One intense guy. That was my impression of Joe Bill Dryden when I first met him in 1988. His text, after five years of working with him as an editor, never altered this impression. His first drafts always had a look of determination, as if he had chiseled them in stone. Joe Bill was one of the lucky few writers who never had to search for his own voice. He seemed to have had one from the start. And that voice was distinct and strong. His was the only work from a technical writer that I’ve ever had to tone down instead of beef up. Joe Bill never resorted to the passive-voice pussyfooting so common in large corporations. He was always direct.

Over the years, I came to understand that his intensity was not driven by fighter-pilot pride (though he arguably had plenty of that). It was driven by a profound concern for his fellow F-16 operators. When Joe Bill used the word you in his articles, everyone knew what he meant—the F-16 pilot. He based his opinions on an objectivity informed by a lifetime of experience in the cockpit. In other words, he had a real feel for the systems and how they worked for those who would have to work them. He never hid an agenda. When he had one, he’d shove it in your face. He wanted F-16 operators to have the most effective and safest equipment that our technology can provide. And he wanted them to use it effectively and safely. To Joe Bill, “Check Six” meant much more than looking behind your back.

Joe Bill Dryden died on 24 May 1993 when his F-16 crashed during a company acceptance flight over north central Texas. He will be missed by many people.

He will also be remembered. If Joe Bill has influenced your flying or if you have had any personal dealings with him that you would like to share with his family (which includes, of course, other Code One readers), I invite you to write to the magazine. A compilation of Joe Bill’s eight years of articles, a project that we began last year, will be published this summer and distributed to F-16 units worldwide as his second Semper Viper book.

Eric Hehs
Managing Editor

Oh, I have slipped the surly bonds of earth
And danced the skies on laughter-silvered wings;
Sunward I’ve climbed, and joined the tumbling mirth
Of sun-split clouds — and done a hundred things
You have not dreamed of — wheeled and soared and swung
High in the sunlit silence. Hov’ring there,
I’ve chased the shouting wind along, and flung
My eager craft through footless halls of air.
Up, up the long delirious, burning blue
I’ve topped the wind’swept heights with easy grace
Where never lark, or even eagle flew.
And, while with silent, lifting mind I’ve trod
The high untrampled sanctity of space,
Put out my hand, and touched the face of God.

*High Flight* by John Gillespie Magee, Jr.
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Dutch pilots pose on the ladder of an Su-27 Flanker at Leeuwarden Air Base. See page 10 for more.
Top Gun takes a look at the danger and excitement that awaits every pilot at the Navy's prestigious fighter weapons school. Tom Cruise is superb as Maverick Mitchell, a daring young flyer who's out to become the best of the best. And Kelly McGillis sizzles as the civilian instructor who teaches Maverick a few things you can't learn in a classroom.

— Video Jacket of Top Gun
Fifteen seconds of fame can have lasting effects. Almost a decade after *Top Gun* the movie blew audiences away with slick aerial cinematography and sizzling astrophysicists, the public relations office at the Navy Fighter Weapons School — the real-life Top Gun — is still awash with visit requests.

Commander Robert McLane (today's counterpart of Tom Skerritt's supporting role as "Viper") is not complaining. "The movie brought us name recognition," says McLane. "The Fighter Weapons School and the Navy received a lot of good press from the movie. It did a lot of good for us. The movie showed the glamorous and exciting side of Naval aviation. Sure, we are constantly having to give tours as a result. But we owe that to the public."

McLane saw the movie when it debuted in 1986. "My children were in junior high at the time," he recalls. "The movie was completely separate from their reality. They knew what dad did. They'd seen me fly in the same airplanes on the screen. But the movie was larger than life. They didn't connect what I did with the movie."
The movie was separate from most realities. Those “MIGs” in the opening aerial scene, for example, were F-5s painted bad-guy black. Unlike real-life pilots, the movie’s aviators rarely strapped on their oxygen masks and never lowered their visors. Most aerial engagements at the school were filmed well below the expressed “10,000-foot minimum altitude” (which in real life is set at 5,000 feet). There is no such thing as a Top Gun trophy. And PhD astrophysicists rarely sizzle. In other words, the movie was far from a documentary. While civilian audiences may have noted a few inconsistencies, Navy aviators had to suspend disbelief from the highest yardarm.

Capt. Mike Manuche, an instructor pilot at Top Gun, has seen the movie twice. “I first saw it with a group of Navy and Marine pilots,” Manuche admits. “We picked it apart. It is like a policeman watching a police movie. You sit in the theater and say, ‘Oh, that could never happen.’ The second time, when I saw it with some civilian friends, I decided it was pretty fun. I appreciated the photography. A movie can be fun to watch even though it doesn’t bear much on reality.”

The reality for both instructors and students is an intense six-week course that sharpens the air-to-air skills of the Navy’s best fighter crews. “The movie is actually fairly accurate in this respect,” says Commander McLane. “The folks who come here are hand-picked by their squadrons. We tend to get the top performers. We make them better by giving them a view of the latest and greatest tactics and threats.”

Today many are asking what the threat is. “All the services are wrestling with that question,” admits McLane. “We’re facing a changing world and a changing threat. We also have a changing environment at home. Our rationale for doing business may not be valid anymore. It costs a lot to train these aircrews. We have to show that the country is getting its money’s worth.

“The Navy perspective has always been a little different from the Air Force,” McLane continues. “Our carriers are deployed all over the world, so we get a firsthand look at a lot of peripheral countries, third world countries. Our course

—the folks who come here are hand-picked by their squadrons. We tend to get the top performers. We make them better by giving them a view of the latest and greatest tactics and threats.

—Skipper Robert McLane, Top Gun Commander
Out in the fleet you'll set up scenarios with other squadrons, but nobody really wants to play the adversary. Here you'll encounter dedicated bandits who execute the gameplan as realistically as the threat would.

— Capt. Tim Curry, Top Gun Student

changes all the time to reflect what we see going on in the world.

Many of these changes concern the proliferation of ex-Soviet hardware. "We're seeing a greater willingness for republics of the former USSR to sell military equipment to foreign countries," McLane explains. "They will sell just about anything they have for hard currency. Today you and I can go out and buy ourselves a MiG-29. It may not run very long because you can't easily get spare parts for it. But we can go get one. They are also selling advanced weapons for existing aircraft. Countries can make their older aircraft more deadly by simply upgrading their missiles. I think we're kidding ourselves if we assume that these countries can't do a good job with this equipment against our equipment."

And technology alone may not be the deciding factor. "As sophisticated as our airplanes are," explains Manche, "an engagement often boils down to who sees whom first. In World War II, you couldn't be shot down by anyone who was outside of 1,000 to 1,500 feet. So if you saw someone a mile away, you had an advantage, time to react and make a decision on how to attack or defend against an attack. So sight was very important. Although missiles that can hit targets beyond visual range give the opposite impression, sight is even more important today. If you are within visual range, you now have the ability to kill an adversary from where you are. You can't shoot someone down thirty miles away unless you can identify them as the enemy. What you see on the radar may or may not be the enemy. Also, radars are not all-seeing. You need to be able to look to the sides and behind you. And those are skills that come with experience and training."

Five people on McLane's staff gained experience in the Gulf War. "While they may not have seen much air-to-air action in Desert Storm," says McLane, "there is something to be said for being shot at and being able to work under those conditions and remain calm, cool, and collected. They can transfer these qualities into the air-to-air arena. Aircrews that have been through combat are pretty competent. They're leaders."

