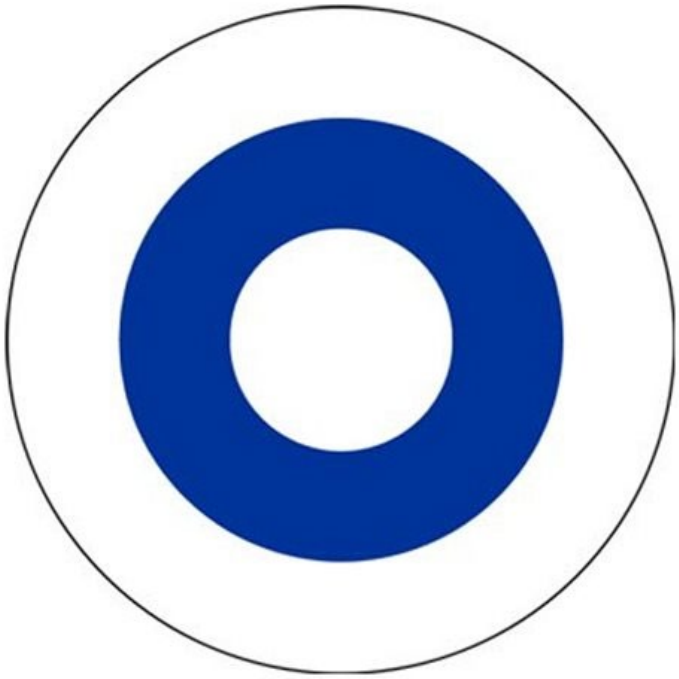
THE

F-18 HORNET

IN

FINLAND



BY NICK ZEDLAR

Draken and MiG Predecessors

At the start of the 1960s, Finland had the option to purchase the French Mirage III or Swedish Saab 35 Draken, but in the end settled on the MiG-21 single-seat interceptor offered by the USSR. On April 24, 1963, Russian pilots delivered the first ten MiG-21F13s to Rissala. These aircraft were F-12s, a sub-type of the common F-13, which were specially adapted to the conditions in Finland. The rest were delivered in November of the same year, for a total of 22 aircraft. They first entered service with Fighter Squadron 3 of the Karelian Air Command. From 1966 to the beginning of the 1970s the MiGs were also deployed to the Häme Air Command at Luonetjärvi.

The first ten were originally designated MG-1 through MG-10, but later all 22 were designated MG-31 to MG-35, MG-46 to MG-50, MG-61 to MG-65, MG-76 to MG-80 and MG91 to MG-92. All of the F-model MiGs eventually were transferred to the Luonetjärvi Reconnaissance Squadron (LRS) in 1978-1980 when the newer MiG-21bis fighters arrived. In the LRS the MiG-Fs underwent rather extensive modifications to better adapt to their new recce role. MG-33 was the last of this type to be decommissioned from the Finnish Air Force.

Its final flight was on January 17, 1986, piloted by CAPT Hannu Vartiainen. About the time Finland was purchasing the MiG-21F, the tandem-seat trainer version known as the MiG-21U was in development. Eventually, Finland purchased two from the Soviet Union (MK-103 and MK-104), which saw service from April 1, 1965 to May 29, 1981. Two MiG-21US trainers (MK-105 and MK-106) entered service in June 1974. In the1980s they were equipped with the improved Tumanski R-13-300 engine, which essentially upgraded them to the MiG-21US successor aircraft, the MiG-21UM. Two UM Mongol tandem trainers (MK-126 and MK-143) entered service in 1982. In the latter part of their service periods, all the MiG-21 models eventually ended up in the Luonetjärvi recce unit.

The first two MiG-21bis Fishbed-N all-weather fighters (dubbed MG-111 and MG-114) were delivered on September 21, 1978 to the Rissala Air Base, Fighter Squadron 31 (Karelian Air Command). These replacements for the MiG-21F Fishbed-Cs suffered a heavy attrition rate from engine trouble and were supplemented by a second smaller batch ordered in 1984 and delivered in 1986. They were primarily interceptors, but had a second ground attack capability. All told, 26 MiG-21bis were delivered to the Finnish Air Force. Most of the MiG21bis are flown by HavLLv 31 (Fighter Squadron 31) and some are in use with the TiedLLv (Reconnaissance Squadron). The MiG-21bis aircraft are numbered MG-111, MG-114 to MG-125, MG-127 to MG-136, MG-138, MG-139 and MG-140.

MiG-21bis (MG-124) of Karelian Air Wing, Fighter Squadron 31

The Draken (meaning “Dragon” in Swedish) was born in the 1950s and entered service with the Swedish Air Force in the summer of 1960. The J-35A was the first in the series, which was followed by modified models through to model F. The C-model tandem trainer was essentially a modified A-model. The E-model was a photo reconnaissance aircraft. The Draken Fs remained in production until the end of the 1980s with improved avionics and weapons systems, which received the designation J-35J. Altogether, over 600 Drakens were built, with exports, besides to Finland, to Austria and Denmark, as well.

