy state.

Silvering can be reduced further by trimming the edges of the decal. Trimming is much easier to do before dipping the decal in water to activate its adhesive carrier film. We also used a two-part softening solution that makes the decals conform to bumps and panel lines. One solution goes on the model surface; the other is placed on top of the decal. We worked with one decal at a time except for the tail code and serial numbers, which were applied at the same time so they could be aligned. Decals were dabbed with a damp rag to remove the excess water and allowed to dry before the clear gloss and clear flat finishes were applied.

All those parts prepared and painted away from the airplane were installed as the last step in this project. We started with the heftier items and worked towards the more delicate ones. The progression went something like this: rear and front landing gear, horizontal tail surfaces, ejection seat, engine inlet heater strut, AIM-120 missile/launcher, AIM-9 missiles, the head-up display, and the canopy. We then built a nice display stand and called it a day (well, we called it two weeks).

**Going Beyond**

Thin wires bent to simulate brake lines give the airplane an added touch of realism.

According to Barr, our model represents about ninety percent of his best, most complete effort. That extra ten percent, however, would have required about three times the labor and pushed us way beyond the deadline for this issue. Those willing to spend inordinate amounts of time for an F-16 model project might try tackling the Verlinden canopy latching mechanism, detail sanding the more obscure areas of the airplane, adding a map light to the cockpit, attaching “remove before flight” ribbons and pins, placing a helmet on the canopy rail, accentuating panel lines, fabricating more hydraulic lines for the wheel wells, attaching the dozen or so tiny static charge needles to the wing and tail surfaces, and seeking professional help for advanced modeler’s syndrome.

Happy modeling. ☀

E. Hehs
The United States Air Force Museum is hard to miss. Just follow traffic east out of Dayton, Ohio, birthplace of the first Wright Flyer, and look for two immense arched hangars protected by an impressive variety of intercontinental ballistic missiles. Admission to the museum on Wright-Patterson AFB property is free and open to the public. Expect to spend at least an entire day exploring the hundreds of aircraft and other aviation artifacts that make this the world’s best military aviation museum.

Besides being the best, the USAF Museum is also the oldest military aviation museum. This grand formation of flying machines began its ascent in 1923 as a modest exhibit of World War I biplanes and related military equipment in the corner of a hangar at McCook Field near what is now downtown Dayton. The Army conducted some of its earliest experimental flying at McCook during and after World War I. The museum followed the Army when it moved its operations to Wright Field in 1927. Eight years later, the museum had grown to include about 2,000 items and occupied its own building at Wright Field. In 1941, the building was converted to wartime use and the collection went into storage until 1954, when it reopened in a former engine overhaul facility at adjoining Patterson Field.
In 1971, the museum moved to its present 400-acre site at Wright-Patterson AFB. A large reception area was added to the facility in 1976. The next year, an aircraft annex was opened about a mile from the main museum on the old Wright Field flight line. The annex, two hangars also on the old flight line, houses about thirty aircraft, including several presidential airplanes. A second giant hangar at the main museum, the modern flight hangar, was completed in 1988. An IMAX theater was attached to the main reception area in 1991. The buildings of the main museum and annex encompass more than 50,000 items in over ten acres of outdoor exhibition space. Yes, the USAF Museum is the largest military aviation museum, too.

You enter the museum behind the metallic cylindrical facade of the new IMAX theater. The entrance feeds into a large two-story glassed-in lobby. From here, you will walk through a souvenir and bookstore area to get to the first two exhibit halls of the main building. These halls are arranged chronologically from early flight through the Vietnam conflict. Display cases of historically significant photos and memorabilia line the walls. The modern flight hangar, up a separate corridor, is arranged more or less by aircraft type and has no set path to follow. The exhibits of the main building present the evolution of USAF aviation. The modern flight hangar, on the other hand, serves up a hardware feast with additional World War II aircraft, several X-planes, some of the latest technology, and many current operational fighters and bombers.

An exact reproduction of the world’s first heavier-than-air military aircraft, the Wright 1909 Military Flyer Signal Corps Airplane No. 1, greets you as you enter the first exhibit hall. Displayed next to it is an original Wright 1911 Modified B Flyer—the first aircraft produced in quantity by the Wright brothers. A Wright B was the first aircraft used for military trials of a bombsight and bomb-dropping device. The displayed airplane—a primitive apparatus of wood, wire, and fabric—last flew in the 1924 International Air Race in Dayton. The two Wright aircraft are encircled by all sorts of fascinating articles from the earliest years of heavier-than-air flight, including the propeller from the first fatal aircraft accident (Lt. Thomas E. Selfridge in 1908), America’s first aircraft engine (a Curtiss four-cylinder used in a Signal Corps dirigible), an original Wright Brothers bicycle, and reproductions of Wright wind tunnels that resemble fine furniture.