Lt. Rick Claggett flew almost forty combat missions in the Persian Gulf. "In combat, you lean back on your training," Claggett says. "You want to train as hard as you can so that it naturally takes over when you go into combat. The basics were there for me when I needed them; I didn't have to think about them."

"But we shouldn't learn too many lessons from the war," warns Claggett. "Because the air war was such a success, training may suffer. The perception may be that we are so good that we can slack up a bit. The truth is that the Iraqis were just not that good at their job."

CODE ONE 5
Training time for Navy and Marine aircrews is normally spent in many ways. Much of it goes to air-to-ground practice, air-to-air instrument flying, and low-level training. "You have only so much flying time," McLane says. "When you have to worry about landing on a boat in the middle of the night, you have to spend some of those precious flight hours making sure that you’re going to clear the ramp and hit the wires. That’s life-or-death training. And it eats up flight time.

"Navy and Marine pilots receive air-to-air training when they are at sea, but it is spread out," continues McLane. "When your primary mission is strike warfare, air-to-ground warfare, you spend less time sharpening your air-to-air skills. At Top Gun, aircrews receive very focused training on air-to-air warfare. They fly at least once a day, sometimes twice. Then we go into our briefing and debriefing and analyze the hops in detail."

Capt. Tim Curry, a student pilot at Top Gun, is in his third week of the course. "The great thing about this school is that the bogies are professional bogies," Curry says. "The presentation you get here is much better than the one you get in the fleet. There is no comparison. It is much more accurate and realistic. Out in the fleet you’ll set up scenarios with other squadrons, but nobody really wants to play the adversary. Here you’ll encounter dedicated bandits who execute the gameplan as realistically as the threat would."

Curry, a Marine F-18 pilot, is one of eight pilots going through the current Top Gun class. The Fighter Weapons School trains about forty fighter aircrews every year. Candidates for the course must have 400 hours in their particular aircraft and have been deployed on a carrier for at least one six-month deployment. Their commanders look for pilots with good stick-and-throttle abilities and potential to become good instructors. To put what they’ve learned to use, those selected must also return to their squadron for another deployment, usually as training officers.

"Timing has a lot to do with the selection," says McLane. "You may have superstar in your squadron – pilots who would make exceptional teachers – but they may be on their way to another squadron. The selection process is a matter of finding the best people at a given time." The school holds five courses every year for the crews of eight aircraft in each course – usually a mix of four Navy F-14s, two Navy F-18s, and two Marine F-18s.

"We work with integrated units called air wings," McLane explains, "what the Air Force calls a composite wing. When the Navy mans a carrier, it sends an air wing. The components of the wing work together between deployments (called turnarounds). The unit will have an EA-6 squadron, an E-2 squadron, two F-18 squadrons, two F-14 squadrons, an A-6 squadron, a helo squadron, and an S-3 squadron. The F-18s, F-14s, and the E-2s tend to work closely during the turnaround. At the Fighter Weapons School, we try to get two F-18 crews and two F-14 crews, several air intercept controllers, and an E-2C naval flight officer from an air wing for each class."

The fighter instruction begins with one week of classwork. Students are brought up to date on the latest information on radar systems, aircraft and weapon upgrades, and threat performance. This portion of the course is also attended by Navy and Air Force active-duty and reserve pilots.

"We exchange a great deal of information with the Air Force in our day-to-day operations," says McLane. "We have one Air Force exchange officer as a permanent member of our staff as well."

In the second week, students start flying one-on-one (called 1v1) engagements against the instructors piloting adversary aircraft. Every sortie involves a series of air-to-air engagements. "We aren’t teaching just the basics of 1v1," says Manuche, a Marine pilot who went through the course himself in 1991. "We expect them to perform well out there. We are teaching the finer points of 1v1. We’re teaching aircrews how to get the most out of training sorties as opposed
to simply going out and blasting opponents out of the sky. Experience alone may make aircrews better. But they'll get better a lot faster with good training.

"We're not only judging the way they fly but also the way they talk about their flights," Manuche continues. "If a pilot beats me in a 1v1 encounter, I want him to be able to show me how he did it. I want to hear why he did what he did. I also want him to be able to do the same if he loses. Students must be able to reconstruct engagements and identify transitions from offensive or defensive to neutral. We want them to take these debriefing skills back to their squadrons and use them with their junior pilots."

The aerial encounters increase in complexity as the course progresses. The 1v1 encounters become 2v2 in the third week. By the sixth week, students are flying as a composite force in packages of four to eight aircraft against an enemy of unknown strength. "We begin by showing them some threats that are not going to do a very good job flying their equipment," says McLane. "Then we raise the ante. At the other end of the spectrum, we'll show them a MIG-29 with radar missiles and a well-trained pilot with a very aggressive mindset. If we don't train to the most capable threat, we're shortchanging ourselves."

The hardware behind that most capable threat happens to be Top Gun's F-16N Fighting Falcons, which the unit has been flying since 1987 (the year after the movie was released).

"We can simulate the MIG-29 and Su-27 and other advanced aircraft very well with the F-16," says McLane, who has over 3,000 hours in the F-14 Tomcat and 150 hours in the Fighting Falcon. "The F-16 was a major leap for the adversary mission into what we call fourth-generation aircraft. We had the biggest engine available at the time put in it and we beefed it up structurally. Most of our hops are pretty dynamic. And we don't give the jets much of a rest in between. Overall, the airplane has been very reliable and we've had very few problems with it on a day-to-day basis.

McLane often gets asked about the follow-on for the unit's F-16s. "I don't think there is one," he says. "I can't imagine anything else that we can use in that role in the next five to seven years. My answer has a lot to do with the F-16's low cost per flight hour. The Navy has looked at some alternatives, including Russian aircraft -- the MIG-29 in particular. Its biggest liability is logistics. How do you get a logistics pipeline going? Who will repair the airplanes? With the F-16, we don't have that problem. The US Air Force has thousands of them -- a great database. And we get great support from the Lockheed Air Services Company."

(Interestingly, Lockheed personnel maintain Top Gun's four Grumman F-14s as well as its eight F-16s.)
Although it is not a firm requirement, most Top Gun instructors have graduated from the school. According to McLane, the school looks for flying abilities and teaching skills when selecting instructors. “Stick-and-throttle abilities, however, are not at the top of the list,” says McLane. “We expect Navy and Marine pilots to already have these skills. We want people who are articulate, intelligent, and willing to work hard. Everyone here works six or seven days a week. We take two holidays off a year, Thanksgiving and Christmas. We work every other holiday. After a couple of classes, the instructors become comfortable with the pace.”

The Fighter Weapons School is a three-year assignment for instructor pilots. “The first year they are getting their feet on the ground,” explains McLane. “The second and third year, they are adding value to our operation; we’re getting a return on our investment.”

The first year is probably the toughest for the instructors. They have to quickly become expert in a particular subject, such as radar systems, weapons, and threat tactics. Capt. Manuche, for example, specializes in the F-18’s radar, the APG-65. “You have to do a lot of research to put a lecture together,” says Manuche. “Then you have to practice the lecture in front of two or three instructors at a time until every instructor has seen it. They critique it and make suggestions. Eventually you perform a dress rehearsal in front of the whole staff. So you better know what you’re talking about. They decide if you are ready. Usually their critique lasts as long as the lecture. It’s tough.” Manuche gives his radar lecture five times a year to the classes and takes his show on the road to other Naval and Marine air stations.

