

# MiG-21 FISHBED

in action



**Aircraft Number 131**  
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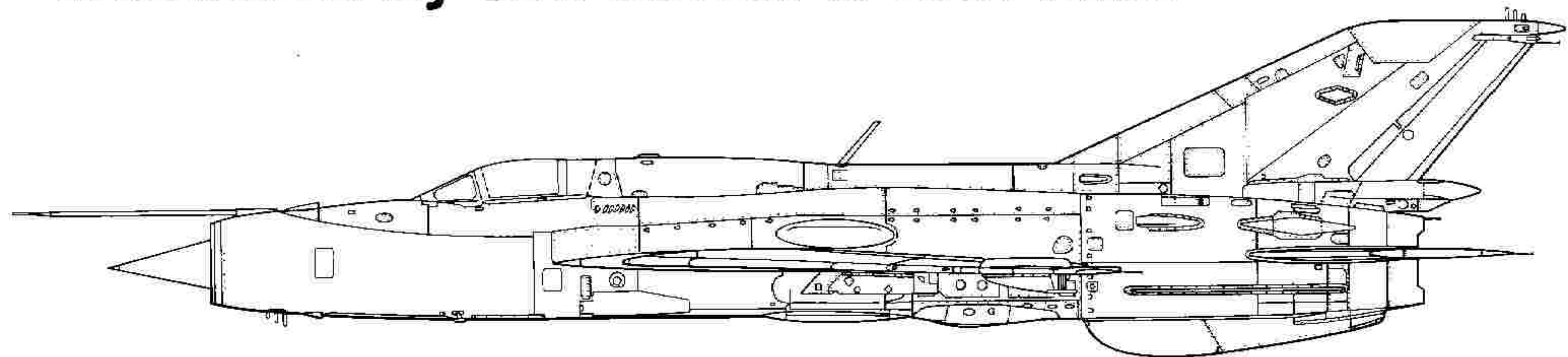
Don Green

# **MiG-21 FISHBED** **in action**

**by Don Linn & Don Spering**

**Color by Don Greer**

**Illustrated by Joe Sewell & Tom Tullis**



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A MiG-21FL Fishbed D of the Indian Air Force shoots down a Pakistani Air Force Sabre with its GP-9 gunpod during the December 1971 India/Pakistan war. The camouflage scheme was hand painted and differed from aircraft to aircraft.

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MiG-21s, such as this MiG-21F-12 Fishbed C of the Finnish Air Force, were the first Mach 2 capable aircraft to enter Soviet service. The aircraft has evolved from a simple clear air interceptor to a true multi-role fighter. The MiG-21 also holds the record as the world's most widely exported supersonic fighter. (Jyrki Laukkanen)





# Introduction

*FOR SALE: The ultimate sport aircraft, a supersonic sporterized (completely demilitarized), MiG-21/F-7M single seat, Mach 2.1 fighter. Cost \$3,150,000 (US). Price includes sixty day orientation on mainland. Please include bank references.*

This ad, intermingled with similar ads for Beechcraft King Airs and Piper Aztecs, was found in a 1988 issue of a popular aviation magazine. For some Fishbeds, the end of their useful lives is to become the private play thing for a millionaire (who else could afford the price of these Chinese-built MiGs), while still others continue to form the first-line of defense for a number of smaller nations.

The MiG-21, when first introduced in the late fifties, was considered by some to be the best Soviet fighter design since the Second World War. But this opinion was balanced by others who claimed that it continued to reflect the unsophisticated Soviet technology of the 1950s. Whatever you may believe, the fact remains that the MiG-21 first entered service with the *Voenna Vozdushnye Sili* (VVS - Soviet Air Force) during early 1959 and continued in first line service for more than thirty years. A record equal, and parallel, to the McDonnell Douglas F-4 Phantom II. The operational record of the MiG-21, now entering its fourth decade, may well extend into the next century (Chinese-built variants). This is a testament to the Mikoyan and Gurevich OKB which designed and built the MiG-21 series.

The MiG-21 has an impressive combat record, having seen action in Vietnam against U.S. forces, in the Middle East by various Arab air forces against the Israelis and against each other, in African border wars, in India against Pakistan and in Afghanistan where it was flown by both Russian and Afghan pilots. It saw only limited combat during the Gulf War (Operation DESERT SHIELD/STORM) against Coalition Forces. A number were shot down while several others were captured intact on the ground. When the civil war in Yugoslavia began in the Summer of 1991, a number of Serbian operated MiG-21s were used in the ground attack role against Croatian, Slovenian and Bosnian held strong points, villages and cities. Several defecting pilots have delivered their MiG-21s to Croatia and now the Fishbed serves as this country's only operational fighter. The MiG-21 has been both the victor and the vanquished in air-to-air combat, but has proved its worth against some of the best of its contemporaries.

During the early 1950s the MiG OKB began work on the first design studies for a single engine, light-weight fighter with an intended performance above Mach 2 and an operational ceiling of 60,000 feet. One reason that the Soviet Union pushed hard for the "Project E" aircraft was the rather frustrating experience the service had with the twin engined MiG-19 Farmer. While the aircraft had amazing climb performance at low altitude, it was very difficult to handle and a number of pilots were killed flying the MiG-19. The Farmer was always regarded by the Soviets as an interim aircraft pending the availability of a reliable Mach 2 capable fighter.

A lot of changes were taking place within the Soviet Union during this period. In March of 1953 Josef Stalin died and was followed by Nikita Khrushchev. That same year the Soviet Union tested its first hydrogen bomb and, on 14 May 1955, the Warsaw Pact, the Eastern counterpart to NATO was formed.

Many factors played a role in the design criteria that eventually evolved into the MiG-21. A key element was the Korean War combat record of the MiG-15 Fagot against other jets, namely the F-86 Sabre. The poor combat record of the MiG-15, added to other operational factors, resulted in a stated requirement for an efficient, single engine, supersonic design stressed for close combat.

The first studies, sponsored by the MiG OKB and TsAGI, led to a design that featured a swept wing of 55 to 57 degrees. During 1954, the AM-9B afterburning power plant became available and this engine was chosen to power the new fighter.

## Swept Wing Prototypes (Ye-2, Ye-50 and Ye-2A)

The first prototype, designated the Ye-2, flew for the first time from the Zhukovsky Experimental Center (also known as Ramenskoye) near Moscow on 14 February 1955 with MiG OKB test pilot G. K. Mossolov at the controls. The Ye-2 was equipped with an RSIU-4 radio, an ARK-5 radio altimeter, a Radal-M radar range finder and an ASP-5N gunsight. It was armed with two NR-30 30MM cannons, one on each side of the lower forward fuselage. The one piece blown acrylic canopy was unique in that it was hinged to open forward. The idea behind the forward opening canopy was that if an ejection was necessary, the canopy would act as a wind break for the pilot.

The Ye-50 was a derivative of the Ye-2 and three were built between 1955 and 1957. These were equipped with a Duchkin S-155 liquid fueled rocket engine at the base of the rudder above the AM-9Ye jet engine. The first prototype, called the Ye-50/1 first flew on 9 January 1956 and was later destroyed (14 July 1956) in a crash landing. The second Ye-50 had a redesigned tail and reached an altitude of 25,600 meters (83,989.5 feet) on 17 June 1957 and a few days later was flown at a speed of 1,460 kph (907.2 mph). The third prototype, the Ye-50/3 had a lengthened nose and increased fuel capacity. During a test flight under the Flight Test Institute of the Air Force, the aircraft crashed after a section of the tail broke away. The pilot, N.A. Korovin, was killed in the accident. When it became clear that the new and more powerful AM-11 power plant would be available soon, the Ye-50 project was abandoned.

Only a portion of the factory test program was flown with the Ye-2; the remainder was conducted with the modified Ye-2A. The Ye-2A featured an uprated AM-11 engine and enlarged jet exhaust. It also differed from the Ye-2 in that there was a large wing fence installed on the wing upper surface and a pitot tube on top of the nose. The factory test program began in 1956 under G.K. Mossolov with OKB pilots V. A. Nefyedov and G.A. Sedov flying part of the tests. There were a small batch of five preproduction aircraft built at Zavod (Factory) 21 under the short lived designation MiG-23. These were assigned for operational evaluation to the Flight Test Institute of the Air Force.

**The Ye-2 prototype was the first swept wing prototype and made its first flight on 14 February 1955 with MiG OKB test pilot G.K. Mossolov at the controls. The next prototype, Ye-2A, had a large wing fence on top of each wing. (Hans-Heiri Stapfer Collection)**



The Ye-2A was shown, together with the Ye-5 prototype, during the Air Parade at Tushino near Moscow on 24 June 1955. Western observers quickly allocated the NATO Reporting Name Faceplate to the Ye-2A, while the delta winged Ye-5 became the Fishbed. By this time it had become clear that the delta wing Ye-5 offered much more promise for further development and the Ye-2/Ye-2A was cancelled.

## Delta Wing Prototypes (Ye-4 and Ye-5)

When it became clear that the swept wing design would not offer the performance needed to reach Mach 2 under operational conditions, work began on a delta wing project, also sponsored by TsAGI. The aircraft, designated the Ye-4, was basically a Ye-2 airframe mated with a 57 degree TsAGI-59 delta wing. The Ye-4 prototype flew for the first time from the Zhukovsky test center on 16 June 1955 with G.A. Sedov at the controls.