These early flight exhibits lead directly to World War I and a gangly three-engine Caproni Ca.36 Bomber—one of the world’s earliest strategic bombers. The Ca.36 carried a crew of four in an open-air seating arrangement and an 1,800-pound bomb load. The aircraft saw duty in the Italian Air Force as late as 1929. The museum’s Curtiss JN-4D Jenny was one of over 6,000 produced. Jennys were used primarily for flight training and, later, barnstorming. The Standard J-1, Spad VII flew in service of the famed Lafayette Escadrille—a French flying unit with volunteer pilots from the United States. The Spad XVI was Brig. Gen. Billy Mitchell’s personal airplane during the war. The deHavilland DH-4 was the only US-built airplane to see combat. The Sopwith F-1 Camel was flown by American pilots assigned to British forces. The museum also has a Thomas-Morse S4C Scout and a Nieuport 28—the first fighter aircraft flown in combat by pilots of the American Expeditionary Forces.

Technological advancements highlighted the period between world wars. The museum’s Consolidated PT-1 Trusty, Loening OA-1A, and Martin B-10 are three prime examples of such advancements. The PT-1 established the basic design for trainers well into World War II. Its innovative framework of welded steel tubing greatly improved structural strength. The OA-1A, an amphibian aircraft, combined features of both a landplane and seaplane by merging the fuselage and hull into a single structure. The design eliminated the hanging floats and the elevated

An IMAX theater is the latest structural addition to the USAF Museum.
engine common to previous seaplanes. The OA-1A on display was one of five that made a 22,000-mile goodwill tour of Central and South American countries in 1927. The B-10, the first all-metal monoplane bomber to be produced in quantity, was fifty percent faster than its contemporary biplane bombers and carried such innovations as internal bomb storage, retractable landing gear, a rotating gun turret, and enclosed cockpits. Gen. Hap Arnold called the B-10 "the air power wonder of its day."

Other museum aircraft represent the between-wars period, many with their own distinction. The Verville-Sperry M-1 Messenger completed the first successful in-flight mating between an airplane and an airship. The Boeing P-12E is the last of the biplane fighters flown by the Army. The Douglas O-38F on display is the first aircraft to land at Ladd Field near Fairbanks, Alaska. The Stearman PT-13 was a primary trainer used early in World War II. The Seversky P-35 is the first single-seat all-metal pursuit airplane. It was flown operationally by the Japanese during World War II. Other notable aircraft to see are the Eberhart SE-5E, Curtiss P-6E Hawk, and the Douglas O-46A.

The airplanes mentioned thus far comprise part of only one of the main building's two exhibit halls. The second hall, which takes you from the early days of World War II through the Vietnam conflict, is stuffed with trainers, transport aircraft, observation aircraft, cargo haulers, liaison aircraft, helicopters, gliders, fighters, and bombers.

Some of the most impressive aircraft in this building are the bombers, most of which are from World War II. They include the Boeing B-29 Superfortress that dropped the second atomic bomb on Japan, a separate walk-through B-29 fuselage, a Boeing B-17 Flying Fortress that flew twenty-four combat missions over Europe, a Consolidated B-24D Liberator that flew combat missions in North Africa, a North American B-25B Mitchell configured as one of the aircraft used on Doolittle’s raid on Tokyo, and a Martin B-26G Marauder flown by the free French during the final months of the war.

A P-36A Hawk begins the first of many US World War II fighters lined up for display. Two of the first six fighters to get off the ground to meet the enemy at Pearl Harbor were P-36s. The Lockheed P-38L Lightning, an exceptional long-range escort fighter, was also used for dive bombing, level bombing, strafing, and photo
reconnaissance. The Bell P-39Q Airacobra was also flown by the Soviet Union during the war. The P-39's engine is located behind the cockpit. The Curtiss P-40E Warhawk was flown by the Flying Tigers and by the first black unit of the Army Air Forces, the 99th Fighter Squadron. The Republic P-47D Thunderbolt served in almost every theater during the war as a high-altitude escort and a low-level bomber. The museum's North American P-51D Mustang—a famous, formidable, and enduring aircraft—was the last prop-driven aircraft assigned to a USAF tactical unit fighter, the West Virginia ANG. The Guard flew the airplane until 1957. The museum has one of the few remaining A-36As, a ground attack version of the Mustang.