Like their students, Top Gun instructor pilots are either F-18 or F-14 qualified. New instructors go through a familiarization phase to reacquaint themselves with the A-4, which they encountered in Navy flight school. Soon after that, they transition into the F-16. The ground portion of the F-16 transition training is usually conducted at MacDill AFB in Florida or Luke AFB in Arizona.

The flying portion of the transition training begins with two flights in the two-seat aircraft (in the Navy, it’s called the TF-16N) and nineteen instructor training flights in the single seater. The transition tends to be easier for the F-18 pilots than it is for the F-14 pilots. “The F-15 guys are accustomed to a single seat,” says Manuche, who transitioned to the F-16 in late 1992. “They have also used a state-of-the-art head-up display. We’re also used to fly-by-wire flight control systems. It’s a fairly easy transition to make.”

When talking to a Top Gun instructor who has come from an F-18 cockpit, it is difficult to avoid direct comparisons between the F-16 and F-18. Most pilots handle the differences diplomatically, “Having flown against the F-18 when I went through Top Gun, it was nice to actually get in the airplane and fly it,” says Manuche. “I really liked the high thrust-to-weight ratio. Every fighter pilot likes to go fast, and this plane is especially good at low altitude. The F-16’s seating arrangement and visibility are also very nice. It is a fun plane to fly and a very good adversary aircraft. It has a nice radar for adversary work. We fly with the APG-66, which is the F-16A radar. Most Air Force pilots are flying with an APG-68 now — which is even better.

Lt. Claggett made the F-18/F-16 transition almost two years ago. “Being able to fly another fourth-generation airplane is one of the attractions for coming here,” says Claggett. “The F-16 is a speed merchant. I love the ability to go 500 knots. That was never possible in the F-18. The F-16 is an easy airplane to learn to fly, especially the way we fly it. That is, we don’t fly all the various air-to-ground missions. We’re strictly air-to-air. Plus F-18 experience certainly makes it easier to transition into the F-16 because a lot of the same ideas went into these airplanes.

“On both planes,” says Claggett, “the flight controls are so simple almost anyone can fly the airplanes.

If you can beat an F-16 at Top Gun, then you can beat anything out there.

— Lt. Rick Claggett, Top Gun Instructor Pilot
after a couple of rides in the simulator. It has to be that simple because of all the decisions a pilot has to make. You don’t have time to concentrate on the basics of flying. The alpha limit may frustrate F-15 pilots. Sometimes you want to point the nose and the F-16 won’t let you do it. But the limiter has some strong advantages, too. The airplane takes care of its pilot; it won’t let you get into a hole. It helps you make the right decision. With the F-18, you can make some major mistakes if you don’t thoroughly understand what you’re doing.

“The sidestick controller really bothered me at first,” Claggett continues. “I’d be distracted and make a grab for a stick that wasn’t there. After a while, though, it becomes natural. I wasn’t a fan of the sidestick before. Now I wish the F-18 had one. The visibility between your legs would certainly be improved in the Hornet. In the F-18, you always have to look around the stick to see what’s on the horizontal indicator. In the F-16, your office is in front of you. The things you need to see are in the open.”

Claggett has over 1,000 hours in the F-18 and about 250 hours in the F-16. “We often fly the F-16 to its limits,” he says. “If you can beat an F-16 at Top Gun, then you can beat anything out there. Nobody can do any better than this.”

Visitors to the Navy’s Fighter Weapons School may not see what they expect to see. They won’t see many monster motorbikes parked in the lot. They won’t see F-14s buzzing the control tower. And they won’t see a bunch of fighter jocks vying for a top slot in the class. The overall theme of the movie, however, may compensate for its exaggerations and inaccuracies. The movie, after all, contrasts competition and independence against teamwork and maturity. By learning to be part of a team, Maverick Mitchell becomes a better pilot.

“We don’t like to see a pair of airplanes splitting up,” says Commander McLane. “We call it yoyo; you’re on your own. We want to see aircraft working together out there. You get synergistic effects from teamwork – massed firepower, different sensors looking in different places, better self-protection. That’s an important lesson that we teach here. And that’s something that we want students to take back to their squadrons when they leave.”

E. Heks

The outstanding aerial photography for this article appears in Dean Garner’s book, TOPGUN Miramar, available from Motorbooks International or by request from major bookstores.
Newly graduated Dutch weapons instructors and some of their teachers unwind in their flight gear around one of the F-16s of the 323rd Squadron.

PHOTOGRAPHY BY ERIC HEHS

THE DUTCH WEAPONS INSTRUCTOR COURSE

10 JULY 1993
If Paramount Pictures ever decides to make a European sequel to Top Gun, producers should pack their portman- 
teaus for Holland and take a look at the Dutch Weapons 
Instructor Course. Held every two years at Leeuwarden Air 
Base, the DWIC, as it is called (but the name could be 
changed to something like Euro Gun, of course), is every bit 
as demanding as Top Gun. Like students at the US Navy’s 
school, the students selected for the Dutch training repre-
resent the best of the best. And also like Top Gun School, the 
Dutch course transforms these pilots into instructors.

More specifically, graduates from the Dutch course 
become weapons instructors. These pilots are a core element 
for maintaining a high-degree of excellence in the Royal 
Netherlands Air Force. They train new pilots. They design 
tactical exercises for their squadrons. They keep abreast of 
new and improved weapons and tactics as well as changes to 
the airplane itself. These instructors must, therefore, have a 
through knowledge of their airplane and its related weap-
ons. They must also know how best to employ these 
weapons. And, finally, weapons instructor pilots must have a 
knack for transferring what they know to other pilots. The 
RNLAf has two to three of these highly trained specialists in 
each of its nine F-16 squadrons.

The weapons instruction course lasts for sixteen weeks 
and is normally divided into four phases: air-to-ground theo-
ry, air-to-ground flying, air-to-air theory, and air-to-air flying. 
In the air-to-ground theory phase, students spend the first 
three weeks in the classroom learning the underlying prin-
ciples of various air-to-ground weapons, tactics, and radar. 
This academics phase also contains some basic electronic 
warfare instruction.

In the second phase, students put what they’ve learned 
in the first phase to use in actual flying. The students act as 
instructors when they brief and debrief these missions and 
are graded on their performance. This phase concludes with 
their dropping live munitions over a bombing range on an 
Inland off the coast of Holland.

Like the air-to-ground theory phase, the air-to-air theory 
phase also takes about three weeks. In this phase, students 
learn how best to employ their aircraft against other aircraft. 
They receive instruction in air-to-air radar, aerodynamics,
infrared principles, threat identification, electronic counter-
measures, intercept geometries, and various air-to-air 
missiles. This phase also includes advanced instruction in 
electronic warfare.

The air-to-air flying phase takes students from a compre-

hensive aerial review of basic fighter maneuvers through 
several four-versus-four encounters against dissimilar air-
craft from foreign air forces. The dissimilar aircraft this year 
came from an RAF F-3 unit and a USAFE F-15E unit, both 
from Britain. In past years, the Dutch have flown against 
Canadian F-18s, French Mirage 2000s, and USAFE F-15s. 
The phase also includes tactical intercept missions, gun firing 
on a dart, and a live AIM-9 firing.