Finland's MiG-21F fighters were fair-weather aircraft only, and the Häme Air Command needed a replacement for its 13 British Folland Gnat Mk.1s in service since 1958 (which were later retired in 1972). The Draken was an all-weather fighter-interceptor with radar and infrared target acquisition systems. It had a supersonic operating radius of about 1,100 km in the intercept configuration. From Rovaniemi in the heart of Finnish Lapland it could reach the frontier in a little over five minutes. It was a logical choice. On April 8, 1970 the government approved the purchase of 12 J-35S (Swedish F-model) interceptors.

Saab J-35FS Draken (DK-223) of Lapland Air Wing, Fighter Squadron 11

Draken-B trainers were originally rented from Sweden, but Finland decided to buy six of them, along with six F-model Drakens, in 1972. The first two of these were flown by MAJ Mikko Järvi and CAPT Pekka Kanninen on May 2 at Häme Air Command's Luonetjärvi Air Base. They entered service in 1974. The J-35C tandem trainer was purchased in 1976 for deployment to the Lapland Air Command, and two C-models were delivered to the Satakunta Air Command beginning in 1985. S-models were shipped for Valmet license assembly the same year and first flew on March 12, 1974, entering service the same year through 1977. The Satakunta Air Command purchased 18 Draken FSs in 1984; 12 were delivered between 1985 and 1988 after Valmet modification and modernization. The first three Saab J-35CS Draken (Swedish designation Sk35C, sk stands for *skol*, or “training”) dual-seater trainers entered service in 1975, followed by two more of this kind in 1984.

All told, Finland purchased 47 Drakens, beginning in 1972. The BS-models were phased out thusly: DK-202 (No. 35265) on September 9, 1993; DK-204 (No. 35261) on November 29, 1994; DK-206 (No. 35266) on January 18, 1974; DK-207 (No. 35245) on October 6, 1995; DK-208 (No. 35214) on May 11, 1995; DK-210 (No. 35243) on July 11, 1995; and DK-212 (No. 35257) on September 26, 1991.

Pushing their service life to the limit, the S-models will continue in service in the Lapland Command until the end of this century. The 35FSs, however, are being eliminated from service starting in 1995. The first

of these was DK-261 and DK-237. The Air Force's November 14, 1995 flight accident at Luonetjärvi claimed the life of one young pilot in addition to retiring DK-231.

Retirement of the MiGs has proceeded in this manner: MiG-21bis MG-111 flew for the last time in 1993 and is now in the Finnish Aviation Museum in Vantaa (greater Helsinki). June 1994 saw MG-136 removed from service. In 1995 MG-123's last flight was in August and MG-132's in October; an in-flight engine fire finished off MG-122 in March (the pilot ejected safely). Accidents removed units MG-115, MG-117, MG-120, MG-128 and MG-139. One tandem-seater MiG-21UM (MK-143) flew for the last time in December 1993. The Karelian Air Command's Mig-21bis fighters are scheduled for retirement in the latter half of 1997.

Selecting the Hornet

In March, 1990 Finland publicly sought to replace these ageing “tired metal” (as they say in Finnish) Mikoyan-Gurevich MiG-21s (slated for operational phaseout 1994-1997) and Saab J-35 Drakens (slated for operational phaseout 1991-2002) with a next-generation fighter.

The official green light to do so was granted in the spring of 1989. Finland invited manufacturers to demonstrate their respective fighters' capabilities in competition. This was done on February 23, 1990 through requests for quotations (RFQs) on 20 single-seater and five tandem designs to Dassault Aviation (France), General Dynamics (USA) and Saab Scania (Sweden).

Although not specifically named in the requests, the main choices were the Saab JAS-39 Gripen (still a prototype at the time), the Dassault Mirage 2000-5 and the General Dynamics F-16C/D Fighting Falcon. Finland was looking for approximately 40 aircraft.

During late 1991 and early 1992, the Finnish Air Force conducted research flights of the various Swedish-, French- and U.S.-manufactured aircraft. All were evaluated in two phases: in the country of manufacture first, then in Finland. In addition, the MiG-29 was evaluated in Russia. Each phase represented two weeks of intensive scrutiny.

McDonnell Douglas' F/A-18 Hornet entered the picture in April 1991. The quotations were received on October 31, 1990. An alternate request for quotation on 60 single- and seven double-seaters was addressed to the same manufacturers on January 3, 1991. The same request was dispatched to McDonnell Douglas on April 12th.

Finland began looking more and more seriously at McDonnell Douglas' F/A-18. On February 12, 1992 the first Hornet to ever land on Finnish soil, BuNo 164652 on loan from the U.S. Marine Corps, touched down in Halli. The D-model departed on the 25th after 15 Finnish trial flights. On May 6, 1992 the Finnish government under Prime Minister Esko Aho announced its intention to acquire the McDonnell Douglas F/A-18C and F/A-18D, 64 aircraft in all: 57 single-seater C-models (designated HN-401 through HN-457) and seven tandem D-model conversion trainers (designated HN-461 through HN-467). The letter of acceptance was signed on June 5th.