The museum also displays memorable foreign-built aircraft of World War II vintage. The British Supermarine Spitfire is one of the most famous fighters of the war. The Hawker Hurricane is recognized for its part in the Battle of Britain. The deHavilland DH-98 Mosquito is a versatile aircraft constructed of plywood with a balsawood core. German aircraft have a place here, too. The Messerschmitt Bf 109G is the standard Luftwaffe fighter; almost 33,000 were built. The Focke-Wulf Fw 190D is one of Germany's best fighters of the war. The Fiesler Fi 156 Storch, a small multipurpose STOL airplane, is famous for rescuing Benito Mussolini from a lodge in the Apennine Mountains in 1943. The Messerschmitt Me 262 Schwalbe is the world's first operational turbojet aircraft. The museum also displays a Kawanishi NIK-2 George 21, a highly maneuverable Japanese fighter produced during the last year of the war, and is restoring a Japanese Mitsubishi Zero reclaimed from an island in the South Pacific.

The path in this part of the museum winds its way through Victory in the Pacific and reaches the jet age for USAF aircraft in the form of a Bell P-59B Airacomet and a Lockheed P-80R Shooting Star. The Airacomet was America's first jet-propelled airplane. It first flew in mid-1942. The Shooting Star, which first flew in 1944, was the first US jet to enter large-scale production and the first US airplane that could sustain speeds in excess of 500 miles per hour. The P-80R on display is a one-of-a-kind stream-
lined variant of the P-80A: it set a world’s speed record in 1947 of over 623 miles per hour.

Around the corner from the P-80R is another Lockheed Shooting Star, an F-80C. (The Air Force replaced P, pursuit, designations with F, fighter, designations in 1948.) In 1950, an F-80C shot down a Russian-built MiG-15 in the first all-jet fighter air battle. Other Korean War-era aircraft on display in this part of the museum include a Republic F-84E Thunderjet and F-84F Thunderstreak; North American F-86A and F-86H Sabres and F-100C Super Sabre; Lockheed F-94A Starfire, the first USAF aircraft equipped with an afterburner; Convair F-102A Delta Dagger, the first supersonic all-weather jet interceptor; a Cessna YA-37A, an aircraft developed from the T-37 trainer to evaluate as a counterinsurgency attack and reconnaissance aircraft; a Douglas A-1E Skyraider used to rescue a pilot shot down over South Vietnam in 1966; and a MiG-15 (NATO designated “Fagot”) flown to South Korea in 1953 by a defecting North Korean pilot.

Many of these aircraft sit in the shadow of the giant Convair B-36J Peacemaker, whose 230-foot wing spans the width of the exhibit hall. In fact, the museum building had to be constructed around the B-36. Near the B-36 sit several of its payloads, including the world’s largest aerial camera, a McDonnell XF-85 Goblin designed to be launched from underneath a B-36 and retrieved in flight, and the twenty-five-foot-long casing of a Mk-17 thermonuclear bomb. The B-36 could carry two of these 41,400-pound weapons.

Before heading for the modern flight hangar, you should relax and enjoy a chili dog and soft drink upstairs in the refreshment area. The windows overlook a collection of airplanes parked outside the museum. These aircraft include the first full-scale development F-16A painted to represent a Fighting Falcon of the South Carolina ANG, an F-15A that broke eight time-to-climb records in 1975, the second A-10 built, and the last of four B-1As built. Also outside and a short walk from these aircraft sit enough airplanes to fill another museum: a Junkers Ju 52 trimotor, Douglas B-23 Dragon, Boeing WB-50D Superfortress and KB-50J, DeHavilland C-7A Caribou, Fairchild C-119J Flying Boxcar, Lockheed EC-121D Constellation, Douglas C-133A Cargomaster, Fairchild C-123K Provider, Boeing NKC-135A Stratotanker/Laser Lab, and a Convair C-131D Samaritan.

Refreshed and fueled, you’re ready to depart to the modern flight hangar. Here you are greeted by one of the most popular exhibits—a Lockheed F-117A Nighthawk stealth fighter with a GBU-27 laser-guided bomb hanging from one of its weapon bays. The USAF Museum first displayed the aircraft, the second of fifty-nine Nighthawks built, just after the Gulf War in July 1991.

From this point, visitors are on their own. Most pass under the wings of the Boeing B-52D Stratofortress and head towards the huge Mach 3-capable North American XB-70 Valkyrie (a point of reference for this side of the hangar). This is the only surviving Valkyrie, the only other one built having crashed after a mid-air collision in 1966. The XB-70’s long skinny neck, massive row of six 30,000-pound-thrust engines, and brilliant white paint scheme contrast with the low-slung and stealthy, but just as swift, airplane next to it—a Lockheed SR-71 Blackbird. The world’s fastest and highest flying operational aircraft, the SR-71 is still flown today by NASA. The museum’s SR-71 made the first operational SR-71 sortie in 1968 and accumulated more flight hours than any other SR-71 (2,981 hours before retiring to the museum).