This year, a final tactics phase was added to the course. In 
this phase, the students had to integrate all that they learned 
in the course into a full combat scenario. After being 
divided into air-to-air and air-to-ground forces, students had 
to penetrate various ground and air threats to reach a final 
ground target. The exercise also included one aerial refuel-
ing. The tactics phase required support from other Dutch air 
force units, including teams equipped with ground-to-air 
Hawk, Patriot, and Stinger missiles. The exercise benefited 
these ground units as well as the Dutch pilots. While such 
operations, called integrated combat training, are nothing 
new for the RNLAf, they are new for the DWIC.

Students for the course are selected on the basis of their 
performance and experience. Each of the country’s nine 
F-16 squadrons submits a candidates list, usually consisting 
of experienced pair leaders or section leaders — pilots who 
have normally been flying in the squadron for about three 
years. Being chosen for the course is a high honor.

Course administrators reduce the list to the top ten for 
the entire Dutch air force. RNLAf officials base their final 
decision on the needs of the squadrons. Their aim is to main-
tain a relatively equal number of weapons instructors at 
every squadron.

Because DWIC is not a full-time school (it is unlike Top 
Gun in this respect), some instructors for the course are bor-
rrowed from several RNLAf squadrons. They participate in 
the training as long as they are needed in a particular phase.
Most course instructors, however, come from the 323rd 
Squadron at Leeuwarden Air Base. The 323rd is the 
RNLAf’s primary F-16 tactical test and evaluation squadron.

The RNLAf began DWIC in 1988 to augment the bien-
nial Fighter Weapons Instruction Training (or FWIT, usually
pronounced f-wit). FWIT produces fighter weapon instructors for the four Western European air forces that fly the Fighting Falcon – Belgium, Denmark, Holland, and Norway. Each of these countries sends three or four pilots through the joint training, which is also held every two years. With more F-16s than any other European air force at its nine bases (and two or three weapon instructors as a minimum at each base), the Dutch needed more instructors than the FWIT could produce.

Besides producing more weapons instructors, setting up an indigenous course has several advantages for the RNLAF. The Dutch themselves can determine the content of the course instead of negotiating with other countries. They can also fit it into their own schedule. And they can include instruction on equipment peculiar to the Netherlands.

While both FWIT and DWIC produce weapon instructors, Dutch pilots who attend FWIT must complete additional training in electronic warfare and tactics to be fully qualified for their air force. The compensatory instruction usually relates to subjects that are not discussed between countries that participate in FWIT. The pilots make up for these subjects by attending the appropriate classes at DWIC.

After all the academics and flying, students at both FWIT and DWIC are exposed to a variety of topics related to their profession in a one-week fighter symposium. What made this year’s symposium special for DWIC was flying demonstrations performed by the Russian Knights – an Su-27 acrobatic team from Moscow. Lt. Gen. Nikolai Antoshkin, the commander of the air force of the Moscow military district and co-founder of the Knights, also gave the students a high-level perspective on the future of the Russian air force.

The symposium included presentations from two prisoners of war from the Gulf War – RAF Ftl. Lt. Bud Burgess and USAF Maj. Bill Andrews (Andrews’ journal was reprinted in these pages last year). Gen. Yiftah Spector of the Israeli air force, a distinguished Israeli pilot with over a dozen aerial kills, spoke on airmanship and leadership. And Code One’s very own Joe Bill Dryden gave his best views on night-vision systems.

The students were also briefed by representatives from industry and the military on a variety of equipment and programs, including the F-16 Mid-Life Update program, engine upgrades, radar improvements, laser-guided munitions, missile technology, helmet-mounted display systems, satellite reconnaissance techniques, and airborne warning and control (or AWACS) operations. Lockheed, Hughes Aircraft, Westinghouse, Pratt & Whitney, Matra Defense, Hamilton & Associates, Elbit Electronics, Kaiser Electronics, and Geo Dynamics were some of the defense contractors in attendance.

Like their Navy (and USAF) counterparts, graduates from the Dutch Weapons Instructor Course are treated to a final dinner. The highlight of the evening is a presentation of awards and graduation certificates after which students trade gifts with their instructors and staff. Then these best of the best, now weapons instructors, return to their home squadrons to share what they’ve learned.

E. Hebs

Information for this article was expertly provided by RNLAF Maj. Leo van Bruggen, who was the deputy supervisor for DWIC 1993, and by USAF Maj. Mike Cook, who is the Operations and Training Staff Officer in the Netherlands.
This was no air show visit. Instead, this was history being made as the Russians descended on Leeuwarden Air Base in their Il-76 transport aircraft and two Su-27 fighters last April. Their landing marked the first time front-line tactical fighters from a Russian air force unit participated directly with a NATO tactical squadron. Soon after the aircraft touched down, a Russian general addressed real fighter pilots, not as an adversary but as a partner in a new and complicated world where air power is playing an increasingly important role.

Lt. Gen. Nikolai Antoshkin, the featured Russian speaker, commands the air force of the Moscow military district. He is also the senior commander of Kubinka Air Base. Antoshkin joined his country’s armed forces in 1961. He graduated from the Orenburg Higher Military Air Force School in 1965. After graduating from the Yury Gagarin Air Force Academy in 1973, he assumed duties as a squadron commander, deputy regimental commander, and then regimental commander. After finishing coursework at the General Staff Academy, Antoshkin commanded a numbered air force in the Kiev military district. By 1986, he was the chief of staff and first deputy commander of the air force of the Kiev military district.

The Russian general has received many awards. Most impressive is his Hero of the Soviet Union medal – his nation’s highest military honor. He received this distinction for commanding the air operations involved in sealing the damaged reactor dome at Chernobyl.

Antoshkin and Maj. Gen. Vladimir Sokolov are considered to be the founders of the two modern Russian fighter aerobatic teams, which operate from Kubinka. The base is the home of three air force regiments. Both aerobatic teams were formed from the Proskurovskii Guards Regiment. The first team was formed from a MIG-29 Fulcrum squadron and was christened the “Stormy Petrels,” then later, “The Swifts.” (An aerial photo of one of these aircraft appeared in the April issue of Code One.) The second team – the one that visited Leeuwarden – was formed from an Su-27 Flanker squadron and became the Russian Knights. Historically, demonstration teams from MIG-15s and MIG-17s to MIG-21s were formed from this regiment in Kubinka.

After the fall of the Soviet Union and the institution of new freedoms, the Russian air force surveyed the many Western demonstration teams, such as the USAF Thunderbirds, US Navy Blue Angels, and the RAF Red Arrows. They then formed a dedicated display unit of six
Su-27s. The unit represents all of the Russian Republics in what became known as the Commonwealth of Independent States, not just the Moscow military district. The blue and gold insignia on the side of the smartly painted Flankers reads “Kubinka” and “Proskurovskii” and honors the 1938 formation of the unit during the Great Patriotic War.

After overseeing the building of the Russian Knights and trying them out in air shows around the Russian capital, Antoshkin allowed the team to prepare for an exchange program with the RAF’s Red Arrows. Subsequently, the Red Arrows visited Russia in 1990. The Knights returned the favor in 1991 by visiting England to support celebrations for the anniversary of the Battle of Britain. The Knights flew into RAF Scampton and were hosted by the RAF’s Central Flying School, the parent unit of the Red Arrows.

The first RAF officer to fly with the Knights was Air Marshal Sir John Thomson, commander of the RAF Support Command. During the same visit, the Knights gave a half dozen British pilots an aerial impression of the Flanker. The Russians’ visit to Leeuwarden was significant because it was the first operational-to-operational contact between Russian and NATO fighter pilots. It was especially significant for the handful of Dutch pilots who got a chance to fly the formidable Su-27.