The following month two VFA-83 squadron Hornet-Cs (Bu Nos 163502 and 163499) from the carrier USS SARATOGA (CV-60) participated in the Kauhava Midsummer Day's celebration. The third Hornet visit was that of the Blue Angels precision flying team, consisting of two F /A-18Bs (Bu Nos 161932 and 161943) and six F/A-18As (Bu Nos 161973, 161978, 161984,161955, 161957 and 161952) at a presentation in Turku in August-September 1992. The fourth visit—another C-model from the USS SARATOGA (BuNo 163481)—was at SIL's (*Suomen Ilmailuliitto*, the Finnish Aviation Society) 75th anniversary celebration in Jyväskylä in May 1994.

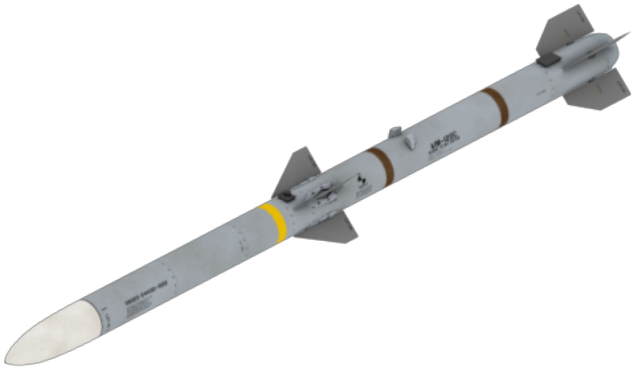
The recommendation of the FAF Headquarters to proceed with the purchase of seven F/A18Ds and 57 F/A-18Cs from McDonnell Douglas was made by the end of April, 1992. The MoD and the Finnish government signed the letter of offer and intent (LOI) on May 6, 1992, followed by the signing of the letter of offer and acceptance (LOA) on June 5th, one day after the government finalized its decision. The letter of agreement on purchasing weapons, maintenance, operation and training systems would not be signed until January 20, 1994. The offset agreement was signed the following day.

The FAF's decision to purchase what was considered the “black sheep” of the fighter competition came as something of a surprise, as the goal of the aircraft acquisition was to choose an inexpensive and light fighter-interceptor. The Hornet can't realistically be considered either. It was relatively heavy and clearly a more expensive fighter than the competition. The Hornet acquisition therefore changed Finland's traditional mostly fighter interceptor policy towards the advantages offered by a more versatile multi-role—and costlier—aircraft. Even the D-models are outfitted with night equipment and conversion-ready from trainer role to battle configuration. Without a doubt the Hornets in Finland, as one Demari article put it, have “opened a concretely new era in Finnish military and security policy thinking.”

Finnish Air Force Headquarters has listed some “decisive factors” for selection of the F/A-18. Primary was “the superior quality/cost ratio, including both purchase costs and life-cycle running costs.” The overall price was actually reduced somewhat by eliminating unnecessary equipment for the Finnish Air Force, such as most carrier equipment, while leaving the fighter’s overall battle capability intact.

According to FAF MAJ-GEN Heikki Nikunen, the flight time-maintenance ratio makes the Hornet a favorable choice. Unlike the Draken and MiG's maintenance timetable of every 50 to 100 hours, the Hornet—by virtue of longer intervals between preventative maintenance schedules (PMS)—spends more time aloft and less time in the repair hangar. In most respects, ease of maintenance makes the use of reserve and conscript maintenance personnel a realistic and routine (and now fully implemented) matter of course.

According to the Finnish Air Force's test pilot and engineer LTCOL Jyrki Laukkanen, the Hornet's main feature is its weapons and radar system, as “its missiles are able to operate at greater distances and under worse conditions than our old fighters." He also cites the aircraft’s look-down shoot-down ability (against cruise missiles, for example), tight-turn maneuverability and dogfighting prowess as major assets. LT Juha Kauhanen of Fighter Squadron 21 has told *Aamulehti* newspaper that the Hornet is easier to pilot than the Draken, which requires more of the pilot and is less “forgiving” in its aerodynamics and performance.



AIM-120 AMRAAM

Laukkanen also touts the AIM-120 AMRAAM's technical superiority, namely its 60+-km range and its ability “to destroy a Draken without the Draken's pilot even knowing what hit his plane. Inside the AMRAAM itself is a better radar system than in the entire Swedish fighter.” These missiles are costing the Finnish taxpayer dearly, however. For economic reasons, therefore, the Finns have chosen to outfit each F-18 with only four such missiles, though it is easily capable of carrying ten at a time. Finland's versions of this air-to-air missile are AMRAAM-Bs, probably in excess of some one million marks apiece.