Next to the SR-71 is a Convair B-58A Hustler, another airplane famous for its speed. B-58s set nineteen world speed and altitude records and won five different aviation
trophies during the 1960s. The Hustler on display set three separate speed records and won the Bendix and Mackay trophies for 1962 during a flight from Los Angeles to New York and back. The airplane beat the old roundtrip record, held by a McDonnell RF-101C, by over two hours and became the first aircraft to complete a transcontinental flight faster than the rotational speed of the earth. Next to the B-58 sits a Douglas RB-66B Destroyer, the last tactical bomber built for the USAF, and a Convair F-106A Delta Dart that recovered itself and landed wheels up in a field after its pilot ejected from a flat spin. The F-106 was an all-weather interceptor developed from Convair’s F-102 Delta Dagger.

This side of the modern flight hangar also has its share of X-planes. On the wall behind the B-58 stands a Ryan X-13 Vertijet, the world’s first vertical attitude VTOL jet. Only two were built. Under one wing of the XB-70 sits an X-1B (the only remaining second-generation X-1 aircraft). And next to it is one of only two remaining North American X-15A rocket-powered aircraft. The museum’s X-15 set an unofficial speed record of 4,520 miles per hour in 1966. The USAF Museum also displays the only Douglas X-3 Stiletto, a supersonic aircraft that influenced designs for the F-104, X-15, and SR-71. The museum has the swept-wing, tailless Northrop X-4 and the Bell X-5, the first jet aircraft to fly with variable-sweep wings. The museum’s other X-planes include the unmanned and supersonic North American X-10, Martin unpowedered X-24A and X-24B “lifting body” designs for returning to earth from space, and a Bensen X-25A autogiro.

The modern flight hangar contains several aircraft from the World War II era. The Consolidated OA-10 Catalina seaplane rescued hundreds of downed fliers during and after the war. The Curtiss C-46D Commando was famous for transporting war materials over the Hump, from India to China over the Himalayas, after the Chinese closed the Burma road. The beautiful Douglas C-47D Skytrain cargo plane was adapted from the DC-3 commercial airliner. The Douglas B-18A Bolo was designed to replace the Martin B-10 mentioned earlier. Here, visitors also find a Grumman HU-16B Albatross that established a world altitude record for twin-engine amphibians (32,883 feet) in 1973.

In front of the XB-70 sits the world’s first swept-wing bomber and first airplane built solely for delivering nuclear weapons, the Boeing B-47 Stratojet. Other aircraft nearby
include a Martin EB-57B Canberra, a Republic F-105D with two aerial victories over Vietnam, a General Dynamics F-111A assigned to the 474th TFW during Linebacker II operations (an intense series of night attacks over Southeast Asia in December 1972), the last Lockheed U-2A built, a McDonnell Douglas F-4C Phantom II that scored two aerial victories in one day in Vietnam, and a Lockheed F-104C Starfighter that was the top finisher in the 1962 William Tell air-to-air weapons meet. The F-104 was the only aircraft that simultaneously held altitude, speed, and time-to-climb world records.

Scattered about the immense flight hangar are several other recognizable and notable aircraft. A Douglas C-124C Globemaster II has its cargo doors wide open and cargo compartment accessible to the public. The North American F-100D Super Sabre in its Thunderbird paint scheme was actually flown by the Thunderbirds from 1964 to 1968. The North American F-86D Sabre was the first aircraft to have all-rocket armament and the first single-seat all-weather interceptor. The museum has the last operational Northrop F-89J Scorpion and a North American B-45C Tornado, the first US four-engine bomber to fly and the first USAF jet bomber to go into production. The Lockheed F-94C Starfire was an all-weather interceptor and a direct descendant of the F-80.

Regrettably, only a portion of the aircraft on display at the USAF Museum can be squeezed into a single magazine article. In other words, you shouldn’t substitute a quick read and a few photos for an actual visit to the world’s largest, oldest, and best military aviation museum.

E. Heks

"There must be an upper limit to the amount of time or stamina one person has for looking at airplanes," theorizes Richard Uppstrom, the director of the US Air Force Museum. "I know the limit is greater than the two buildings we have now." Uppstrom and many others who support the USAF Museum would love to test that limit. The $24 million price tag of a third building, however, represents an immediate challenge to Uppstrom and to the Friends of the USAF Museum, a volunteer organization that raises money for the museum and, particularly, funds for museum expansions.

The current master plan for the museum calls for three buildings to be added to the two existing exhibit hangars. Two of the new buildings would provide room for future acquisitions, restorations under way, aircraft now stored outside, and aircraft in the museum's annex. The third would provide space for restoration work now done away from the main facility in hangars on the old Wright Field flight line.

"I want to get all our airplanes inside for two reasons," Uppstrom explains. "Visitors don't pay much attention to them when the temperature is twenty below zero and the wind is howling. And, more importantly, to prevent deterioration and corrosion and put an end to the perpetual paint/repaint cycle. We need a new building. We need to get all the airplanes over here from our annex as well because less than twenty percent of our visitors make that one-mile trip to the annex."