The Russian Knights arrive for DWIC 1993 in an Il-76 transport aircraft and two of their six Su-27 Flankers.

A German MIG-29 was also on display during the DWIC Symposium. The German pilot of this former East German aircraft lectured the DWIC students on his aircraft’s capabilities and shortcomings.
The Changing Face Of Flight Training Simulators

BY ROBERT L.Bothwell

Simulators come in a variety of flavors, from the plain vanilla of software programs that run on a personal computer to the fudge ripples of facilities with complex aerial imagery projected onto the inner walls of large dome-shaped chambers. This may come as a surprise, but the latest trend is towards the vanilla end of the spectrum. Air forces are considering lower-cost devices that can easily be accommodated at the squadron level.

In the past, ground-based training at the squadron level has been relatively unsophisticated. A squadron normally has trainers for cockpit familiarization, avionics familiarization, and egress procedures. All of these devices have limited functions designed to train specific tasks. For example, the egress procedures trainer is used to instruct and to practice how to unstrap, unplug, and get out of the aircraft in case of an emergency. While these trainers are common, the complexities of simulating flight have confined flight simulation trainers to large centralized facilities devoted to pilot instruction or to research.

Active-duty USAF bases normally have their own flight simulation trainers to support continuation training (periodic ground-based flight training required by the Air Force). Smaller units, like USAF Reserve and Guard squadrons, typically have no such trainers, so pilots must travel to off-site locations to fulfill these requirements. The 301st AF Reserve Squadron at Carswell AFB in Fort Worth, for example, uses the nearby flight simulation laboratory here at Lockheed.

Instructors at these large simulation facilities sit in front of a console and an array of display screens in a room separate from the simulated cockpit. They use intercoms to communicate with the subject pilots (usually over the din of air-conditioning compressors and circulating fans required to keep the system cool). These simulators often require their own army of technicians to keep the large mainframe computers running and maintained.
As inconvenient, complicated, and expensive as these systems are, they still offer a safe supplement to flying training. On top of that, they conserve valuable air assets and make them available for more advanced training and exercises. They also avoid fuel and maintenance costs associated with actual flight.

Advances in microcomputers and the associated reduction in computing costs, however, are making flight simulation training even more appealing by eliminating most of its shortcomings. What used to take a warehouse of space can now be accommodated in a ten- by twelve-foot room. Complicated remote consoles with a multitude of operator screens are being replaced by much simpler instructor stations located within arm's reach of the subject pilot. Some of these systems can be operated by one person. The armies of technicians are now being replaced with 1-800 assistance lines like those used by software companies. These new systems can be fired up within a matter of minutes. And because they use compact microprocessors found in standard desktop computers, they can operate in a standard office environment.

The birth of these new microprocessor-based flight simulation trainers can be traced back to Lockheed's F-16 Avionics Familiarization Trainer and USAF Armstrong Laboratory's Avionics Intercept Trainer, both developed in the mid-80s. These devices train basic avionic procedures for air-to-air intercept missions. They do not go very far to duplicate the F-16 cockpit. The pilot sits in a regular office chair before a radar display and a computer monitor that presents a simple outside visual scene and head-up display information.

The success of these early trainers led to the Part Task Trainer, which was developed by industry for the Air National Guard. Like its predecessors, the Part Task Trainer is used to sharpen primarily air-to-air intercept skills. However, its cockpit comes much closer to the real thing by displaying instruments on a large video monitor. It also has a simulated threat environment that displays enemy aircraft targets on the pilot's radar and an out-of-canopy visual scene.

Armstrong Laboratory went beyond its first microprocessor-based device with its Multitask Trainer. This trainer uses mechanical instruments in a realistic cockpit rather than instruments displayed on a video monitor. The system is significantly more complex and expensive than its predecessor.

Another entry on the microprocessor-based squadron trainer scene will be the Unit Training Device developed by industry. This trainer is to be designed to instruct both F-16 and F-15 pilots at the squadron level in air-to-air, air-to-ground, and emergency procedures. Details on this system have yet to be defined.

Lockheed's own Falcon Star cockpit trainer is another member of this emerging class of aircrew trainers. Like the latest microprocessor-based systems, it is compact and transportable. It requires less than 120 square feet of floor space and ceiling heights as low as seven feet. Falcon Star trains routine aircraft procedures like preflight checks, takeoffs, landings, and instrument approaches. It can also be used for emergency procedures and for more complicated tasks that involve employing weapons and electronic countermeasures against air and ground threats.

The evolution of all these trainers is characterized by a struggle between cost and fidelity. More specifically: the higher the fidelity, the greater the cost. Because of its array of mechanical instruments in a
realistic cockpit, for example, the Armstrong Lab's Multitask Trainer is much more expensive than its lower-fidelity predecessor, the Air Intercept Trainer, which has only a radar display and a small video display. The relationship between cost and fidelity, however, is not axiomatic. It can be circumvented with a little ingenuity and resourcefulness.

Costs can be lowered without diminishing fidelity by avoiding things that don't contribute directly to training, such as air conditioning for cooling the trainer's components and requirements for non-standard power supplies.

Another approach is to use, wherever possible, commercially available hardware and software. These components enjoy a reliability and maintainability proven in other systems and applications. The Falcon Star trainer, for example, has an image generator developed by Evans & Sutherland. This system has a terrain database with a variety of features, like mountains, airfields, roads, and bridges. The system displays air and ground threats and a variety of weather conditions.

The software supporting what the pilot experiences inside the Falcon Star cockpit has some unique advantages. It benefits greatly from company-owned software models used in the development of the F-16. These include aerodynamic models created from actual flight test data, instrument models developed for piloted vehicle integration stations, and avionic software validated in Lockheed's engineering flight simulators. Changes to the software can be inserted in Falcon Star before they are put in the F-16. This attribute gives pilots a chance to train before they fly.

The approach to simulating mechanical cockpit instruments also reduces costs. While mechanical displays simulated on video monitors (often referred to as "glass instruments") offer the least expensive approach, they also tend to be the least realistic. But employing actual mechanical displays in a simulated cockpit can be very expensive. The Falcon Star trainer sidesteps this tradeoff by combining realistic instrument faces with video monitors. The result is an authentic and geometrically precise instrument panel with significantly fewer moving parts and lower life-cycle costs. The trainer has a control stick, throttle, seat, and rudder pedals that match the F-16's specifications.

The instrument panel in the Falcon Star is reproduced on the instructor's console. Since the console's display resembles the instrument display in the airplane, instructors can use familiar scan patterns when monitoring student performance.

Cockpit trainers like Falcon Star will soon be a common sight at every fighter squadron. They will accommodate tasks of simpler squadron-level trainers. They will supple-

Belgium, Denmark, the Netherlands, and Norway are considering a squadron training device based on Falcon Star as part of their Mid Life Update Program for the F-16.

Bob Bothwell is a project engineer on the Falcon Star cockpit trainer.

Falcon Star is a trademark of Lockheed Corporation.
MATV VISTA

THE LATEST DESIGN IN THRUST VECTORING
By James Sergeant
Thrust vectoring lets the exhaust flow from an aircraft’s engine be redirected to enhance takeoff performance, maneuverability, or control. The first aircraft to use a jet thrust diverter for vertical lift was the Bell X-14, which first flew in 1957. The X-14 was one of NASA’s most successful x-planes, flying nearly a quarter of a century with few accidents and no major injuries. The X-14 verified the viability of a vectored-thrust vertical/short takeoff and landing aircraft (commonly referred to as V/STOL aircraft).