An F/A-18C Hornet with 10-AMRAAM loadout

Additionally, the dual engines' larger fuel consumption is greater than a single engine’s, but—according to one report—only by six to eight percent. MAJ-GEN Matti Ahola, Commanding Officer of the Finnish Air Force, maintains that additional fuel consumption is about 1.3 times current levels. In addition, the overall flight-hour cost for Hornet ops is roughly equivalent to the Draken's 22,000 - 26,000 FIM, that is, not greater than 25,000 FIM according to current estimates.

Overall, the *Ilmavoimat* was particularly impressed by the aircraft's flight performance, weapon system and ground support. Some of the other criteria in selection were the agreeable payment schedule, foreign military sales (FMS) procurement, 100 percent offsets commitment from all manufacturers, spare availability and ongoing Hornet production.

Purchasing the Hornet

Modern fighters are expensive to purchase, arm, operate, hangar and maintain. In addition, ground crews, pilots and support personnel must be trained, paid and berthed. Though Finland’s political status in the North has changed and its membership in the European Union is opening up new avenues and possibilities, geographical imperatives remain constant. Finland pays for its independent, credible defense forces, which must stand alone according to the country's enduring, but modified policy of military nonalignment. Despite the performance accolades, praise and impressive testimonials concerning the superior technology incorporated into the sleek F/A-18 airframe, for a small country, the Hornet is quite a significant financial burden. This is particularly true considering Finland's persistent double-digit unemployment and sluggish economic recovery after the recession of the late 1980s and early 1990s.

First estimates placed the price of a single aircraft at 203 million marks (around $47.2 million), once the critical equipment was factored into the cost. In May 1992 original estimates, excluding weapons, placed the initial purchase cost at 9.5 billion FIM (Finnish marks), or about $2.2 billion. By the beginning of April, then-Defense Minister Elisabeth Rehn stated that, according to the most current data, the figure had risen to 16-17 billion FIM ($3.7 billion to almost $4 billion).

At its worst, the unfavorable exchange rate placed the cost at 20 billion FIM (around $4.65 billion), but the cost has largely stabilized at around 14 billion -15.3 billion FIM (approximately $3.26 billion - $3.56 billion). As Harri Mannonen points out in his *Yhteishyvä* magazine article “Millaisia hävittäjiä saa 14 miljardilla?” (“What kind of fighters do you get for 14 billion marks?”), this equates to about 3,000 FIM per Finn.

According to the 1994 estimate set forth by Heikki Hiilamo and Simo Sipola's book *Aavelasku* (“Phantom Bill”), the total price tag is expected to exceed 37 billion FIM (around $8.6 billion), which includes maintenance and fuel. Weaponry alone was first estimated at 3.5 billion FIM (about $814 million), but in January 1994 the approved AIM-120 AMRAAM acquisition came to 4.42 billion FIM (about $1.03 billion). Total payment for the aircraft has-been agreed to conclude by 2000-2001. By 1994, Finland had already paid about four billion FIM (around $930 million).

As mentioned, the total final cost is subject to exchange rates and indices. The fighter purchase budget dictates that the funds be divided into two parts, or authorization to order (ATO) phases, thusly:

- **First Authorization to Order (ATO-1):** 9.5 billion FIM (1992-2000)
  Purchases all the aircraft, funds Finnish industry, administrative costs and the prerequisites for the first phase of maintenance, training and operations.
- **Second Authorization to Order (ATO-2):** 4.42 billion FIM (1994-2001)
  Procures part of necessary equipment; the majority of maintenance, ground support and training systems; weaponry and part of communications system.

The published base price tag for an unarmed F-18 is $33.7 million. One wry *Kainuun Sanomat* columnist suggested that Satakunta (literally “Hundred District”) should be renamed Miljardikunta (“Billion District”) instead, to more appropriately reflect the hefty Hornet price tag. By the closing years of the decade, the Hornets and other air defense expenditures will have consumed half of the defense budget, largely at the expense of the ground forces, which must endure some “lean years” on the eve of the 21st century. With political pressure to remove the cost-effective anti-personnel landmine from Finland's stockpiles and much recurring talk of attack helicopter procurement for the Army (now an agreement between Finland and its Nordic partners for a joint acquisition program), the sucking sound of Air Force funding is increasingly more difficult to bear by the other Finnish military branches.

In any case, Hornet delivery started in November 1995 and is expected to last until the year 2000, with four entering Air Force service in 1996 (for a total of 11), ten in 1997 (for a total of 21), 13 in 1998 (for a total of 34), 18 in 1999 (for a total of 52) and 12 the last year (for 64 total aircraft by 2000). The Ds were completely built in the United States, but the C-models are a different story. They've been transported by ship to Finland, for assembly by Finnish personnel. This is currently taking place at Valmet's (now Finavitec) facilities. Here the craft are being pieced together with components from the company's Kuorevesi factories in Halli (where, incidentally, almost all of the company's Hawk trainers have been manufactured). Engine assembly takes place in Fighter Squadron 21's backyard, at the Linnavuori plant in Nokia (just outside Tampere). There are 137 GE-supplied kits.