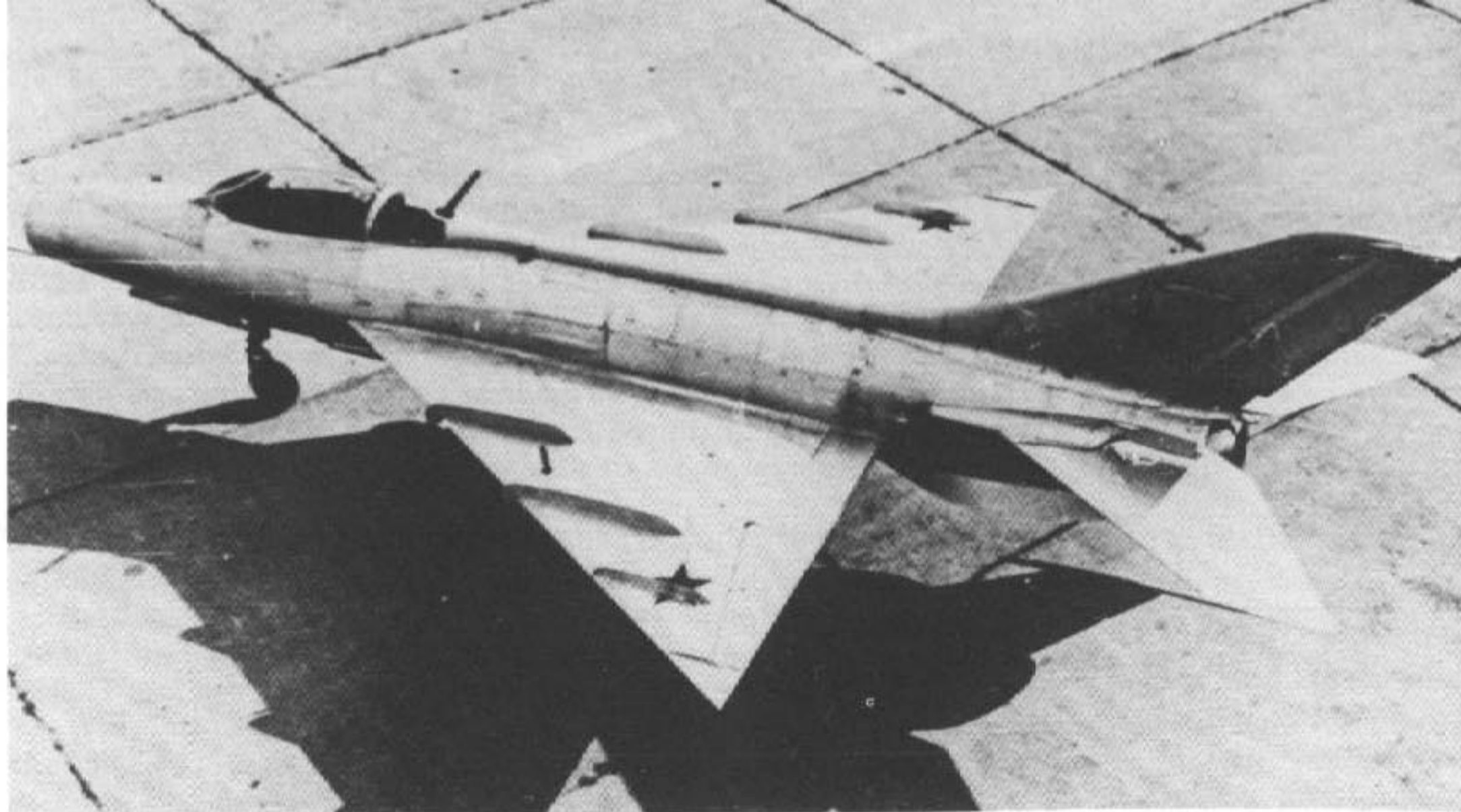
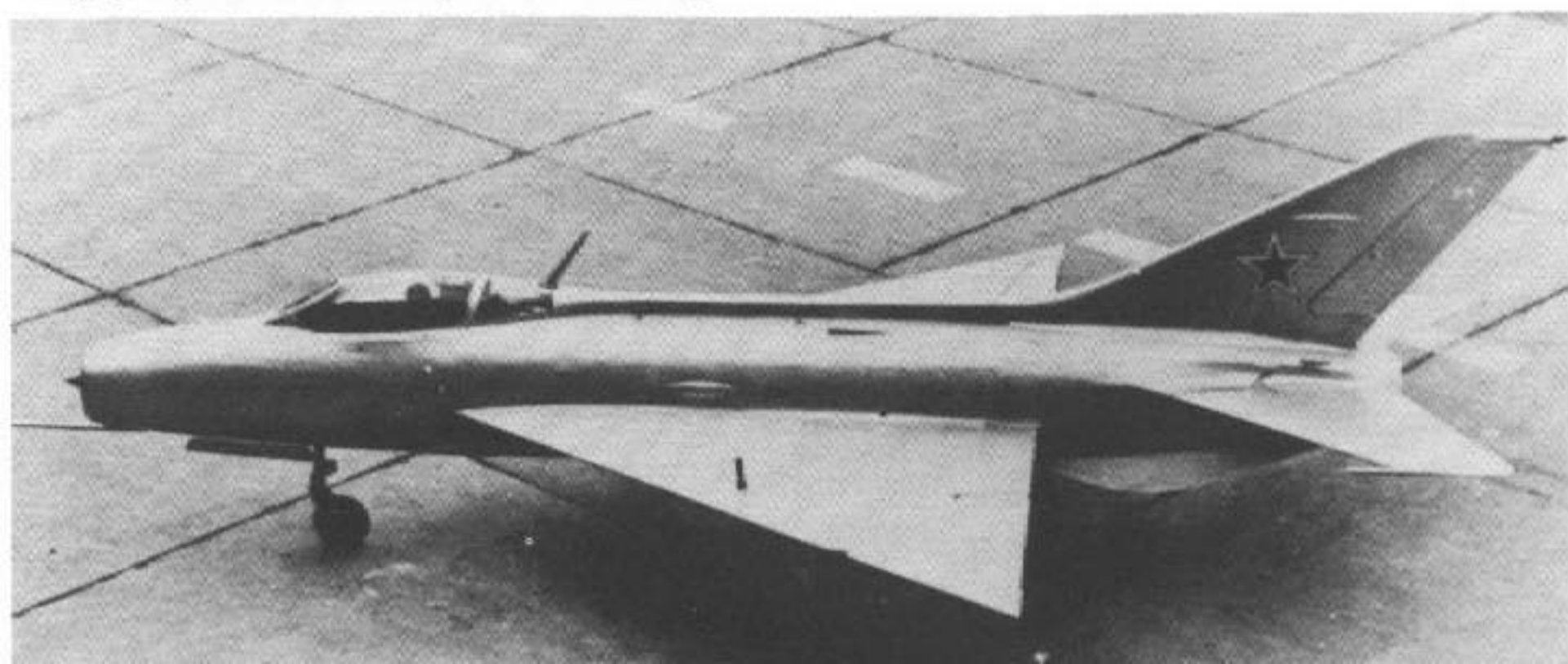
During the test program, the wing of the Ye-4 was modified with three wing airflow fences being added to each wing extending back from the wing leading edge and the wingtips were more pointed than on the original wing. The small air intake on the dorsal spine was also deleted on the modified Ye-4.

The Ye-4 was followed by the Ye-5 which featured an AM-11 engine, an enlarged jet exhaust and less pointed wingtips. This prototype was flown on 9 January 1956, but, on 20 February, the engine caught fire during ground testing and was destroyed. The Ye-5 was returned to the factory for repairs, returning to the test program at Zhukovsky on 26 March. Test flights showed that the top speed of the AM-11 powered prototype was nearly 700 kph (434.9 mph) faster than the AM-9 powered Ye-4 prototype. Teething troubles with the AM-11, however, continued and another engine failure led to a halt in further flight tests of the AM-11 powered Ye-5.

The Ye-5 was again returned to the factory for modifications. The nose was shortened by some 400 mm (15.74 inches) to change the aircraft's center of gravity. The jet exhaust was also modified and the internal fuel capacity was increased from 1,570 to 1,810 liters (414.75 to 478.15 gallons).

The modified Ye-5 was back at Zhukovsky on 1 April 1957 to investigate the modifications of the airframe and the engine. A total of two Ye-5 prototypes and five pre-production aircraft were built to conduct the flight test portion of the Flight Research Institute (LII) program and the operational evaluation by units of the Soviet Air Force. These tests were successful and the aircraft was cleared for production under the designation MiG-21.

**The first delta winged prototype was the Ye-4 which made its first flight on 16 June 1955. The Ye-4 was basically a Ye-2 airframe mated with a TsAGI designed delta wing with very pointed wingtips. (Hans-Heiri Stapfer Collection)**

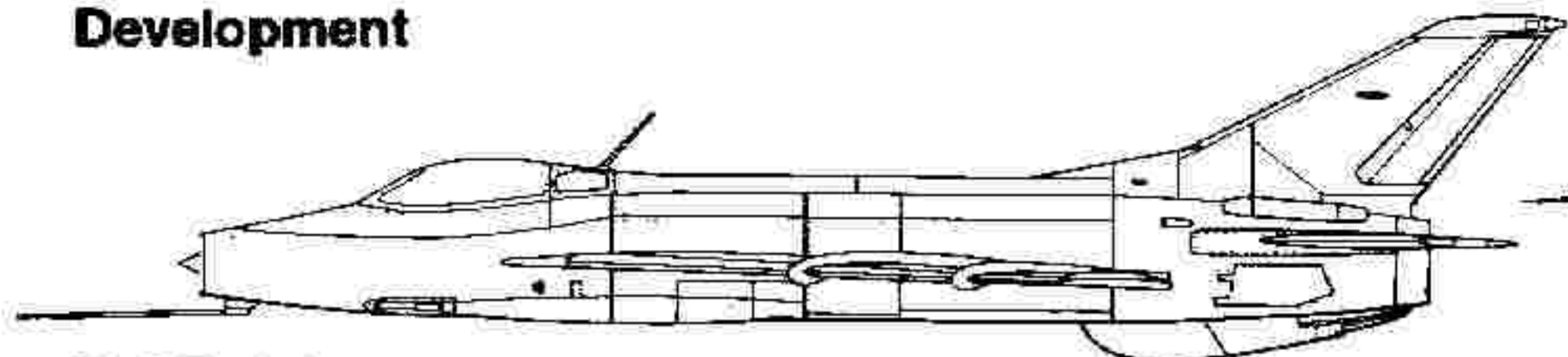


**The Ye-4/2 prototype featured three wing fences extending back from the leading edge of the wing. The tube extending upward between the first and second wing fence was a visual indicator that the main landing gear was down and locked. (Hans-Heiri Stapfer Collection)**

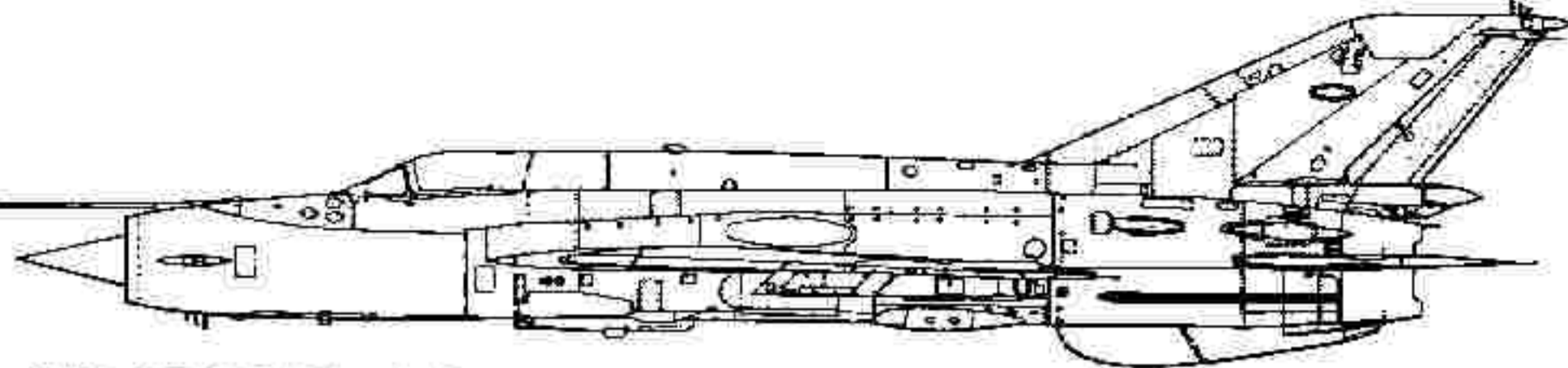
**The Ye-5 prototype differed from the Ye-4 in the engine installed. The Ye-5 was powered by 5,098 lbst AM-11 power plant, which boosted the top speed by nearly 700 kph (434.9 mph). The Ye-5 was unveiled on 24 June 1955 and NATO assigned the reporting name Fishbed to the prototype. (Hans-Heiri Stapfer Collection)**