The first several Navy A-6 Intruders built by Grumman had one of the earliest thrust-vectoring systems. This system first flew in 1960. The pilot could manually set the direction of the aircraft’s “tilting tailpipes” in normal cruise or in a takeoff position (of twenty-three-degrees down from the horizontal cruise setting). By providing additional lift, the takeoff position reduced the required takeoff roll for the Marine Corps mission. The system, however, was not cost effective and was subsequently dropped after the seventh production aircraft.

The most successful operational application of thrust vectoring has been on the AV-8B Harrier flown by the British Navy and the US Marines. This system, also manually controlled, permits short takeoff and vertical flight. Although impressive at air shows, the aircraft has some tactical limitations. Vertical flight with a full weapons load consumes a lot of fuel and significantly reduces the airplane’s operational radius. Still, the aircraft is well suited for the Marine Corps, which operates the Harrier close to the front lines and at austere operating locations.

More recently, thrust vectoring has been used to enhance the stability, control, and handling qualities of more conventional fighters (that is, non-V/STOL aircraft). The aerodynamic benefits of vectored thrust have been analyzed and demonstrated in several flight test programs, including the F-18 High Angle of Attack Research Vehicle (known as the F-18 HARV), the Rockwell/Deutsche Aerospace X-31, and the Lockheed/Boeing YF-22 Air Superiority Fighter.
The F-18 HARV vectoring system employs spoon-shaped paddles mounted externally on the aircraft to deflect the engine exhaust. The HARV program has produced significant increases in maneuverability at moderate angles of attack as well as additional control at angles of attack near seventy degrees. Envelope expansion flights completed last year by NASA demonstrated stable flight at seventy degrees AOA. (The previous maximum for the aircraft was fifty-five degrees.) The system, however, cannot operate at supersonic speeds. It also adds another 2,100 pounds to an aircraft with a shorter range and a lower thrust-to-weight ratio than the F-16.

The X-31 also employs paddles to deflect engine exhaust from its single General Electric F404-GE-400 turbofan engine. The first of two X-31s completed its initial flight in October 1990. The aircraft achieved controlled flight at seventy degrees AOA last year and is being used in air combat maneuvering flight tests this year. The X-31 has a design speed of Mach 0.9.

In the YF-22 demonstration program, thrust vectoring was successfully integrated into two new engine/nozzle combinations. Unlike the HARV and the X-31, the YF-22 vectors thrust with engine nozzles instead of external paddles. The YF-22’s nozzles provide additional pitch control power so the aircraft can maneuver effectively at slow airspeeds and higher angles of attack. The aircraft has thrust vectoring in the pitch axis only. (The aircraft’s shape was designed to provide adequate stability control so that yaw vectoring is not required.) The YF-22 performed pitch and roll maneuvers up to sixty degrees AOA in its highly successful flight test program.

The latest in the line of thrust-vectoring systems will soon be flight tested on an F-16D. This system, called the Multi-Axis Thrust-Vectoring System or MATV, was designed and built by Lockheed Fort Worth Company and General Electric. The MATV has an exhaust nozzle that provides up to seventeen degrees of thrust vectoring in any direction. The compression link of the normal production nozzle on the General Electric F110 engine has been designed into a new outer flap, which is connected to a new divergent flap design. Three unique vectoring actuators position a ring that translates the nozzle flaps to the desired geometries.

Nozzle movements in the MATV are commanded automatically by the flight control system so that, unlike the Harrier, the pilot doesn’t have to position the nozzle manually. The nozzle provides additional stability and control power to augment the basic flight control surfaces. The design not only provides pitch vectoring like many of its ancestors, but it also provides yaw vectoring at a multitude of pitch/yaw combinations. The nozzle retains independent control of the exhaust expansion ratio as well. The entire mechanism of the prototype, which adds just over 400 pounds to a standard F110 engine, is significantly lighter than other thrust-vectoring systems. The system design could be further developed for incorporation into future production F-16s or for retrofit into F-16s with digital flight control systems.

General Electric completed a month-long ground test of the MATV-modified F110 engine in early 1992. Lockheed

The F-18 High Angle of Attack Research Vehicle produced good results; however, its externally mounted thrust-vectoring system has no practical application.
Fort Worth Company (then General Dynamics) designed the flight controls and avionic software. Lockheed also developed the flight control laws, modified the flight control system hardware and software, and devised the required cockpit displays and switchology. The test aircraft and support for the flight test demonstration were originally to have been provided by a foreign military sales customer.

Although the system development was nearing completion in 1992, the lack of a test aircraft threatened to delay the flight demonstration. The program is back on track now that the Variable-Stability In-Flight Simulator Test Aircraft (better known as the VISTA/F-16) has been chosen as the testbed for the MATV.

Like the F-18 HARV, the X-31 has externally mounted paddles to deflect exhaust.

The YF-22 required only pitch vectoring nozzles to maneuver effectively at high angles of attack.

*Code One* readers may recall (from an article in the January 1991 issue) that the VISTA/F-16 is an in-flight simulator for training test pilots and for developing flight control laws for other aircraft. The aircraft can simulate a variety of aircraft types with its variable-stability system that interfaces with the digital flight control system. Lack of funding forced the VISTA into flyable storage after five acceptance and functional check flights were completed in April 1992. Flight tests of the variable-stability systems, however, will begin in early 1994. In the meantime, the VISTA/F-16 will head out to Edwards AFB in California this summer for an aggressive flight test program for the MATV.

The new multi-axis nozzle will allow the F-16 to maneuver effectively beyond its current twenty-five degree AOA limit to fifty, sixty, and possibly over seventy degrees AOA. Although not a part of the MATV program demonstrations, other potential benefits to the F-16 include decreased takeoff distance, increased range and fuel efficiency, control reconfiguration to compensate for system failures or battle damage, and the removal of the AOA and handling limitations for air-to-ground loadings. (These limits for air-to-ground loadings are now set at sixteen degrees maximum AOA and reduced roll rates of 100 degrees per second.)

Although the technical benefits of thrust vectoring to aircraft stability and control are clear from a purely engineering standpoint, the tactical benefits are under debate. Many fighter pilots argue that the slow aircspeeds associated with high-DAO maneuvers are tactically undesirable. You may be able to hit an adversary with an amazing pirouette and gun shot at eighty degrees AOA. But your resulting aircspeed of sixty knots makes you an easy target for your opponent's wingman.

On the other hand, as a typical air-to-air engagement progresses from an initial high-speed merge into several turns and attempts to position you for a shot on your opponent, the F-16, even with the latest engines and thrust capabilities, continues to lose aircspeed. You soon find yourself against the airplane's AOA limiter at twenty-five degrees, trying to swing the nose around a little more to get a gun shot...
The J Turn minimizes time and radius of a turn to gain an offensive position.

Resembling a flat spin, the Helicopter Gun Attack enables an aircraft to track an adversary well inside the adversary's turn radius.
or a missile lock. But the flight control system won’t quite let you get there.

Controlled flight to seventy degrees AOA will impress aeronautical engineers. But fighter pilots will more likely be taken by the system’s ability to remove the AOA limiter and improve the aircraft’s agility and nose-pointing ability. The system will also allow the airplane to attain its maximum lift efficiency (or coefficient) at approximately thirty-five degrees AOA. Maximum lift for any fixed-wing aircraft occurs just before the wing stalls, loses lift, and develops high drag.