Besides more space, Uppstrom would also like the museum to acquire several airplanes. At the top of his short list is a Boeing P-26 "Peashooter," the first of the US monoplane fighters. Others include a Kellett YG-1B Autogyro (the only autogyro squadron was based at Patterson Field); Douglas A-24, a very rare World War II dive-bomber; Keystone B-4, B-5, or B-6 (biplane bombers from the early 1930s); Sukhoi Su-22 (a Russian ground attack fighter); Mikoyan and Gurevich MiG-25 (Russian interceptor); Japanese Mitsubishi Betty (a twin-engine bomber of World War II); and a Ford Trimotor. US military cargo versions of the Trimotor were called the C-3 and C-4.
The P-38 Lightning: Lockheed's First Fighter

By Neil Anderson

My first encounter with the Lockheed P-38 Lightning was when I was ten. I carved a model of it from balsa and finished it proudly as a D-Day strike aircraft, invasion stripes and all. Sometime after that pivotal invasion, I sat spellbound as my father recounted his own experiences on Omaha Beach. Fifty years later, I got a taste of a real P-38 Lightning—as a demonstration pilot in the 1994 Farnborough Air Show.

This particular aircraft, a P-38J, is a highlight of Stephen Grey's fighter collection at Duxford Air Base north of London. A first look at the aircraft shows its salient points: tremendous wing area for long-range high-altitude missions, concentrated firepower in the form of four .50 caliber guns and one 20mm cannon, and two engines to enhance safety and extend range in those days of unreliable power plants.

Photos Alan Ernoult & Patrick Bunce
I found several P-38 features enjoyable and others quite advanced for a pre-World War II design.

The P-38 is nearly two thirds larger than an F-16. As a single-engine aficionado, I point to the two engines as offering twice the failure opportunity, twice the fuel flow, and at least twice the system complexity tucked into a larger target area. On the other hand, the large wing area and opposite rotating props produce more forgiving landing qualities. The P-38 has tricycle landing gear, carries ample ammunition quantities, and is piloted from an unusually large cockpit—probably the largest among single-seat aircraft.

The aircraft’s paint scheme is flashy. Besides the Vargas nose art and underwing invasion stripes, the airplane displays an impressive collection of mission markings, including high cover or umbrella missions, fighter sweeps, bombing missions, escort duties, trains, and two German aircraft destroyed. These markings certainly represent a fine record, one well worth highlighting.

The cockpit itself deserves some comment, not just because of its spaciousness, but more because it illustrates the several generations of design attention in this critical area. The yoke was perhaps necessary for roll control leverage in the early aircraft but could possibly have been modified or discarded for the boost-ed aileron models seen later in the Lockheed F-80. The articulated control column masks several critical switches—prop feather, glycol coolers, and oil cooler doors, to name a few. Several less-than-desired features are also obvious in the pilot’s office—reversed fuel selector handles, prop feather switches only two inches apart, several backward-oriented handles and switches, water leakage due to roll-down windows and an overhead top hatch, and a single-wire release for the top hatch. Considering its 1938 design vintage, the P-38 stands out as the first real multirole fighter with emphasis on long-range bomber escort tasks. You might label it the first “slash and run” fighter design.

This particular P-38 has been modified to enhance safety and to improve reliability. Its turbosuperchargers, a unique feature in 1938, were deactivated. A second DC generator and second hydraulic pump were installed. Most of the early electrical and avionic systems were replaced. And the ordnance systems were deactivated. The only maintenance anomaly during the Farnborough week was a hydraulic system failure just before one taxi. An o-ring in the right main gear actuator rolled out of its groove and allowed several gallons of hydraulic fluid to escape as the extension/retraction system failed. Fortunately, it happened on the ground. (I certainly don’t relish another landing gear problem in any aircraft.)

I found several P-38 features enjoyable and others quite advanced for a pre-World War II design. The dive brakes and maneuvering flaps are exceptional. At high altitude, they would easily become life savers. Pilot visibility aft, up, and forward quarters is good, though lateral and downward views are quite limited. I can readily understand why the prominent cockpit above the gondola is necessary. The tricycle landing gear combined with very low landing approach and touchdown speeds simplify landings greatly.
The engines rotate in opposite directions. Counter-rotating engines may cause headaches for those providing engine and propeller spares. But it sure eliminates yaw motion with power changes for the pilot. In fact, the designers included no yaw trim system. However, I could imagine the anxiety for a pilot flying with an engine out or returning from a mission with a hung bomb or drop tank. Still, the Allison engines start easily, run quietly in flight (I could hear the fuel boost pumps and the touchdown tire squeak), and economize fuel flow. With a high fuel fraction for escort or intercept missions, Berlin missions from bases in England were possible during the war.