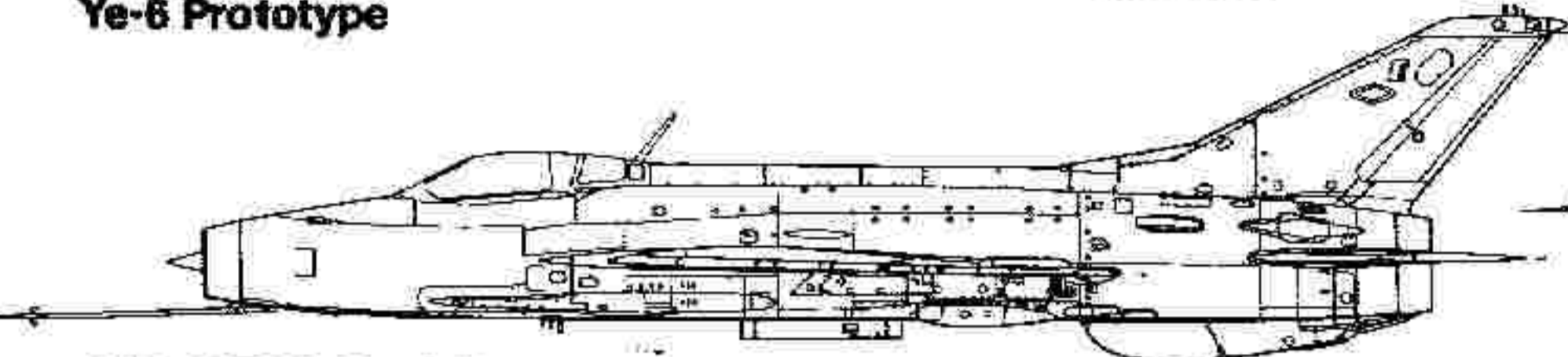
# Development



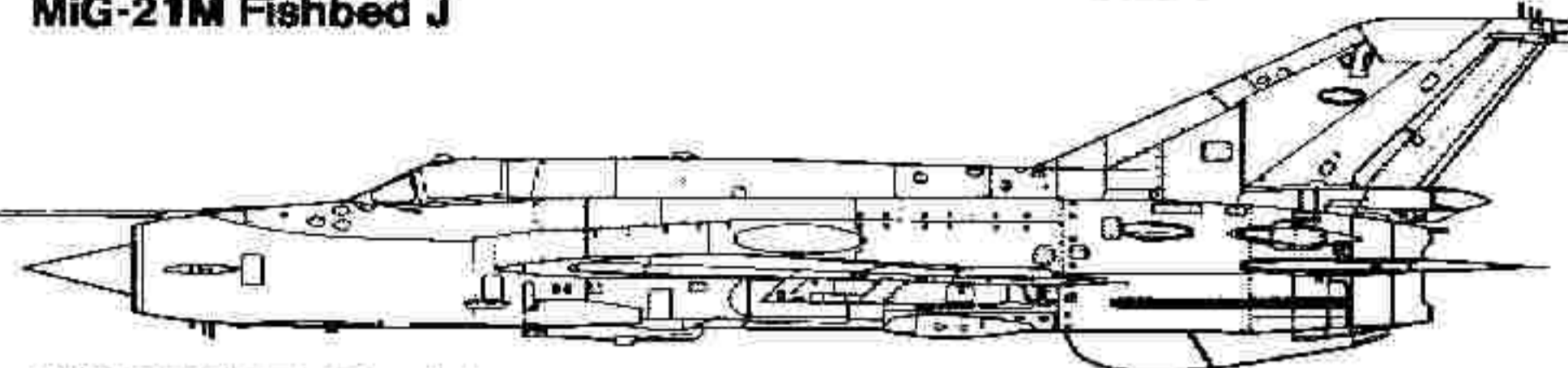
**Ye-6 Prototype**



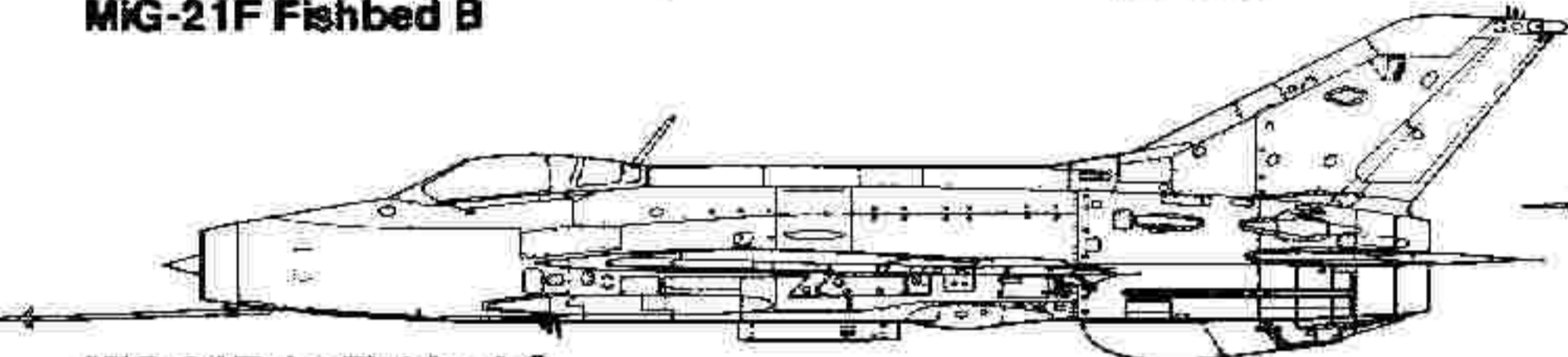
**MiG-21M Fishbed J**



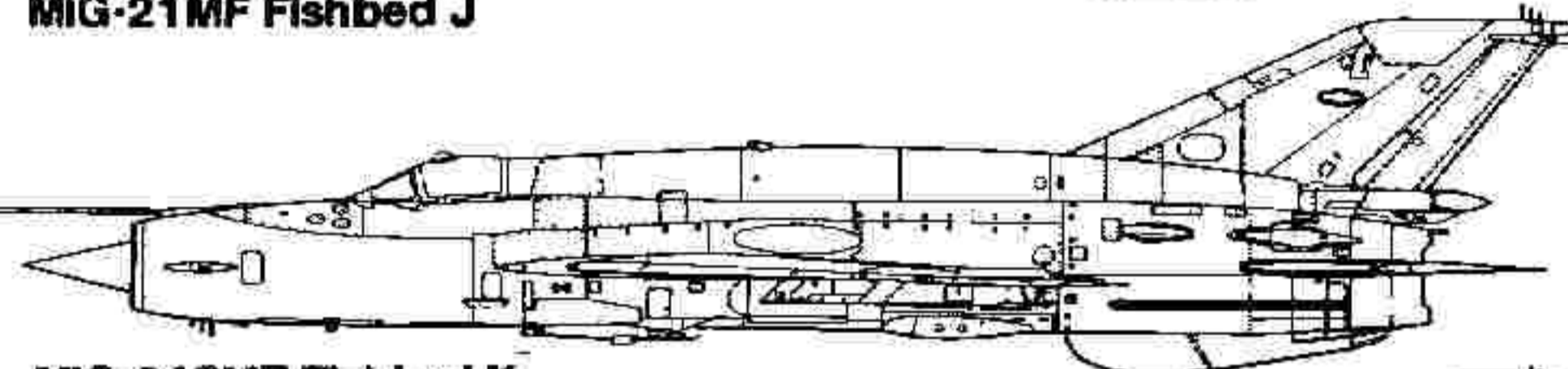
**MiG-21F Fishbed B**



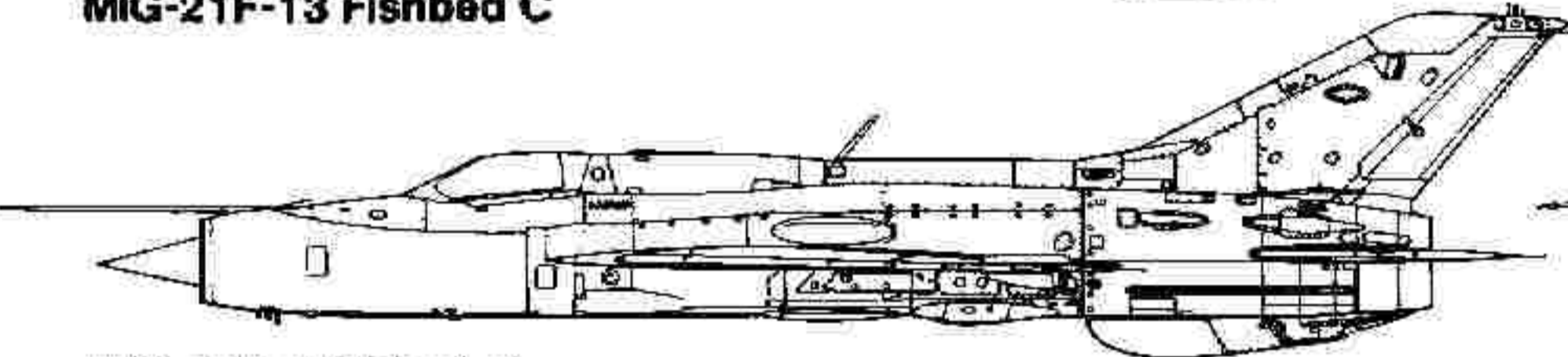
**MiG-21MF Fishbed J**



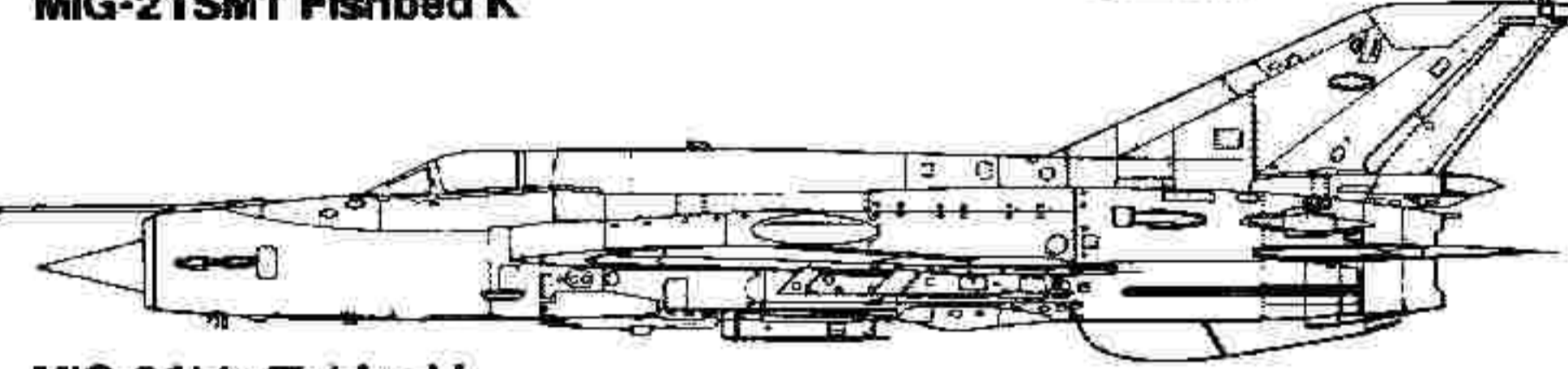
**MiG-21F-13 Fishbed C**



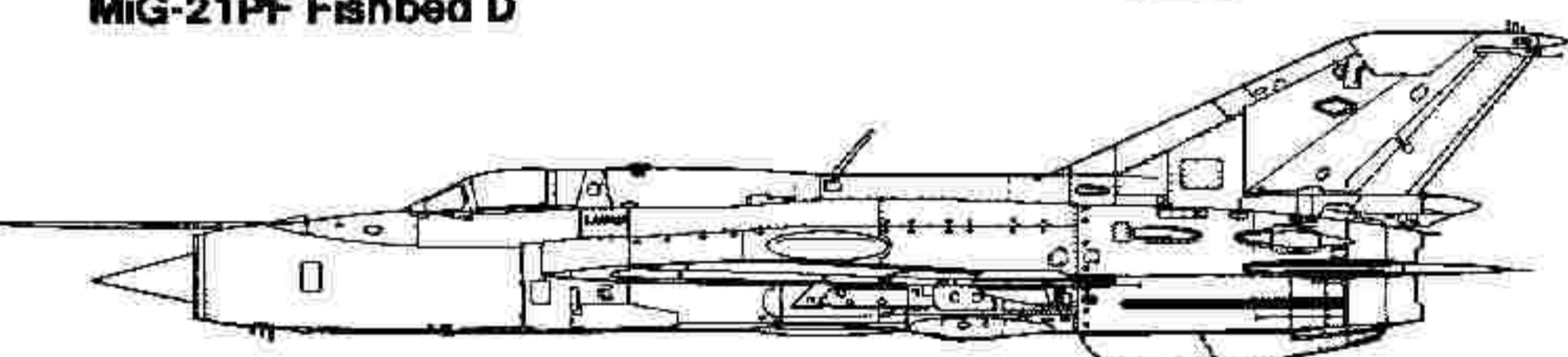
**MiG-21SMT Fishbed K**



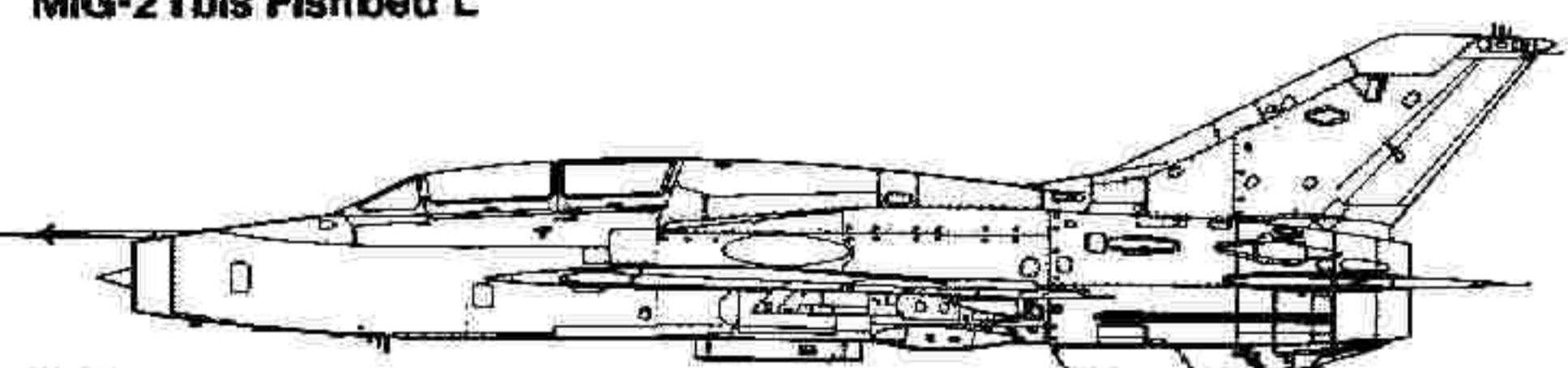
**MiG-21PF Fishbed D**



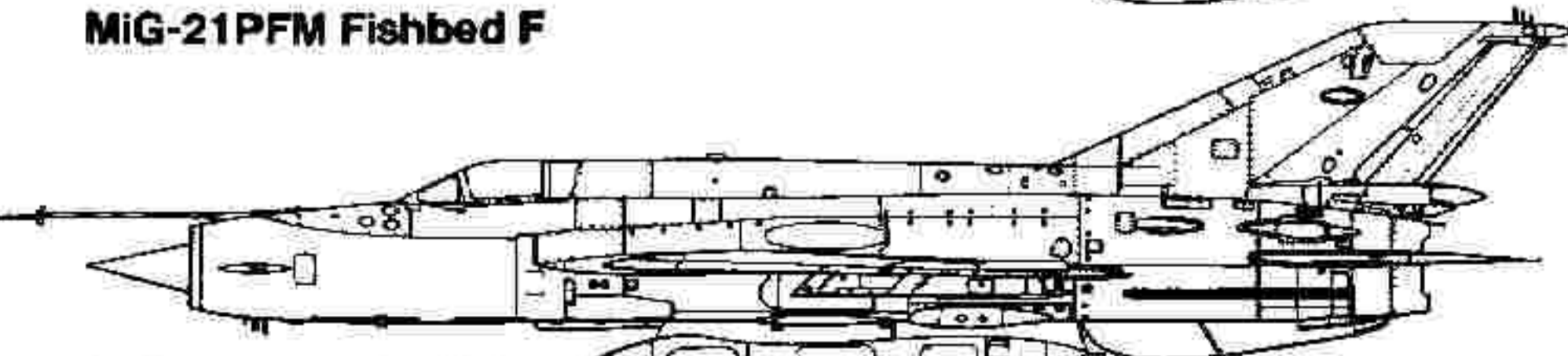
**MiG-21bis Fishbed L**



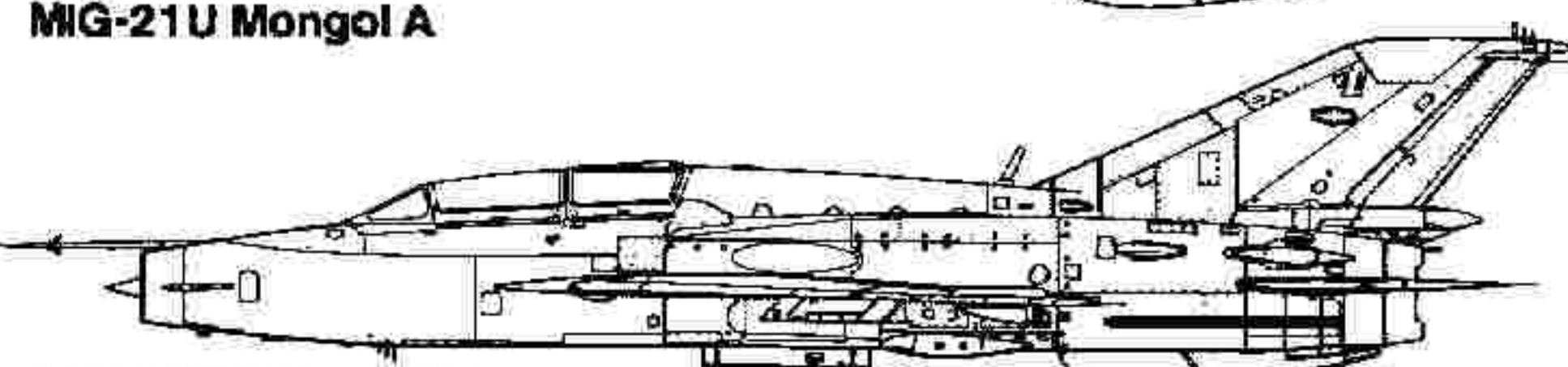
**MiG-21PFM Fishbed F**



**MiG-21U Mongol A**



**MiG-21R Fishbed H**



**MiG-21UM Mongol B**

# First Generation MiG-21 Fishbeds

## MiG-21F-13 Fishbed C

### Ye-6 Preproduction Aircraft

The favorable results achieved with the Ye-5 prototype led to a decision to introduce the fighter into service as the Soviet Air Force's standard interceptor.

Three preproduction aircraft were built under the designation Ye-6. The Ye-6 was equipped with an improved version of the AM-11, designated the R-11F-300, which led to a further redesign of the jet exhaust. The Ye-6 differed from the Ye-5 in that the two small ventral fins were replaced by a single enlarged ventral fin mounted on the aircraft centerline. There was also a fairing added above the elevators, the balance weights on the elevators were reduced in size and a static discharger was added to the fin.

The two speed brakes used on the Ye-5 were replaced by a single speed brake mounted under the rear of the fuselage and two cooling air intakes were fitted on each side of the rear upper fuselage.

The MiG-21 program suffered a serious setback during the seventh flight of the Ye-6. At an altitude of 18,000 meters (59,500 feet), the R-11F-300 engine failed and, instead of ejecting, V.A. Nefyedov tried to save the Ye-6 and attempted a dead-stick landing at Zhukovsky. The aircraft crash landed and a fire broke out. V.A. Nefyedov was pulled from the crash badly burnt and died some hours later in the hospital.

The flight test program continued using the remaining Ye-6/2, with flight trials being flown between 1957 and 1958. In 1958 the aircraft was finally cleared for full production. The Ye-6/2 differed from the Ye-6/1 in that the three wing air flow fences were replaced by a single smaller air flow fence on the outboard wing. The Ye-6/2 also had larger flaps, the wingtips were less pointed and equipped with a static discharger and there was a missile pylon/rail for a single K-13 (AA-2 Atoll) missile mounted on each wing. This wing became standard on all early production MiG-21s. During these flights the Ye-6/2 reached a speed of Mach 2.05 at an altitude of 12,050 meters (39,534 feet).