On production aircraft, the F-16 AOA limiter is set at twenty-five degrees for a good reason. At higher angles, the aircraft does not have quite enough stability to keep the nose from slicing off to the side while maneuvering. This side-to-side stability, called lateral-directional stability, decreases dramatically above twenty-five degrees – to the point that departures from controlled flight occur. So a limiter was installed in the flight control system logic to preclude any such departures.

Thrust vectoring overcomes this instability at higher AOAs by providing additional control power to stabilize the aircraft and allow it to turn on its own axis. With this increase in lateral-directional stability, the F-16 will be able to turn even tighter and point the nose even better at slower speeds.

As part of the MATV flight test program this summer at Edwards, project test pilots Joe Sweeney, from Lockheed, and Maj. Mike Gerzanics, from Edwards, will try to expand the usable F-16 flight envelope from the current twenty-five degrees AOA to beyond eighty degrees. The primary goal of the MATV program, however, is to demonstrate the tactical benefit for thrust vectoring on an F-16 – a goal that relatively few of the thrust-vectoring programs to date have pursued. Most thrust-vectoring systems were designed to demonstrate the feasibility of thrust vectoring but not its tactical benefits.

In the last phase of the test program at Edwards, the MATV-equipped F-16 will be flown in one-versus-one and one-versus-two fighter-engagement scenarios. Test pilots from Lockheed and the 416th Test Squadron at Edwards as well as USAF operational test and evaluation pilots from the 422nd Test and Evaluation Squadron at Nellis AFB will take part in these tactical demonstrations. The flight test program will also accommodate VIPs who want a first-hand experience of the benefits of thrust vectoring for the F-16.

An aggressively paced test program will be required to complete the flight tests within the available time. The MATV contract specifies testing to be terminated on 1 December 1993 so that the aircraft can be de-modified and returned to the VISTA configuration by 1 January 1994. The flight test program to complete development of the VISTA variable-stability system is scheduled for mid February through late August 1993.

James Sergeant is the Lockheed flight test engineer for the MATV program and was a flight test engineer for the first YF-22.
Lockheed Fort Worth Company's Chief Test Pilot Steve Barter performed daily F-16 flight demonstrations at Le Bourget air field for this year's Paris Air Show. The Lockheed pilot flew an F-16C leased from the US Air Force in Europe.

Lockheed air-playing cards were distributed at the Paris Air Show.
**RNLAF Deploys F-16s To Italy.**

Eighteen F-16s from the 313th and 315th Squadrons from Twenthe Air Base in Holland deployed to Villafranca, Italy, for Operation Deny Flight. The Royal Netherlands Air Force began flying combat air patrols in April to enforce the no-fly zone over Bosnia.

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**F-111E Passes 6,000-hour Mark.**

Col. Richard Meeboer, the commander of the 20th Operations Group at Upper Heyford in the United Kingdom, piloted the twenty-five-year-old aircraft in its milestone flight on 22 April. This is the first F-111E to pass 6,000 hours of flying time. Coincidentally, the flight marked Meeboer’s 2,000th flying hour in the F-111E. Meeboer, a native of Biloxi, Mississippi, has over 4,500 hours total flying time.
**First Block 50D Delivered.**

The US Air Force took delivery of the first F-16 Block 50D in May. The first airplane was a single-seat F-16C model. This latest version of the F-16 adds significant combat capability and growth potential to the baseline Block 50 configuration first delivered in late 1991.

The new capabilities include a horizontal situation display format on existing multifunction displays, improvements for both the high-speed anti-radiation missile (HARM) and the AGM-65 Maverick missile, expanded safety functions for ground collision avoidance and an “unusable fuel” advisory, and software changes necessary for the AGM-65C Maverick missile and the PGU-25/B cannon round. The aircraft also has an upgraded programmable display generator with seven times the speed and four times the memory of the current unit as well as growth capability for color displays and digital color maps, an improved data modem developed by the Naval Research Laboratory, an interface computer for the HARM that allows F-16 to attack threat radars without support from F-4G Wild Weasels, a new ring laser gyro navigation system, an improved VHF/FM antenna, and a data transfer cartridge with expanded memory. Some of these systems will be incorporated into existing F-16A/B aircraft in the Mid-Life Update program and into new F-16A/B aircraft.

Production of the Block 50D version will gradually supplant Block 50 production by late 1993. The Block 50D series will continue with a choice of the 29,000-pound thrust Increased Performance Engines. The new version aircraft powered by the General Electric F110-GE-129 are designated Block 50Ds, while those powered by the Pratt & Whitney F100-PW-229 are designated Block 52Ds.

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PHOTO GARY TOLBERT
NASA Langley Gets An F-16XL.

The single-seat XL is being modified at Langley for a research program to support a high-speed civil transport program. Tests will demonstrate a high-lift device that improves low-speed aerodynamics and reduces aircraft engine noise.

F-16 Successfully Employs INS/GPS-Guided Weapons

A Block 40 F-16 was used as the flight test aircraft at Eglin AFB in Florida in a program that demonstrated the operational feasibility of an all-weather weapon guided by a combination inertial navigation/global positioning system. The INS/GPS guidance unit was installed in place of a normal video seeker on a GBU-15 guided weapon. Six INS/GPS-guided weapons were dropped in the tests. In the first test, the weapon dropped through a mid-level cloud deck and was successfully guided to a designated target shrouded by a 700-foot cloud ceiling.
**F-16 Block 50D Launches HARM In Data Link Mode.**

An F-16 Block 50D successfully launched an AGM-88 high-speed anti-radiation missile at a target emitter detected by off-board sensors in April. Information on the target was sent to the aircraft from a mission coordinator over the Improved Data Modem. The launch marked the first time that target information was digitally linked with a USAF combat aircraft to cue a weapons launch. The test aircraft was piloted by Maj. C.D. Moore from the 6516th Test Squadron at Edwards AFB in California.

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**Alaskan Pilot Receives Aviation Valor Award.**

Capt. Jim Van Hoomissen received the American Legion Aviation Valor Award for his outstanding airmanship in landing an unpowered F-16 at night. The incident happened on a training mission in Alaska last December. Van Hoomissen, a pilot of the 18th Fighter Squadron, flew a twenty-mile straight-in approach and landed safely at Eielson AFB. This was the first night/unpowered landing ever made in an F-16.
Hooligans Surge Sub-Zero.

The 119th Fighter Group of the North Dakota ANG in Fargo flew almost four dozen sorties with eight primary aircraft and three spares on a cold day in February. The temperature reached a high of thirty-five degrees below zero. The Hooligans of the 119th FG set two precedents for the Air National Guard: the first hot refueling operations with R-11 refueling trucks and flying forty-four sorties in eight hours under some of the most extreme weather conditions imaginable.

Ellington Celebrates Seventy-five Years.

An F-16 from the 147th FG of the Texas ANG in Houston, Texas, flies with a special tail commemorating the base’s seventy-five years of service. The 147th operates the F-16A/B Air Defense Fighter. The base is named for Lt. Eric L. Ellington, a pioneering pilot killed in 1913.
Towers Of Compliments

Congratulations once again. Your April 1993 issue was, as usual, superbly done. The cover, artwork, illustrations, and photography were exquisite. Your article on MIG designer Alexander Velovich was most interesting and informative – adding new insights on a remarkable engineer and a unique perspective on Soviet life. Ben Jureczko’s paintings continue to be aesthetic and illustrative masterpieces. And of course, Joe Bill Dryden pushes the upper limits with his flowing prose and pearls of layman-digestible aero-talk and jet-jock jargon, rendering his features nearly as savory and intriguing as flight itself.