The Farnborough flight demonstration included a P-38 takeoff and showline passes followed by the dramatic F-16C six-minute performance demonstration and an arcing, plan-view photo pass by both Lockheed products before individual landings. Steve Barter and Bland Smith, Lockheed demonstration pilots, added several of their own touches improving the F-16C join-ups and timing cues to keep the display within Farnborough time constraints. The P-38 maximum speed during the show was 300 knots with normal accelerations up to four g’s. The crowd delighted in the unique exhibition.

No doubt, those attending had an affection for the Lightning and the F-16 as well.

The F-16 fits nicely into the Kelly Johnson progression of P-38/F-80/F-104/F-117 and now the F-22. Like the P-38 before it, the F-16 also has unique features, unprecedented range, great firepower, remarkable operator loyalty, and a true multirole capability. Not too surprisingly, these and additional features are being factored into the F-22 design. Small wonder its popular nickname is “Lightning II.”

Neil Anderson is director of international marketing at Lockheed Fort Worth Company and former F-16 chief test pilot. He flew the P-38 twelve times in England.

Like the P-38 before it, the F-16 also has unique features, unprecedented range, great firepower, remarkable operator loyalty, and a true multirole capability.
F-16ES Takes To The Skies

Lockheed recently began flight testing an F-16 modified to represent the F-16ES “Enhanced Strategic” aircraft version in Fort Worth. Lockheed test pilot Joe Sweeney flew the F-16C leased from the US Air Force for 1.3 hours in the initial sortie and for 0.7 hours in a second flight. The aircraft performed as expected—like a standard F-16—when equipped with shapes representing two twenty-four-foot conformal fuel tanks attached to the upper wing and fuselage on each side of the aircraft.

Each tapered fitting is two feet high and two feet wide at its largest point. The F-16ES configuration is designed to greatly extend the F-16’s range. The conformal tanks hold about 3,200 pounds of fuel. The conformal tanks and external fuel tanks give the F-16 an unfueled mission radius of more than 1,000 miles with ordnance, equivalent to that of an F-15E.

In other flights, the aircraft was equipped with additional features of the proposed F-16ES configuration, including 600-gallon under-wing tanks, a shape representing an internal FLIR sensor mounted on the aircraft nose, and weapon load of two 2,000-pound bombs. Elements of the configuration, including an internal FLIR and 600-gallon tanks, have been flown extensively on F-16s previously.

The demonstrations were conducted to collect data on aerodynamic effects and flight performance and to validate predictions. The aircraft, obtained from Edwards Air Force Base, California, is equipped with flight-test instrumentation and a spin chute for post-departure recovery tests.

Lockheed proposed the F-16ES configuration last year when competing with the F-15E for a fighter sale to Israel. Israel’s desire for longer-range strategic capabilities was made known in the final stages of the competition, which was too late for Lockheed to demonstrate the F-16ES features.

Israel ultimately selected the F-15E while making arrangements to take delivery of fifty early model F-16s from the USAF inventory. Lockheed has continued work on the F-16ES concept because of the performance potential and because of interest expressed by other potential customers.

“The F-16ES will provide a very long range capability to those customers who require it at a significantly lower cost than other options,” said A. Dwain Mayfield, Lockheed’s vice president of F-16 Marketing and Strategic Planning. “The ES configuration is expected to open new markets for the F-16 as it further expands the multirole qualities that have been well-proven both in US and international service.”
Korea Accepts New Fighting Falcons

The Republic of Korea Air Force formally accepted the first of 120 new F-16 Block 52 aircraft in December ceremonies in Fort Worth. Korea selected the F-16 in early 1991 after canceling an order for the F/A-18. Korea canceled the Hornet buy because the cost had escalated to about $1 billion over original estimates. Korea received earlier models of the F-16 under an order for thirty-six in the 1980s. That program was completed for less than the original estimated cost, allowing Korea to purchase four additional F-16s with remaining funds.
Eglin Tests New Munitions Dispenser

The 46th Test Wing at Eglin AFB in Florida is flight testing the first air-to-ground stand-off munitions dispenser for the F-16. The unpowered dispenser is released during high-speed, low-level flight and flies autonomously up to ten kilometers. Higher altitude releases can more than double the weapon’s range. The weapon, made by CMS, Inc. (a subsidiary of Deutsche Aerospace), releases submunitions over its target area in a pattern that can cover an area up to 350 meters wide and 1,000 meters long.

Pilots Break 10,000-hour Flight Record

Four Air Force Reserve pilots from the 944th FG at Luke AFB topped the previous record for cumulative F-16 flying hours on one four-ship mission. The F-16C pilots flew part of their record-setting mission in formation over Northern Arizona University in Flagstaff and over the Veteran’s Hospital in Prescott in honor of POW/MIA day ceremonies. Maj. Lance Undhjem (2,941 hours), Maj. Kevin Henabray (2,643 hours), Capt. Michael Loida (2,400 hours), and Capt. Leonard Dick (2,177 hours) now hold the record previously held by four pilots from the 419th FW at Hill AFB in Utah.