The third preproduction aircraft, the Ye-6/3, began flight testing in December of 1958 and, under the designation Ye-66, captured two world speed records for the Soviet Union in 1959 and 1960. This aircraft was later fitted with canards on either side of the nose as part of the Ye-8 project. In this configuration, the designation was changed to Ye-6T/3.

### MiG-21F Fishbed B

During 1959 and into 1960 a small batch of MiG-21s was built at Zavod 21 in the industrial city of Gorky under the designation MiG-21F (company designation Ye-6T and Soviet Air Force designation Type 72). The MiG-21F differed from the Ye-6 preproduction aircraft in that it had a three pole SRO-2M (Odd Rods) IFF antenna on top of the vertical fin and a second antenna on the fuselage underside just behind the nose-wheel bay.

The MiG-21F was equipped with an ASP-SDN gunsight, an SRD-5 (High Fix) radar range finder and was armed with two NR-30 30MM cannons with sixty rounds of ammunition per gun, but was not fitted with underwing missile pylons. The MiG-21F was known to NATO as the Fishbed B.

The MiG-21F-13 (Type 74) was the first version of the Fishbed to be built in substantial numbers. Early MiG-21F-13s were similar to the MiG-21F, but beginning with aircraft number 115, the chord of the vertical fin was enlarged and the canopy framing was modified slightly. This modification prompted NATO to assign the MiG-21F-13 the reporting name Fishbed C.

Beginning with MiG-21F-13 number 0815, the port NR-30 cannon was deleted and the cannon port faired over. The underwing pylons were reinstalled on the MiG-21F-13 and modified to carry rocket pods, small bombs, or air-to-ground rockets for the ground attack role, in addition to the normal air-to-air armament of a K-13 (AA-2 Atoll) infrared homing missile.

While the MiG-21F had no autopilot, the MiG-21F-13 was equipped with a KAP-2K autopilot. Other avionics included an ARK-10 radio compass, an RV-UM radio altimeter, an R-802V multi-channel radio, an MRP-56P radio beacon receiver, an SOD-57M transponder, an SRO-2M IFF (Odd Rods) and a Syrena 2 radar warning receiver. Late MiG-21F-13 had the SRD-5 radar rangefinder replaced by an SRD-5M (Scan Fix).