Already, at least 150 Finavitec personnel have been trained in the U.S. for C-model assembly. The first F404-GE-402 engine in Finland was produced in August 1995, while airframe construction of the first Hornet-C launched at the same time. Instrumentointi Oy, the largest independent avionics repair unit in the Nordic countries, has been tasked with installation of ground support and training equipment, including flight simulators, in addition to responsibilities for testing Hornet computer software. This first F/A-18C (HN-401) was expected to fly in the summer of 1996 and enter service in the FAF in September 1996. This actually happened ahead of schedule, as we shall see in a moment.

Valmet/Finavitec, the Finnish state-owned corporation which started out as a government arms producer, has always had close ties to Finnish military production. Valmet has experience with aircraft manufacture. It already assembles the MD-80 engine as a Saab contractor and is the sole manufacturer of the aircraft's airbrakes. With heavy lobbying, Valmet's primacy in the government bid was secured. McDonnell Douglas sold the assembly and maintenance know-how to the Finns as part of the agreement, with technical support and assistance, training, equipment and weapons manufacturing information. This guarantees government contractual support of Valmet for the duration of the Hornet program in Finland.

In addition, Valmet's dual-seater Redigo prop-trainer aircraft became the decisive element of the deal. Redigos, under a sales assistance agreement signed in December 1991 with McDonnell Douglas, will be marketed abroad for the first time using McDonnell Douglas's local sales network to Persian Gulf states, Japan, Taiwan and other countries (eventually, however, the Italians stole the fire of these hopes when they purchased Redigo rights and promptly began beating the Finns at marketing the aircraft overseas). In any case, every Valmet division, excluding the tractor division, has been included in the reciprocal Hornet deal.

Not surprisingly, after news of the contract, Valmet's shares rose from 18 FIM to 46 FIM. The company calculated that it would benefit 2,600 man-hours from spare parts manufacture and assembly, along with the creation of a few hundred new jobs. Later, Valmet wants to secure long-term civil aviation contracts through foreign deals, with prospects in the pipeline such as the MD-12 McDonnell Douglas-Taiwanese joint deal, predicted to be the first real challenger to the Boeing 747. McDonnell Douglas' carrier-based Hawk trainer, currently in the development phase, may offer Valmet some additional future contract work.

By the end of October 1995 about 40 percent of the $3 billion offset obligation for the Hornets had already been fulfilled. As a result, in addition to technology transfers, small and medium-sized Finnish companies have been offered inroads into the U.S. market. As of October, 1995, total booked offset credit amounted to $1.37 billion (about 6 billion FIM). The share of direct offsets consists of assembly and part manufacture of the aircraft; indirect offsets include export (68 percent), technology transfer to Finland (14 percent), marketing assistance (ten percent) and miscellaneous (eight percent). The total offset covers the entire purchase price of the Hornets. The obligation must be fulfilled by the year 2005.

Although it is the author's personal opinion that the offsets were probably a little too optimistic, confirmation of just how much or how little they have lived up to Finnish high expectations has not been forthcoming. If the Redigo debacle and consistently unfavorable exchange rates are any indication, the Finns did not make out as well as they had hoped.

In any case, Valmet Aircraft Industries has been rechristened Finavitec. With its new name, it is setting new production records. Finland's first single-seater Hornet (number HN-401) was delivered three months ahead of schedule on June 28, 1996. It entered active service the same week. The delivery ceremony at the Air Force's Kuorevesi plant in Halli was attended by Finnish President Martti Ahtisaari and Minister of Defense Anneli Taina.

F-18C (HN-401) of Karelian Air Wing, Fighter Squadron 31

Other VIPs included USN Vice-Admiral John Lockard, Herbert Lanese (McDonnell Douglas' director, military aircraft division) and Finavitec's Chief of Operations Veijo Vartianen. At present, about one Finnish FN-18 per month rolls out of Finavitec's plants and into aviation history.

Receiving the Hornet

At Lambert Field in St. Louis, the first Hornet manufactured for Finland (D-model HN-461), undertook its maiden flight at 8:30 on the morning of Friday, April 21, 1995. The test flight was piloted by McDonnell Douglas test pilot Fred Madenwald. Seated behind him for the 123-minute flight was USN LCDR Dave Stuart. Afterwards, it received its battle-gray paint and Finnish military insignia. This aircraft's official rollout was August 7th.

F-18D Hornet (HN-461) of Satakunta Air Wing, Fighter Squadron 21

By the end of August, five of the seven D-models had been test flown. Evaluation of Hornet 461's instrument landing system (ILS)—which, incidentally, American Hornets lack—took place in June at Naval Test Flight Center Patuxent River, Maryland. More tests followed at China Lake Naval Air Station, California.

Finland's first four F/A-18 Hornets (all D-models, designated HN-462, HN-464, HN-465, and HN-466) were delivered on November 7, 1995 to the Satakunta Air Command's Pirkkala Air Base south of Tampere. Over 5,000 observers were on hand to watch the aircraft land after their 9-hour, 35-minute flight, which lasted 8,200 km across the Atlantic Ocean. The first touched down in Pirkkala at 3:06 p.m. These dual-seaters were piloted by American Naval aviators from VFA-125 “Rough Raiders” (NJ). Their Finnish officer counterparts rode shotgun.