Code One continues to be a quality and informative publication. It’s one that I always see in Air Force, Marine Corps, and Navy squadrons around the country – and even a few airline management and operations offices. You just can’t help but like it.

Capt. Joe Towers, USNR
San Diego, California

Of All Places

I discovered the remains of what I believe to be a portion of the April 1993 issue of your magazine under my car today. Indeed (relatively speaking) was part of the cover and the table of contents. I’m doing research on Soviet (Russian) aircraft design. An undamaged article on the MIG-29 would fit right in.

Donald Van Hook
Omaha, Nebraska

The Best Detail

We attend classes in the Mechanical Engineering Department at the University of Gaziantep in Türkiye. We are very much interested in aerospace technology, especially in the design of jet engines, aircraft structures, and avionics. We follow most of the aerospace magazines, such as US Air Force Magazine, Armada, Military Technology, Military Simulation & Training, and Defence & Aerospace. We were also following Code One through one of our fellow students. Unfortunately, he has graduated and left the university. So we are now unable to read Code One. And we are very sad about it. Other magazines usually present news about aerospace, but Code One always gives the best detail.

Could you please send us a copy to be shared by everyone in our department?

Murat Gülekbi
Cagri D. Gül
University of Gaziantep
Türkiye

Air Forceless In Vanuatu

I have read four of your publications. Your magazine is very interesting for me as it gives news on military advanced technologies for countries around the world. I also enjoy it because I have a particular interest in air forces. My country does not have one at the moment.

G. Melteras
Civil Aviation Dept.
Bauerfield Int. Airport
Ripablik Blong Vanuatu

Geographic note: Vanuatu is in the southwest Pacific, 1,200 miles northeast of Brisbane, Australia.

Behind The Scene

It is interesting to see the Russian-built DC-3 behind the MIG-29 on page 1 of the April issue. The Russians built 2,000 of these aircraft during World War II. This was the one airplane used by both sides in the Vietnam War.

John R. Chevedden
Redondo Beach, California

Editor’s note: Good eye! Our local expert says that the aircraft is a Lisunov Li-2, the Russian equivalent of our DC-3.

Thanks, Partner

We provide components for the F-16’s aircrew oxygen systems and are proud to be partners with Lockheed. Having read from cover to cover the January 1993 issue of Code One, I say you have a winner. Thanks for sharing this impressive magazine.

John J. Sheehan
Essex Cryogenics
St. Louis, Missouri

We'd like to hear from you. Send letters to Editor, Code One Magazine, Lockheed Fort Worth Company, PO Box 748, Mail Zone 1793, Fort Worth, Texas 76101.
Editorial Acclaim

Your publication is great! A well put together magazine with good pictures and interesting articles.

Carole B. Lapine
Editor, Thielok Magazine
Thielokol Corp.
Ogden, Utah

Helping With Homework

The information in Code One will be extremely helpful in preparing my report on the design and characteristics of the F-16 for my class at Embry-Riddle Aeronautical University. By the way, the article you did last year on F-16 operations at Eielson AFB Alaska, my last unit, was superb. I really enjoyed it.

Capt. Craig A. Eidman
AFB
North Carolina

Never Too Late For Beryl

In my work as a freelance writer, I receive several aviation publications and other sorts of news releases that apply to flying and the aviation industry. Of the publications I receive, Code One is just about tops.

It may be a bit late to refer to your October 1992 issue. Nonetheless that feature on Beryl Erickson was a pure joy to read. My roots are in North Dakota, her home state.

I hope you continue the good work. I love those F-16s, the artwork, and the photos.

Eleanor Wagner
Bermuda Dunes, California

Society, Anyone?

I'm twenty-one and working towards an aviation degree. I am also a long-time fan of the F-16. I recently ran across three copies of Code One in one of my classrooms and read all of them from cover to cover. I could not believe that there was a magazine completely devoted to the Viper. Sign me up!

I have one question: Why hasn't an F-16 Society been formed for F-16 pilots, maintainers, and enthusiasts similar to the F-4 Phantom II Society? All over the world, F-16s are being retired from service and replaced by F-16s, so why not form a society in honor of a fighter that is bound to become even more legendary than its predecessors?

Stephen Chapis
Seaford, Delaware

The Best And The Most

I've been in the military service for a couple of months now in the Royal Netherlands Air Force as a trainer aircraft picture operator at the Control and Reporting Centre "Bandbox" of CRC/MiATCC Nieuw Milligen (the other abbreviation stands for Military Air Traffic Control Centre, which is known among pilots over the world as "Dutch Mill"). I work rather closely with Dutch F-16s, mainly in the air-defense role.

I have been a fanatic air forces enthusiast for over five years, especially the USAF and our RNLAF. I have been particularly interested in USAF units that fly the F-16. Why? I don't know. But I think it is because the F-16 is one of the best and most beautiful fighters in the world.

I am a so-called spotter and often go to Gilze-Rijen Air Base about ten kilometers from my home in my leisure time. They also fly the F-16 there. Code One is very interesting, especially for me with my love for USAF Fighting Falcons.

Joris Heeren
The Netherlands

Code One Spawns A Journalist

As the son of a Lockheed Fort Worth Company employee, my contact with your magazine has always been second hand. My father brought home his old copy for me to look through. When I was younger, the airplane photos and stories captured my attention and fueled my interest in aviation. Photography became my greatest interest in high school, and I learned to appreciate the quality photos in Code One.

Now I am in college at Texas A&M University in College Station. When I go home to visit, I have to search for a little brother's room for Code One. The years of reading your magazine have not inspired me to major in Aerospace, but rather, to study Journalism.

William Moran
Texas A&M University
College Station, Texas

From The Trenches

Our cadets literally pour over the informative and entertaining articles for information about military aviation and about flying in general. Thanks for being so helpful in keeping people aware of aviation out here in the trenches so far away from the real Air Force. Keep up the fantastic work.

John S. Rogers
Col., USAF (Ret)
Aerospace Science Instructor
Rosenberg, Texas

Who reads Code One?

Sergei Khrushchev, the son of former Soviet Premier Nikita Khrushchev, looks over the Alexander Velovich interview and MiG-29 article in the April issue. Khrushchev is now a professor at Brown University in Providence, Rhode Island.

From The Trenches, Part Deux

The in-depth articles on a variety of topics makes your magazine a very useful periodical in the classroom. I have used past issues obtained through AFJROTC Headquarters for lesson plans on a variety of subjects.

Quite a few of my students express interest in becoming fighter pilots, airline pilots, or employees in the aerospace industry. Your periodical greatly expands their view of these careers. Additionally, your articles explain how one company can influence a large portion of the aerospace world. Articles on how foreign countries use the F-16 help my students understand how small the world really is and how important it is for them to obtain a good education to continue US influence in world affairs.

We look forward to many more issues of your magazine. Keep up the good work in helping America's students succeed.

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Aid To South Korea

Thank you for your kindness. I have just started receiving Code One. I'm sure that the magazine will be a great aid to both our staff and to me.

Song Sei Heon
Hanuk Aviation University
Seoul, South Korea

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