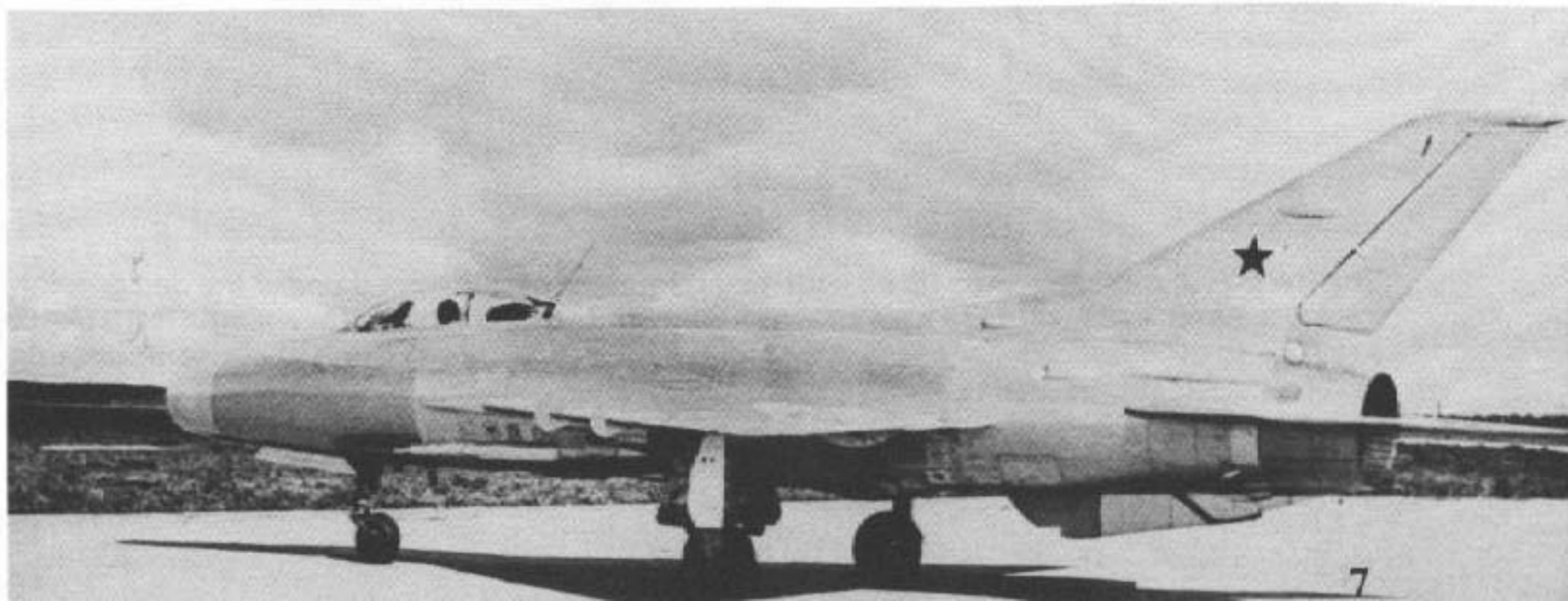
While all Ye-2 and Ye-4 prototypes were equipped with the same ejection seat used in the MiG-19 Farmer, the MiG-21F and MiG-21F-13 were outfitted with an improved SK ejection seat.

During its production life the MiG-21F-13 was continually improved. Early on, the internal fuel capacity was increased from 2,280 to 2,550 liters (602 to 673 gallons) and the under fuselage centerline pylon was plumbed to accept a 490 liter (129 gallon) drop tank.

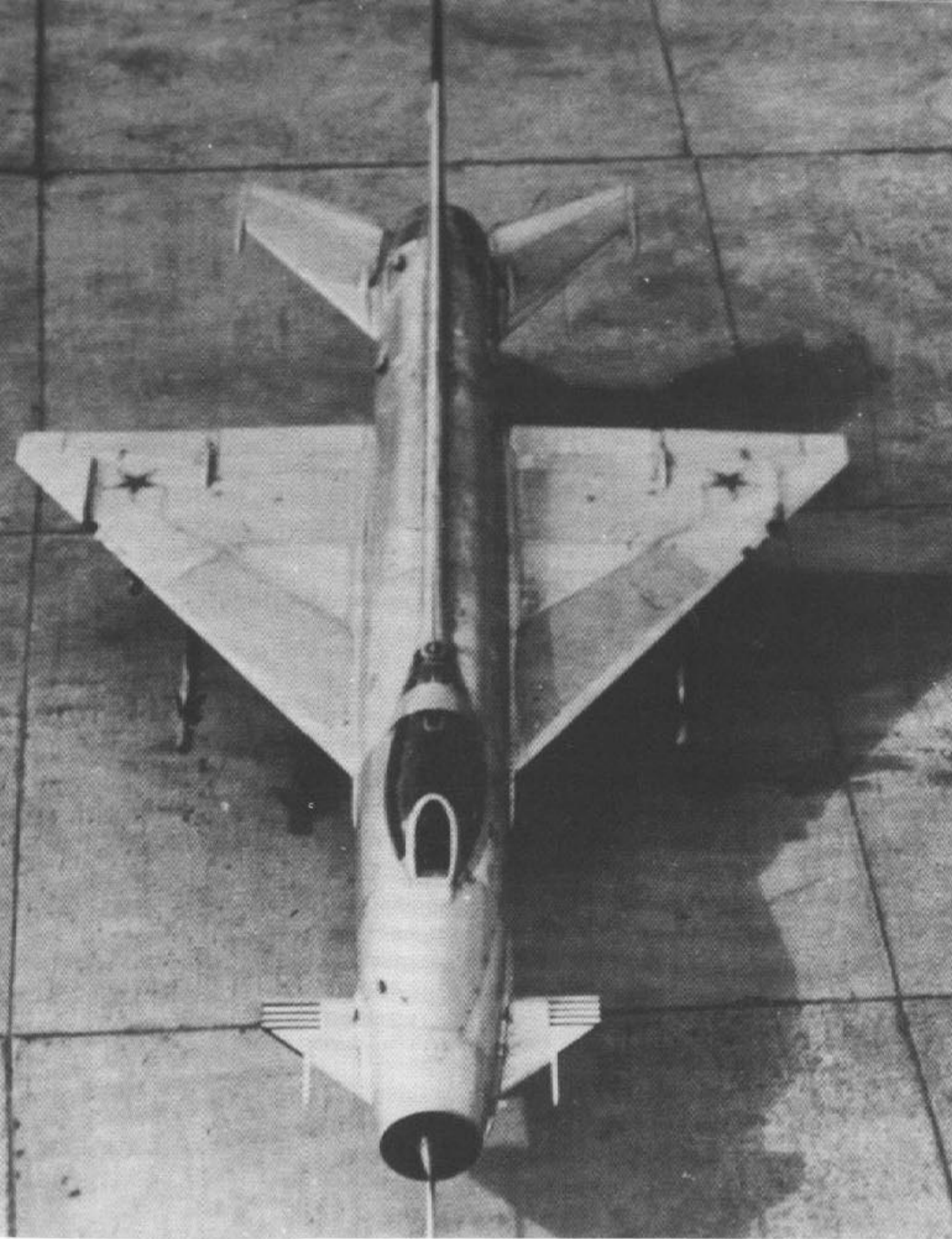
The MiG-21F-13 was built exclusively for the Soviet Air Force at the Zavod 21 factory at Gorky between 1960 and 1962, then production was shifted to the *Znamya Truda* (Banner of Labor) factory in Moscow where all export MiG-21F-13s were produced (between 1962 and 1965). During 1962 the first MiG-21F-13s were exported to members of the Warsaw pact, followed by exports to numerous other friendly countries.

An export MiG-21F-13 of the Iraqi Air Force was the first Fishbed to be evaluated by Western intelligence. On 16 August 1966, Monir Radfa took off from Rashid Air Base near Baghdad and flew to Israel where he picked up an escort of IDF/AF Mirage III fighters. He landed at Hatzor AB and the aircraft was quickly towed into a hangar. The Fishbed C, Black 534, was repainted with IDF/AF insignia, special recognition markings

**The Ye-6/1 preproduction aircraft featured a new power plant and a single ventral fin on the aircraft centerline. MiG OKB test pilot V.A. Nefyedov was killed during the factory trials flying this aircraft. (Hans-Heiri Stapfer collection)**







The third Ye-6 prototype was fitted with canard surfaces on the nose under the designation Ye-6T/3. For missile tests the aircraft was also outfitted with a pylon for a single R-13 (AA-2 Atoll) air-to-air missile under each wing. The canards were free-floating at subsonic speeds and locked at supersonic speeds. (Hans-Heiri Stapfer Collection)

and given the serial 007. The aircraft was carefully evaluated in Israel before it was shipped to the US during 1969 under Project HAVE DONUT.

The USAF was very interested in finding out just how good the MiG-21 was in a combat environment and there are reports that some sixty MiG-21s (mostly F-13 variants) have taken part in combat training in the Nevada desert. The Red Flag series of exercises conducted at Nellis AFB were developed to give American and Allied air crews realistic training in countering Soviet and Soviet trained threats. The MiG fleet (flown by a squadron known as the Red Hats) added a great deal to this realistic training. According to mostly foreign sources, the MiG-21 fleet acquired by the USAF came mainly from Egypt and Indonesia.

## MiG-21F-12

The MiG-21F-12 was a special export designation for the Fishbed Cs which were delivered to Finland, which became the first non-Warsaw Pact country to take delivery of the Fishbed C. On 6 April 1963, the first ten MiG-21F-12s arrived at Kuopio, the home base of the 31st Fighter Squadron. These were followed by a further twelve Fishbed Cs. The MiG-21F-12 remained in service until 17 January 1986, when they were replaced by later variants of the MiG-21. A total of four aircraft were lost in crashes during operational service with the Finnish Air Force.

## Ye-6V

Two Ye-6V test aircraft were involved in a series of tests intended to devise a new storage system for the braking parachute. The braking parachute on the MiG-21F-13 was housed in a compartment in front of the ventral fin under the fuselage. On the Ye-6V the parachute was housed in a container at the base of the rudder. The modification was never adopted for use on the MiG-21F-13, but it was added to the MiG-21 later during production of the MiG-21PF. One Ye-6V was demonstrated at the Tushino Air Display on 9 July 1961.

**This Soviet Air Force MiG-21F Fishbed B is on display at the Army Museum in Moscow. The MiG-21F did not have an underwing ordnance pylon and had a narrow chord fin. The aircraft in the background are a MiG-15 (left) and a MiG-17 (right). (Don Linn Collection)**



# Ye-66A

In early 1961 the MiG-OKB installed the newly developed R-11F2-300 engine in the first MiG-21F-13 prototype (Ye-6T/1). The engine power was augmented by a liquid fueled rocket engine S3-20M5A which was mounted under the fuselage. The aircraft, given the designation Ye-66A, was used to capture a new altitude record on 28 April 1961 when G.K. Mossolov climbed the Ye-66A to 34,714 meters (113,891 feet).