All the Hornets were outfitted with two 330-gallon external tanks. Accompanying the fighters was a McDonnell Douglas KC-10 Extender strategic tanker, which refueled each fighter nine times (averaging every 64 minutes) during the trip. The tanker was itself refueled twice by a Boeing KC-135 Stratotanker. The KC-10 departed with the Hornets from St. Louis, but broke off for England when the formation reached Norway. During each four-minute refueling operation, the fighters took on an average of 660 gallons (2,500 liters) apiece, equivalent to topping off their drop tanks. Each burned about 7,920 gallons (30,000 liters) of jet fuel on their way to Finland, averaging 14 gallons (52 liters) a minute or 826 gallons (3,130 liters) an hour.

The journey was uneventful. Visibility was poorest over Iceland. After having gained permission to pass through Swedish airspace, the F/A-18s were joined briefly over Sweden by two Saab JA-37 Viggen interceptors. The Viggens maintained a higher altitude than the Finnish fighters, never closed under 1.5

km and made no radio contact. It was reported that the trip from Rymättylä, west of Turku, to Pirkkala lasted less than ten minutes.

Finns themselves first flew Hornet HN-465 on November 17, 1995. The aircraft was moved to the Halli Test Flight Center by MAJ Juha Grönmark and MAJ Kauko Vilpponen. Ten days later, HN-464 was flown by LTCOL Jarmo Lindberg and CAPT Kim Jäämeri.

Following the November 1995 Satakunta Air Command deliveries, the Karelian Air Command received its own Hornets—the three remaining D-models from the United States—on Friday, February 16, 1996. The three aircraft (referred to as Zesty 41-43 for the flight) touched down at Rissala Air Base near Kuopio at about 12:30 p.m. after a non-stop flight of over nine hours from St. Louis. The USMC aviator-piloted flight (by Ross Roberts, John McSherry and Brian Grant) proceeded as planned, though take-off was delayed by an hour in Missouri for ice removal.

Accompanying them, the “shotgun Finns” were CO, Karelian Air Command COL Heikki Harjunmaa; CO, Air Force Headquarters COL Osmo Tolvanen; and CAPT Jari Tuominen of the Lapland Air Command. COL Harjunmaa reported a pleasing, quiet journey at a 12-kilometer flight ceiling. In addition to hundreds of spectators, on hand to meet the air crews were MAJ-GEN Matti Ahola, *Ilmavoimat* CO.

Equipping the Hornet

Finland's Hornet procurement brings with it three years' worth of spares; I- (Air Command), O- (Squadron) and D- (Depot) level logistics; the majority of repair shop maintenance logistics; product support throughout delivery; training equipment and training of personnel in the United States; 300,000 pages of manuals and support material; pilot equipment and the participation of Finnish industry. A complete Hughes-manufactured simulator placed at the Pirkkala Air Base is supplemented by computer training equipment at all the Air Commands, as well as at the Air Force Technical School, the site of a system simulator for the conversion training of pilots and maintenance personnel.

Finland chose that its Hornets be equipped with the APG-73 coherent pulse doppler radar system, which hasn't even yet been installed in the U.S. military's own aircraft. It is a further developed version of the standard APG-65, which is also being placed in the new E/F-models, will be in the Swiss and Malaysian Hornets. This Hughes-manufactured system flew for the first time in April 1992. Its signal processor is nearly ten times faster than its predecessor, with improved ECM capabilities, though the antenna and transmitter unit are the same as the APG-65's. The APG-73 fire-control radar will be built entirely in the USA. However, the Hornet's onboard computer will be manufactured by Valmet. The computer is known as Dlec. It is reported to be of a new and revolutionary type.

APG-73 Fire Control Radar

Enhanced receiver sensitivity has extended range to over 250 km in Velocity Search Mode,150 km in Range While Search Mode and 75 km in Track While Scan Mode and 55 km in Raid Assessment Mode. The entire system weighs just over 200 kg. The radar provides target information to the missiles after firing. At mid-flight to target, the missile switches over to its own inertial instruments, and in the final phase before detonation utilizes its own radar.

Finland's Hornets are outfitted with the ITT/Westinghouse ALQ-165 ASPJ (Airborne Self Protection Jammer) system. The ASPJ contract was signed on September 30, 1994. The *Ilmavoimat* is the first

customer for the ASPJ, the U.S. Navy having cancelled its order in 1992. The ASPJs will cost about $2 million apiece. Integration of the ASPJ with the Finnish Hornets will be handled by the U.S. Navy. The aircraft's datalink is Finnish-built. As their Kuwaiti and Canadian counterparts, Finnish Hornets are equipped with a searchlight on the port side of the nose.