Widnall Flies F-16 With Thunderbirds

The Honorable Sheila Widnall, Secretary of the Air Force, visited Nellis AFB, Nevada, in November for briefings on operational training, test evaluations, range capabilities, and overall base capabilities. Her visit included a forty-minute ride in the back seat of the lead Thunderbird aircraft piloted by Lt. Col. Andersen (above) during a practice show. This was her second flight in an F-16. Her first was a gutsy night LANTIRN flight at Edwards AFB in September 1993.
Shaw’s 78th Wins Moody Bomb Comp

The 78th Fighter Squadron of Shaw AFB in South Carolina, flying the latest F-16 Block 50 aircraft, placed first among seventeen teams competing in the annual Moody Bombing Competition last October. The 68th FS from Moody, flying F-16 Block 40 aircraft, finished a very close second. The difference between first and second place was determined by a tie breaker. Shaw scored one more direct hit than Moody.

The annual competition, hosted by the 347th Wing at Moody AFB, consists of one timing event, three bombing events, and a strafe event. Participating squadrons provide one two-aircraft team. The competition this year featured a timed C-130 airdrop category in which two units participated with one aircraft each. Besides placing first and second for top team awards, F-16 units also took the top five places in the Top Gun competition as well as second through fourth places in the strafe events. An A-10 team finished first in strafe. The Top Gun award went to Capt. José Monteagudo of the 68th FS. Monteagudo had four direct hits out of six bombs dropped and scored 594 points out of a possible 600.

The seventeen teams competing included eight F-16 teams, five F-18 teams, two A-10 teams, one AV-8 team, and one F-14 team. F-15E and A-6 teams had agreed to compete earlier but cancelled. The eight F-16 teams were from Shaw, Moody, Pope AFB, and Andrews AFB.

51st FW Earns Another Colombian Trophy

For the second straight year, the 51st FW of Osan AB in South Korea was recognized as having the best flying safety record in the US Air Force. The unit won the prestigious Colombian Trophy last October for its 11,190 sorties, totaling 16,670 hours, flown without a major mishap during the fifteen-month evaluation period. The 51st has been flying the F-16 for six years. The unit’s record is particularly impressive because Osan AB is one of the busiest Air Force airfields in the world and the world’s fifth busiest air traffic area.

Tiger On The Tail

The 31st Tiger Squadron of the Belgian Air Force displayed its colors at the 1994 Tiger Meet last May in Cambrai AB, France. The 31st won the coveted Silver Tiger Award for the best squadron at the annual gathering of squadrons that share a common mascot in the fighter community.
Heartened Aardvark Fan

While deployed with the A-10As from Myrtle Beach AFB, South Carolina, to Nellis AFB for a Red Flag exercise in the spring of 1980, I recall accompanying a fellow crew chief down to an F-111 on the "live" pad. This guy was a former F-111 crew chief. After our walk around, he commented, "If your wings don't sweep, you ain't s---." I said, "Right."

Fourteen years later, I can honestly say he was right. While I thoroughly enjoyed my five years on the A-10, and even after cutting my teeth on the F-4, the F-111 is a maintainers' aircraft. By that, I mean you do not depend on what a test set tells you when you plug it into an aircraft to investigate a pilot-reported discrepancy. The Aardvark makes you think and, of course, work.

I am now a production superintendent at Cannon. I had the opportunity to be part of the 1994 Proud Shield Team. The F-111 (all models) is one damn fine aircraft.

Yes, the aircraft is old, and parts are limited. And we don't get the publicity and prestige of the newer weapon systems. But let me tell you, nothing can touch this bird on the deck at 200 feet AG or plinking tanks with PGMs [precision-guided munitions].

The Fighting Falcon is a fine aircraft for what it is designed to do. I am just heartened to see the venerable Aardvark get some publicity, too. Thanks.

MSGT. Bob Parker
428th Fighter Squadron
Cannon AFB, New Mexico

The Model Article

Your article entitled "The Model F-16" in the October issue was fantastic! Coincidentally, I first saw your publication when visiting the Virginia Air National Guard base in Richmond last spring to deliver an F-16C model I had just customized for one of the pilots of the 149th FS. I have built and customized a number of models for flight crews since then. I apply decals to display the actual tail numbers for each pilot's aircraft and even place his name on the canopy rail. I've enclosed a photo.

Scale models have always played an important role in structural design and wind tunnel testing for the aircraft industry. Building models can be a pleasurable hobby for all ages and may provide the opportunity to make a rewarding contribution to the flight crews of individual squadrons. I hope your article will inspire more people to try the hobby.