## Czech built MiG-21F-13

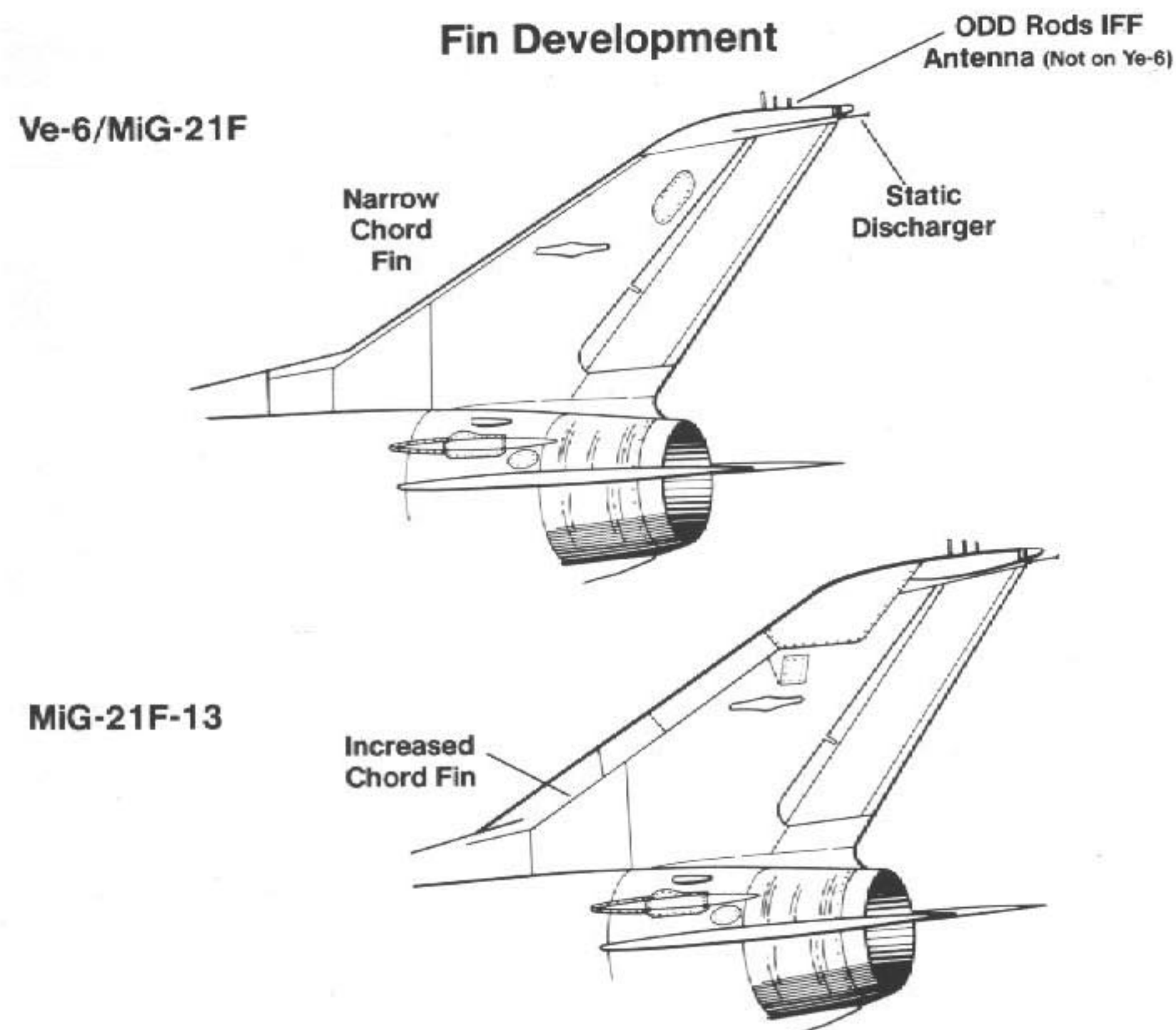
Czechoslovakia was the only Warsaw Pact country to build the MiG-21F-13 under license. In 1962 a number of Soviet built MiG-21F-13s were delivered to the Czech Air Force and production started that same year at the Aero plant in Vodochody on the outskirts of Prague. The Czech MiG-21F-13 differed from the Soviet built-Fishbed C in having that the fixed rear portion of the canopy was deleted and faired over. Initially, a number of MiG-21F-13 knock-down-kits were delivered from the USSR and reassembled at Vodochody to allow the Czechs to gain some experience with the new type before full production started. Cooperation between the Soviets and Czechs was far from easy and the original production drawings had to be redrawn and some of the drawings supplied did not match up with the pattern aircraft and subassemblies delivered to Czechoslovakia.

Most of the MiG-21s built at the Aero Vodochody plant were delivered to the Air Defense Regiments of the Czech Air Force; however, a small number of Fishbed Cs were exported to the German Democratic Republic (East Germany). Production of the type continued until 1973 and a total of 194 Fishbed Cs were built in Czechoslovakia.

Soviet Air Force pilots scramble to their early MiG-21F Fishbed B fighters. The MiG-21F and early MiG-21F-13 had a narrow chord fin and rudder. (Hans-Heiri Stapfer collection)



Black 9904, an early Soviet-built Czech Air Force MiG-21F-13, taxis to the run up area for preflight checks. The MiG-21F-13 Fishbed C differed from the MiG-21F Fishbed B in that it had a wider chord fin and rudder. (Norm Taylor)



# Chinese built MiG-21F-13

In May of 1962, five MiG-21F-13 were supplied to China to serve as pattern aircraft for production of the Fishbed C in China. The license production of the MiG-21 was under the leadership of the Shenyang Aircraft Design Institute. On 17 January 1966, the first Chinese built J-7 (Jianji or Fighter) took off for its maiden flight with test pilot Ge Wenrong at the controls. Full J-7 production was approved during June of 1967 and three plants were involved in production: Shenyang, Ghengdu and Guizhou.

Early J-7s and J-7As built for export under the designation F-7A (Albania and Tanzania) were all produced at Shenyang. These aircraft were basically the same as the Soviet MiG-21F-13 except that they retained both cannons. The F-7B designation was used for aircraft exported to Egypt and Iraq.

The Chinese continued to develop the J-7 both for use at home and for export. The J-7II incorporated a new ejection seat, and a conventional windscreen and aft opening canopy replaced the original forward opening one piece canopy. The aircraft also had the braking parachute relocated from under the fuselage to a bullet shaped pod at the

**These early MiG-21F-13 Fishbed Cs are all carrying UB-16-57U sixteen shot rocket pods. All Soviet Air Force MiG-21F-13s were built at Zavod 21 in Gorky, while export Fishbed Cs were manufactured at the *Znamya Truda* factory in Moscow. (Wolfgang Tamme via Hans-Heiri Stapfer)**



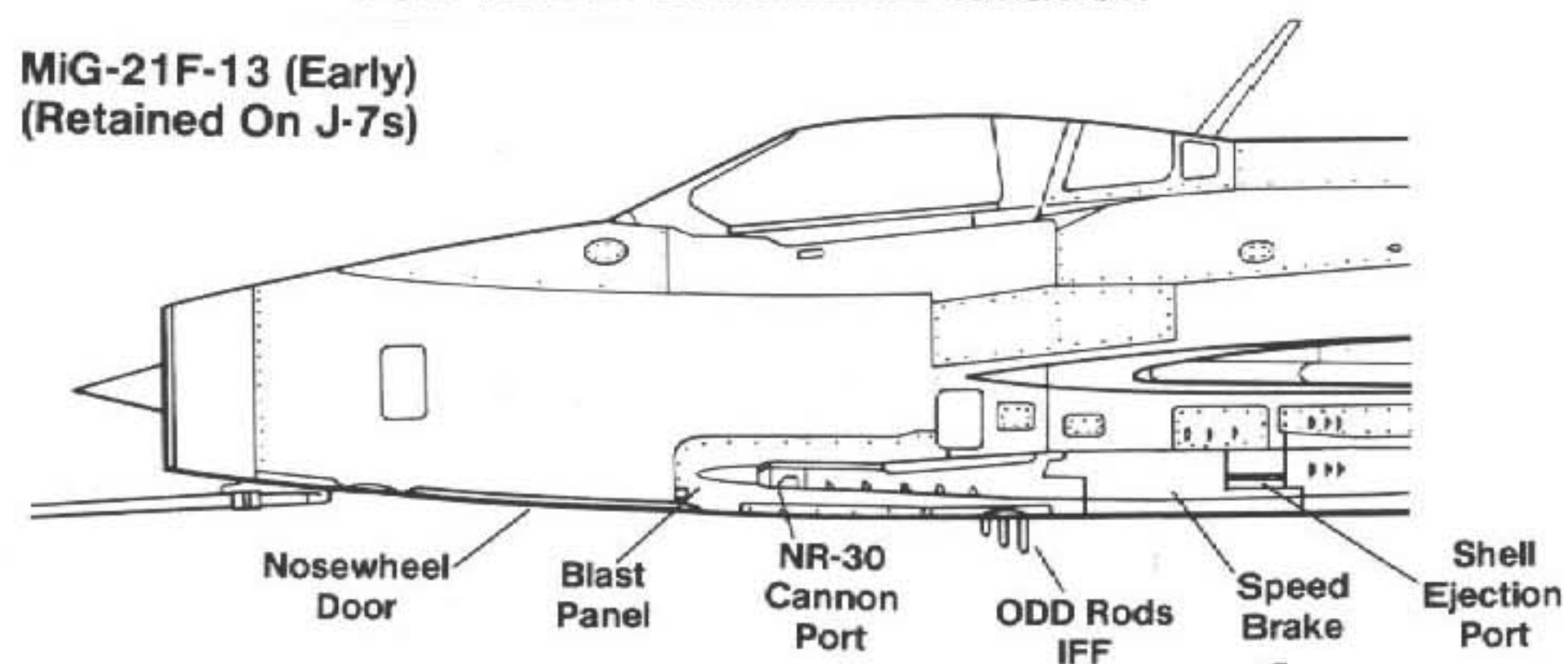
**This Czech Air Force MiG-21F-13, Black 9902, takes off for a training sortie. This is a late production aircraft which has the port NR 30 30mm cannon deleted and the cannon port faired over. (Norm Taylor)**

base of the fin. Export variants of the J-7II are known as the F-7M Airguard and F-7P Skybolt. These feature further refinements such as western electronics, Martin Baker ejection seats, a relocated air data probe (from under the nose to above the nose) and four wing pylons instead of the two normally found on the J-7/MiG-21F-13. F-7Ms have been exported to Zimbabwe, Iran and Iraq. The F-7P Skybolt was built with some twenty-four items of western equipment specified by the Pakistani Air Force and this variant serves with Pakistan, Bangladesh and Sri Lanka.