Remarkably, however, Finland did not choose the cold-weather equipment. The most recent information indicates the Hornets' take-off and landing performance under Finnish foul weather conditions has been generally favorable, though reported icing around the engine air intakes initially caused concern. Nevertheless, the Hornet's handling during take-off and landing has been described as exceptional even on ice-covered runways. There has been some talk that the Hornet is less successfully operated from dirt and gravel airfields due to the position of its intakes than competing fighter designs, but the severity of this liability appears to be negligible. In any case, Finland operates its aircraft from premium airfields or specially prepared dispersal launch-points, so this is not a problem.

Apart from employing the FN-18’s Gatling gun against ground targets, Finland for years operated the Hornet in strictly air-to-air, reconnaissance and electronic warfare roles. Later, Finland acquire improved AIM-9X Sidewinder and AIM-120C-7 AMRAAM air-to-air missiles, along with new avionics, cockpit displays, sensors, NATO datalink, and helmet mounted sights (HMS), along with air-to-ground standoff strike capability via the JASSM cruise missile.

Operating the Hornet

In the beginning, according to Commander, Satakunta Air Command, COL Jouni Pystynen, there were no complaints of noise in the Tampere area when the Hornets began flight ops. However, by the following autumn, civilian complaints had reached the ears of successor CO LTCOL Markku Määttänen. He has explained that the approach path Pirkkala Air Base is dictated primarily by prevailing wind conditions. For this reason, the majority of the time the aircraft are forced over Tampere's southernmost residential areas.

Evidently, the Hornets' approach path is determined by wind direction at any given time, because at Pirkkala the FN-18s land braking against the wind. Wind direction about 80 percent of the time is from Vesilahti (the rural area on the other side of the base) towards Tampere, so the heavily populated urban area routinely suffers. It would seem that the airfield is grossly inadequate, in any case, with a critical equipment shortage due to lack of funds. Civilian aircraft are forbidden to land there with tailwinds over 10 knots, which further demonstrates the runway length problem, though this shortcoming does not affect Hornet flight operations. Flight controllers at the base oppose any bi-directional runways. They feel that poor visibility under adverse weather conditions could lead to collisions between approaching and departing aircraft.

The Hornet's growing pains in Finland were just beginning, when on Friday, November 8, 1996, an American test pilot flew too low on approach and damaged Finland's sixth F-18 by colliding with landing lights at the Halli facility. He was unaware of his error until told after landing. Damage was restricted mostly to weakened structural support joints and hydraulics. Yet, as Finavitec's Air Safety Director Jukka Koskela has said, "when one speaks of aircraft repair, that's money up in smoke... tens of thousands of marks."

According to *Aamulehti* and *Helsingin Sanomat* newspapers, both reporting on Wednesday, May 14, 1997, an engine fire occurred in one of the C-models at Pirkkala during a routine training flight on Monday, May 5. The plane had just been delivered the week before. In fact, it had been flown but six hours when the incident occurred. Until this event, reportedly nothing out of the ordinary characterized the newly assembled aircraft. The pilot shut down the burning engine immediately according to procedure and was able to return safely to base on the other engine. Finnish Air Force CO MAJ-GEN Matti Ahola admitted that situation was dire enough to have warranted an ejection in any single-engine aircraft.

Upon inspection (particularly under high pressure tests), it became apparent that a leaky fuel coupling was the culprit. It is located between the fuselage and the engine compartment, where fuel is directed laterally to cool an oil pump. Fuel leaked from this area into the engine, vaporized and ignited in the afterburner like a roman candle. The same fault was discovered in another F-18 assembled at Kuorevesi. Such engine fires have reportedly plagued many Hornets in U.S. service, as well as in the Swiss and Canadian air forces. Word was sent immediately to the USMC and MDC contacts in the States. Technical experts were promised by week's end. Needless to say, the Finns were determined to get to the bottom of this fault.

By summer 1998, the FAF had noticeably fallen victim to that all-to-familiar pilot retention problem that plagues most air forces around the world. Whereas a Hornet pilot may earn some 20,000 Finnish marks per month (around $48,000 a year), his civilian counterpart at Finnair brings home double that figure,

probably with all-round better benefits to boot. Air Force pilots suggested upping pay by some 45 million marks (over $8 million), which equates to a monthly salary increase of about 16,000 to 18,000 FIM per pilot. This will make them think twice about “selling their freedom” over the 10.5-year mandatory commitment to the Service.

Integrating the Hornet

Despite this collage of problems, there is no doubt that Finland's overall interceptor and air defense capability is greatly enhanced. Although the maximum combat ceiling and speed of the country's new aircraft is roughly analogous to that of former performers, it represents a clear improvement in acceleration, climbing, turning, endurance and range. Other performance upgrades are airborne radar-related (better look-down capability, improved target detection range, multi-target tracking ability, radar navigation ground map features and heightened ECM capacity) and AAM-related (missile launch at greater distances, improved performance in an ECM environment and higher missile payloads per aircraft for multi-missile shots).

The chart below presents some basic size and weight stats to the reader in order to get a general picture of Finland's move up to the FN-18.