Steve O'Dell
Midlothian, Virginia

Editor's note: The Virginia ANG adopted their F-16 fin flash design from one of O'Dell's first F-16 models for the unit.

Hunting Egg-16s

The October issue was very interesting. I was especially attracted by the article on F-16 models. The Egg-16 is a very special model. Would you know of a source for this cute little aircraft?

MSgt. B. Rutten
Belgian Air Force
Hill AFB, Utah

Editor's note: Some Egg-16s can still be found on the back shelves of your local hobby shop. Rumors persist that the egg series aircraft may go back into production, but without the Egg-16. Readers can contact the manufacturer directly.

Hasegawa Models
1193-2 Yagussi Yaizu Shizuoka
425 Japan

Missing Models

The October issue came as a double treat to me because it contained two of my favorite things—real 1:1 scale F-16s and scale plastic model ones, too. The article, "The Model F-16," provided an interesting insight into the scale model hobby. Being an avid collector of plastic model kits and a builder, I could fully relate to its contents.

I fully agree that the F-16 Fighting Falcon is one of the most often-modeled aircraft in the plastic model industry. The artwork showing full-color box tops of the various kits available is impressive. Indeed. However, I wish to add that it is by no means complete. In 1989, Hasegawa released a 1/72nd-scale kit of the F-35. Also absent from the display is Hasegawa's "coin series" F-16 and their 1/48th-scale Thunderbirds F-16A kit.
Besides these, Monogram produced a kit containing four Thunderbird F-16s in 1/72nd scale that could be displayed in a diamond formation.

One last point: the manufacturer DML is based in Hong Kong, not Korea. Keep up the good work. I look forward to the next issue.

Tony Ng
Singapore

Corps Readers

Thank you for the copies of Code One. My cadets have really enjoyed them. I would like to take this opportunity to thank you and Lockheed for being willing to spend the time and resources to support this program. Too often, as you know, we decry the problems of education and the at-risk student but are unwilling to expend the effort to help out. If Code One catches the attention of only a handful of students in any given school and provides one more incentive to stay in school, then it will have paid dividends well in excess of the cost involved.

1Lt. Wm. A. McGrew (USAF, ret.)
Elkin High School JROTC
Elkin, North Carolina

Take One Down, Pass It Around

I delight every quarter reading my Code One. The articles are fascinating, the photographs magnificent, and the design and layout are superb. And I am not the only one who benefits. My son loves to look at the pictures. (He's almost nine and loves airplanes.) Then I send it to my dad, a former Navy pilot. And he passes it on to my cousin, who's a current US pilot. So thanks from all of us to all of you for a great magazine.

Carol L. Aton
Economic Development Institute
Georgia Tech
Atlanta, Georgia

Future Customers

My brother-in-law, who flies F-16s in the Indiana ANG, passed me a copy of the July issue. Congratulations on producing such an interesting and professional publication. It is obviously put together by individuals with a deep affection for their subject matter. I read it from cover to cover and enjoyed every article and photo. Rather than try to beg for more second-hand copies, I would like to subscribe myself.

Living in Britain for several years, I've had many occasions to see the F-111s based here. Now that they've been passed on to New Mexico, Code One provides a unique means of keeping up with news of their activities and future. I look forward to reading more about them and the F-16.

I recently returned from a visit to Slovakia, where I had the opportunity to fly the MiG-29 (and other aircraft) with the Slovak air force. The F-16 patches on my flight suit were the envy of all the Slovak pilots, and I left with many requests to send some back to the pilots who flew with me. I will also send them my first few issues of Code One after I finish with them (if I can part with them). Who knows—maybe they will be future customers for the F-16.

Daniel B. Peterson
ZS Associates
Berkshire, England

Lone Star Memories

I am involved in flight testing the Naval Lynx helicopter, which is completely dissimilar to the F-16. But some of the problems we face are the same. The frank reporting of F-16 trials in Code One will be very useful. Also, the photography of the most beautiful flying machine ever created (excluding, perhaps, the F-51) is magnificent. My ambition in life is to fly these two machines.

I spent a very happy year working with Bell in Hurst [Texas] and have many real friends in Fort Worth. So next time you're in the Cattleman's Steakhouse in the Stockyards, open a Lone Star and think of us in foggy, soggy Britain!

John Doherty
Senior Flight Test Engineer
Westland Helicopters
Yeovil, England

A Few Requests

Being a person who enjoys historical aircraft as well as current production aircraft, I would love to see articles on both the B-36 and B-32, which were produced primarily at your Fort Worth location by Consolidated Vultee. I am constantly amazed by the stories of these two aircraft. Perhaps they could be included in in-depth articles.

Richard S. Dann
San Diego, California

Editor's note: We're collecting B-32, B-36, and B-58 personal histories for potential articles. If you have a story, or know someone who does, send it in.