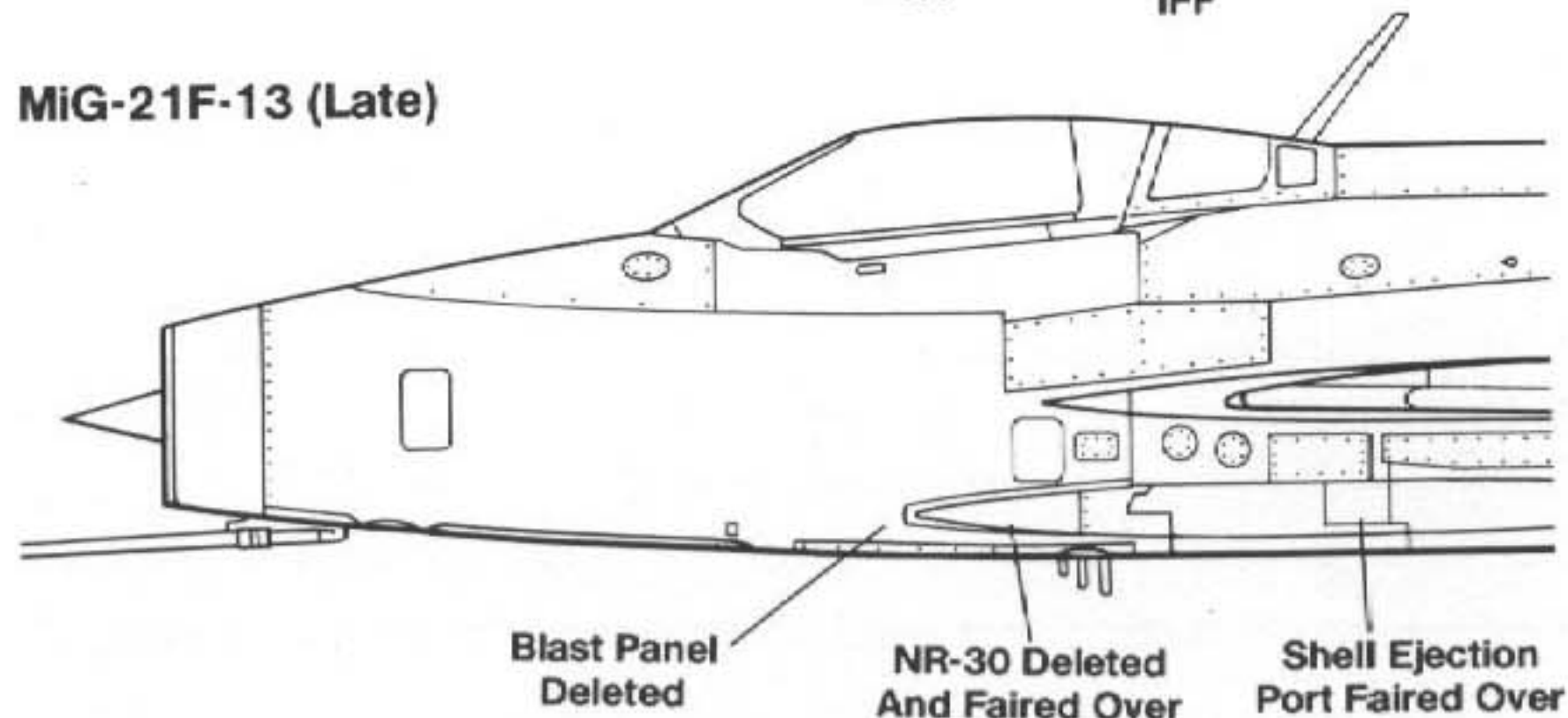


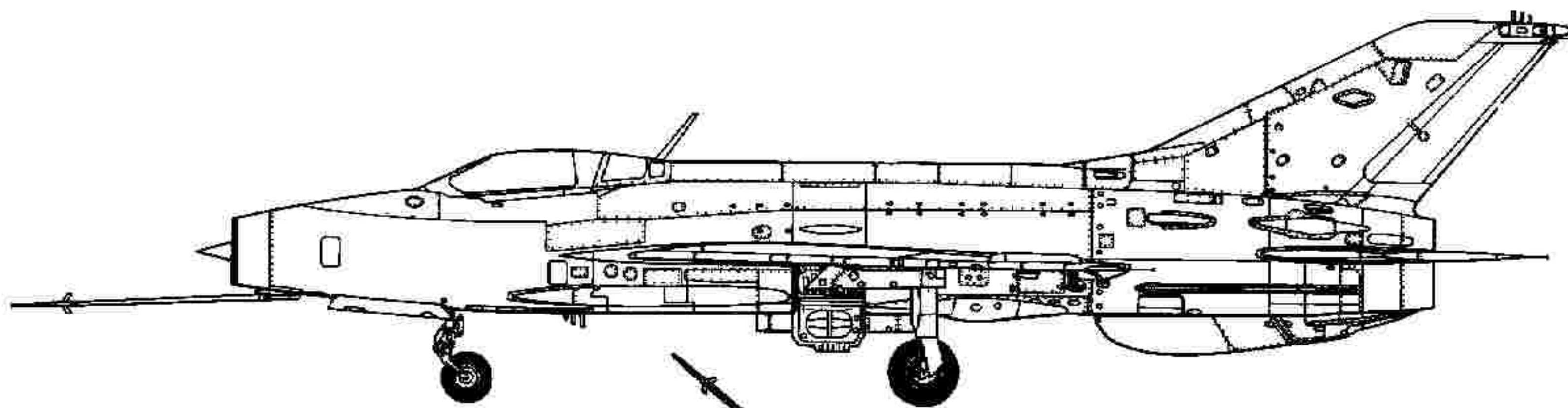
## Port NR-30 Cannon Installation

**MiG-21F-13 (Early)  
(Retained On J-7s)**



**MiG-21F-13 (Late)**





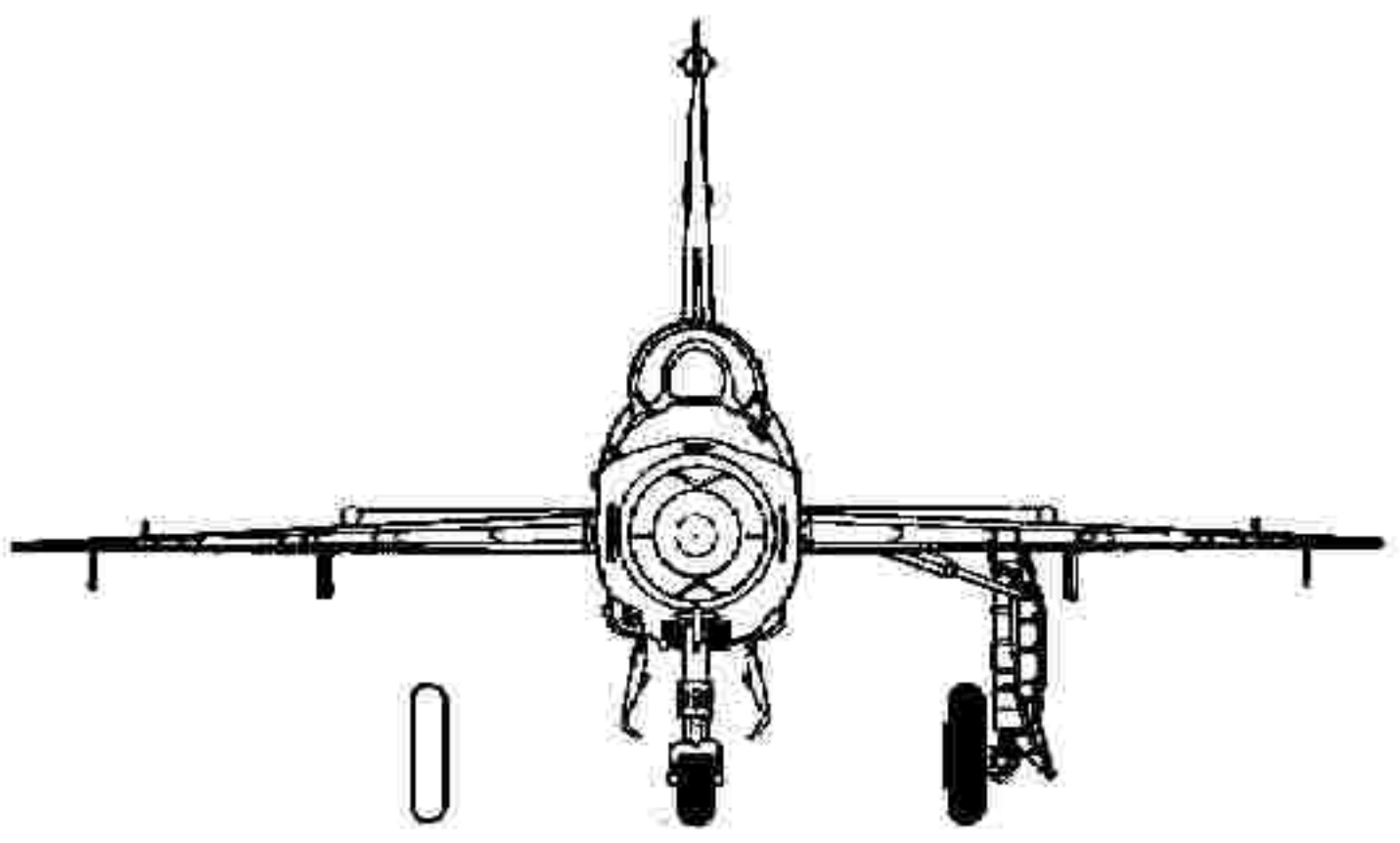
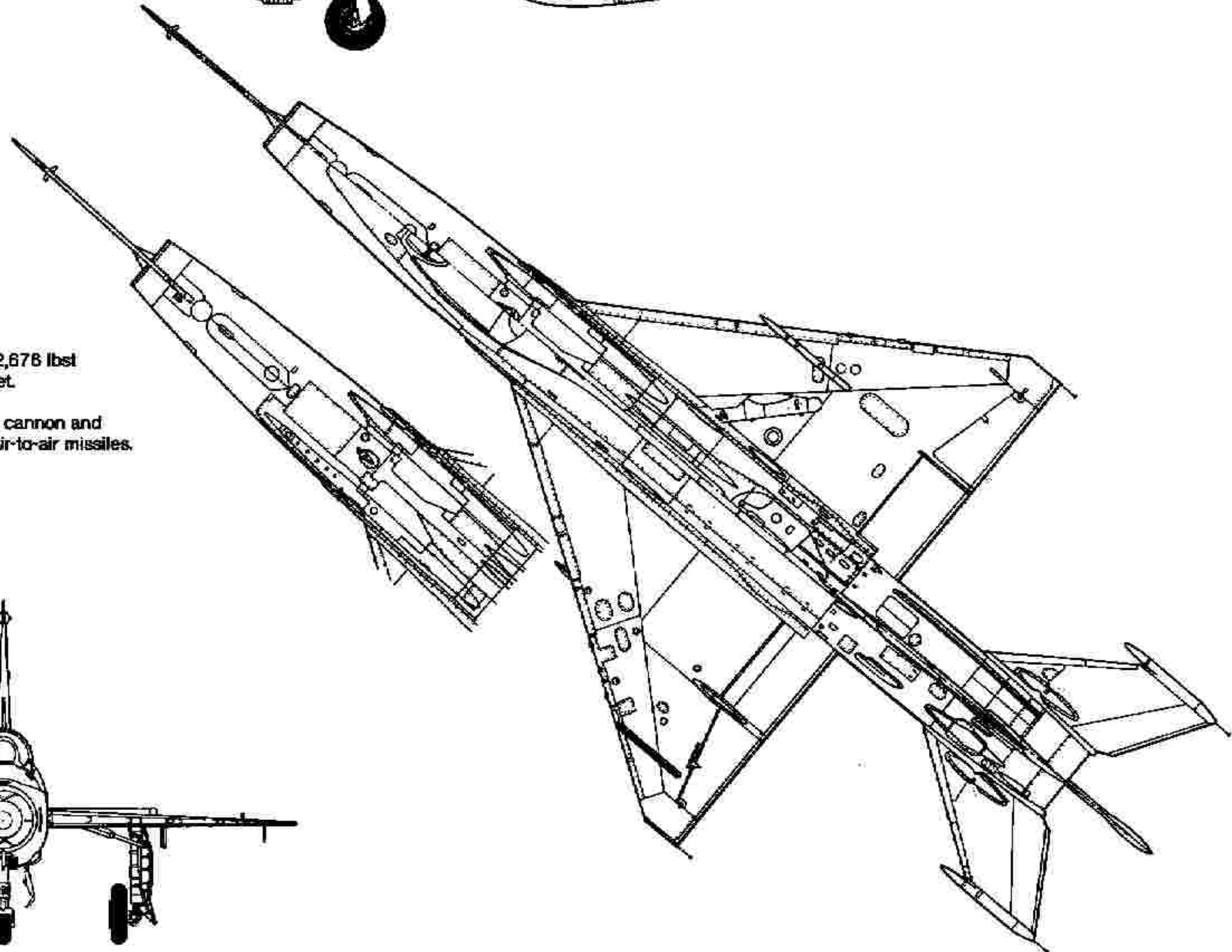
**Specifications**