Finnish Fighter Comparison Chart			
	F/A-18C	**Draken FS**	**MiG-21bis**
Weight (kg)	10,680	8,250	5,750
Wing Area (m2)	37.16	49.2	23.04
Wingspan (m)	11.43	9.42	7.15
Length (m)	17.07	15.34	15.76
Height (m)	4.67	3.89	4.10

As LTCOL Jyrki Laukkanen has said, “At the moment our air defense is good, although on the surface the amount of aircraft is immeasurably small." He's right. The FAF is a miniscule air force by Super Power standards, yet, arguably, it ranks among the top-notch military organizations in the world for its size. This is a matter of quality, not quantity. Now that fundamental changes are under way in the structure, procurement and deployment of Air Force resources (in particular the introduction of the Hornet into service), the Ministry of Defense reports that at least ten MiGs have been phased out and all will be eliminated from active service by the year 2000. The *Ilmavoimat* will continue for some time in a state of flux, upgrading facilities and equipment and absorbing the next generation fighter into its ranks.

Aamulehti newspaper states that there are approximately 20 aircraft deployed to a given Air Command (or Air Wing). According to the Air Command HQ CO Hannu Myöhänen, Autumn, 1996 hangar construction at a cost of about 18 million FIM (c. $4.19 million) and renovation and repair of other structures at the base, will carry a 30 million - 40 million FIM (c. $6.98 million - $9.3 million) price tag over the next four years. The Lapland Air Command expects to receive its own Hornets in 1999.

A Finnish fighter wing corresponds to its regional air command: western, eastern or northern. Each operates a single fighter squadron of 12 to 20 aircraft, plus a few liaison planes, as well as maintenance, logistics, administrative and base defense personnel. Up until a few years ago Finland deployed its older aircraft in the following manner:

- **North:** 18 Drakens (six F- and 12 S-interceptors, five B- and three C-OCU trainers) Lapland Air Command, Fighter Squadron 11;
- **West:**12 Draken F-interceptors Satakunta Air Command, Fighter Squadron 21; and
- **East:** 30 MiG-21 (30 interceptors and six tandems) Karelian Air Command, Fighter Squadron 31.

According to Pekka Parantainen, a frequent Hornet article contributor to *Aamulehti* newspaper, Fighter Squadron 21 is now exclusively an F-18 unit. This move ends 25 years of faithful service afforded by Saab Draken interceptors. The last of these Drakens were flown to the Lapland Squadron at Rovaniemi, where they (all 25-30 now stationed in the north) will continue their service until the end of the century. Their aircrews, however, did not accompany them and have remained at the Satakunta Command. The final Saab 35CS “Cesar” was piloted by MAJ Markku Viitala with LTCOL Jarmo Lindberg in the backseat.

Finn Facts

- **Kickin' "A":** Finland's Hornet designation differs from the standard F/A (Fighter/Attack), being simply FN-18, as, other than strafing capability, they for decades lacked ground attack armament. This would later change as part of the Mid-Life Upgrade cycle program, with the planned acquisition of the AGM-158 Joint Air-to-Surface Standoff Missile (JASSM), a 2,000-lb cruise missile, and all aircraft modifications to integrate it, at an estimated cost is $255 million in 2015.
- **Buckle Up:** The first modification the Finns made to the Hornet was replacement of its seatbelt!
- **Live Long and Prosper:** The operational lifetime of the Hornet in the *Ilmavoimat* is expected to last until around the year 2030.
- **Round-trip Ticket:** FN-18s can fly round-trip between Rovaniemi and Helsinki—roughly the entire length of the country—without refueling.
- **Gas Slurper:** A Hornet burns in the neighborhood of 10,000 liters an hour (costing 10,000 FIM or about $2,326). However, this accounts for only about eight percent of the aircraft's overall repair and operating cost.
- **Flight Hours or Bust:** The Air Force's eventual target for the Hornet is 10,000 flight-hours per annum, which will cost around 250 million FIM.
- **Street Hooker:** The *Ilmavoimat's* F-18s are equipped with the arresting hook system, making 300-meter landings possible on short runways. This is possible on even smaller pre-prepared highway strips, if necessary.
- **Grounded:** By the end of January 1996, critical technical manpower shortages, budgetary restraints and, to some degree, foul weather, limited ops at Pirkkala Air Base to a couple of dozen flight-hours for the Hornets' first month in Finland.
- **Ye Olde Junk:** The fate of Finland's old MiGs and Drakens? Some have been put in museums, some preserved for crisis service, and the rest sold for scrap. For instance, the last BS-model "Peter" Draken-35 (DK-206) was piloted by MAJ Markku Anttonen from Rovaniemi (Lapland Air Command) to the Helsinki Museum of Aviation on October 6,1995.
- **The Finnish Air Force:** The Finnish Air Force (FAF), or *Ilmavoimat*, today consists of 4,500 personnel (1,300 of which are conscripts), who serve in three air commands (Karelia Air Command, Lapland Air Command and Satakunta Air Command), one reconnaissance squadron, one transport squadron and the Air Force Academy.

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