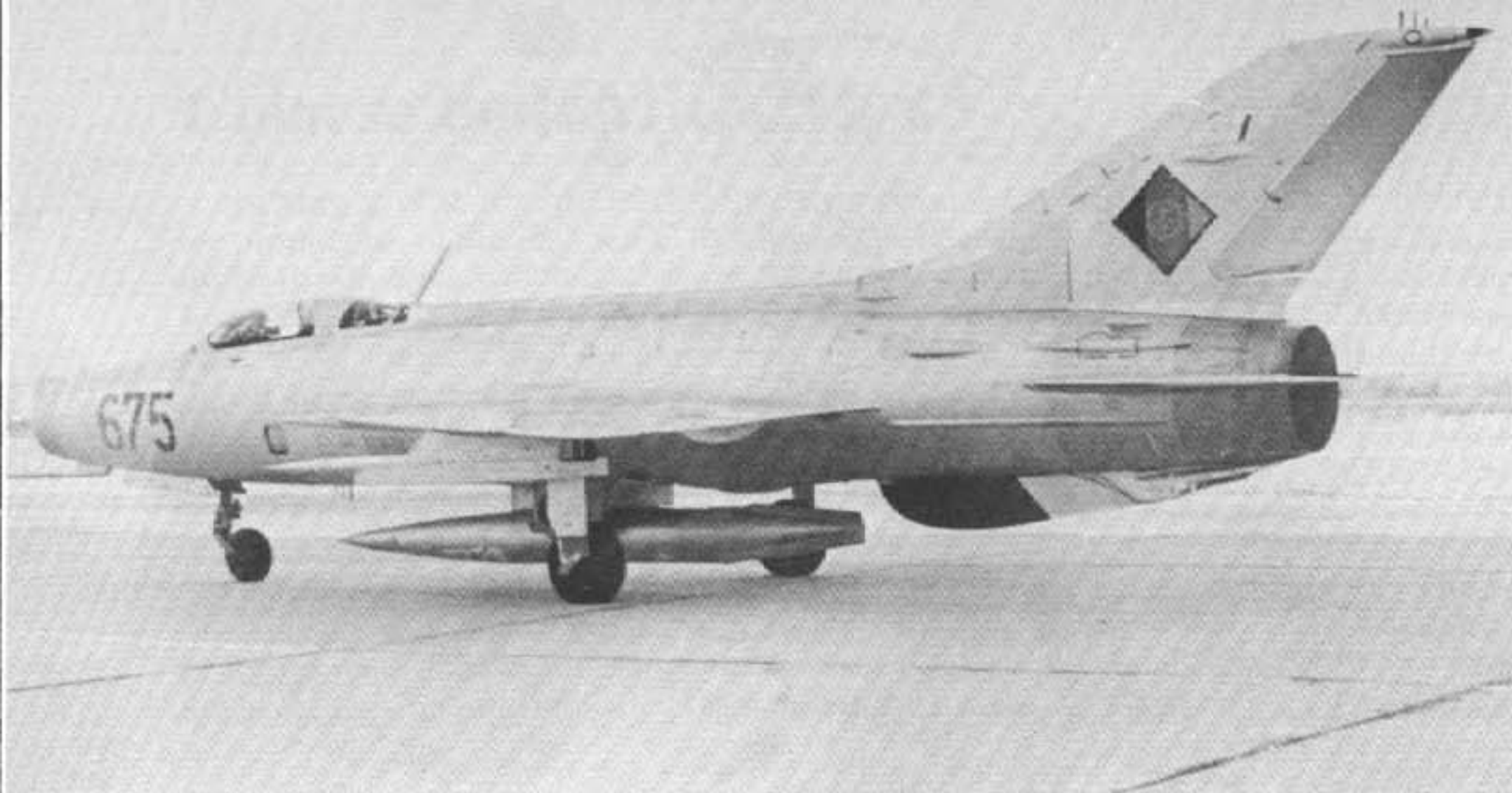
**MiG-21F-13 Fishbed C**

**Wingspan** .....23 feet  
**Length** .....43 feet 2 inches  
**Height** .....13 feet 2 inches  
**Empty Weight** .....10,079 pounds  
**Maximum Weight** .....19,080 pounds  
**Powerplants**.....One Tumansky 12,678 lbst  
 R-11F-300 turbojet.

**Armament**.....One NR-30 30mm cannon and  
 two K-13 (AA-2) air-to-air missiles.

**Performance**  
**Maximum Speed** .....1,320 mph  
**Service ceiling** .....60,958 feet  
**Range**.....1,038 miles  
**Crew** .....One





**This East German Air Force MiG-21F-13 Fishbed C, Red 675, carries a supersonic drop tank on the centerline pylon. East Germany was one of the first Warsaw Pact nations to receive the MiG-21. (Norm Taylor)**

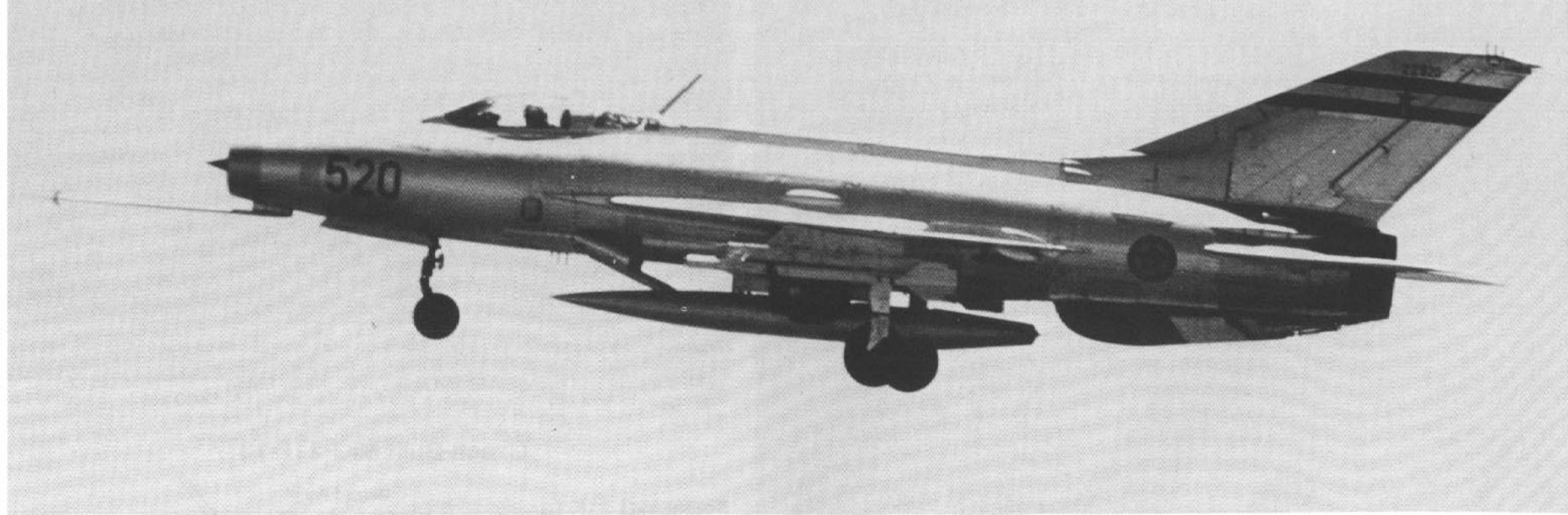
**This MiG-21F-13 Fishbed C of the East German Air Force carries a 130 gallon drop tank on the fuselage centerline pylon. The MiG-21F-13 was powered by a 12,676 lbst Tumansky R-11F-300 turbojet engine. The small inverted T antenna under the port wing is one of the antennas for the radio altimeter system, the second antenna is under the starboard wing. (U.S. Navy)**



**The pilot of this overall Natural Metal Iraqi Air Force MiG-21F-13 Fishbed C flew the aircraft to Israel. The aircraft was tested by the IDF/AF with the side number 007, then transferred to the USAF. (Hans-Heiri Stapfer Collection)**

**Red 709 was a MiG-21F-13 Fishbed C of the Romanian Air Force which received its first Fishbed Cs during 1962. The style of Romanian national markings was changed during 1984 from the star insignia to a roundel insignia. (Hans-Heiri Stapfer Collection)**





**A MiG-21F-13 Fishbed C of the Yugoslav Air Force on final approach with its forward speed brakes deployed. The aircraft is armed with a K-13A (AA-2 Atoll) air-to-air infrared homing missile (which was a copy of the U.S. AIM-9 Sidewinder). (U.S. Navy)**

**Late in their operational service with the East German Air Force the MiG-21F-13 Fishbed Cs were given a tactical camouflage scheme consisting of Olive Green and Earth Brown upper-surfaces over Blue-Gray undersurfaces. (Wilfried Kopenhagen via Hans-Heiri Stapfer)**

**This Hungarian Air Force MiG-21F-13 Fishbed C was mounted on concrete blocks and preserved in an open display area without its canopy. The tactical number on the nose was Red with a thin White outline. (Don Spring/AIR)**





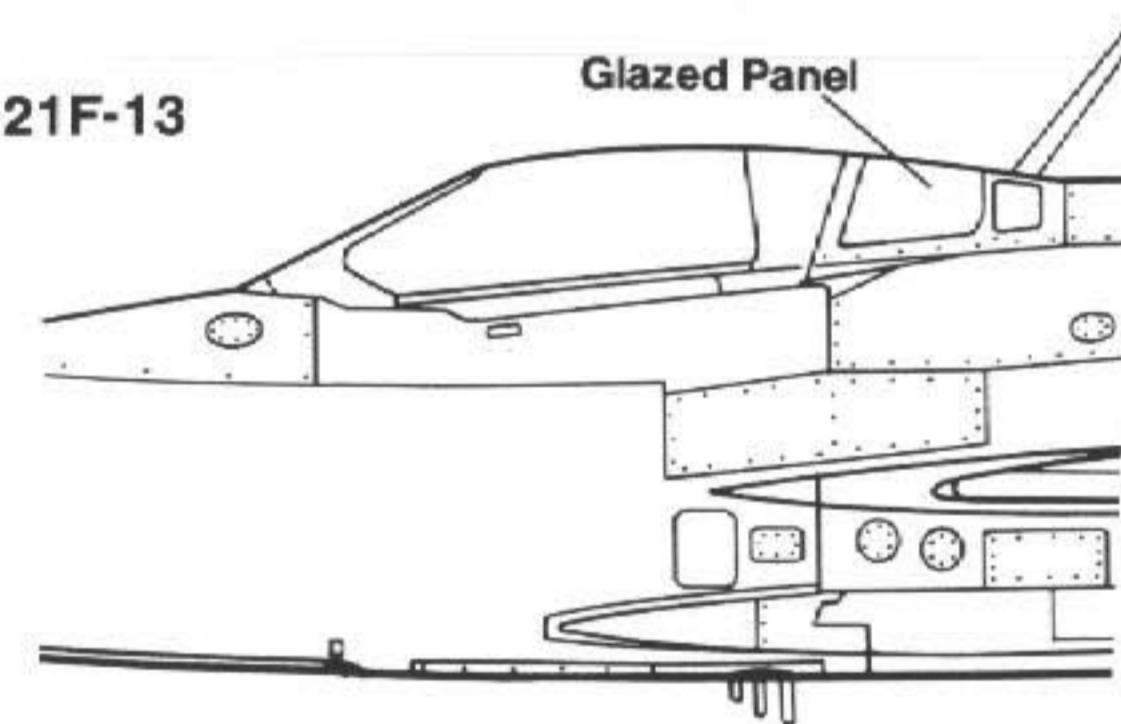
The canopy on the MiG-21 was unique in that it was forward hinged. The plate above the ejection seat was compressed downward when the canopy was closed, arming the ejection seat. (Norm Taylor)



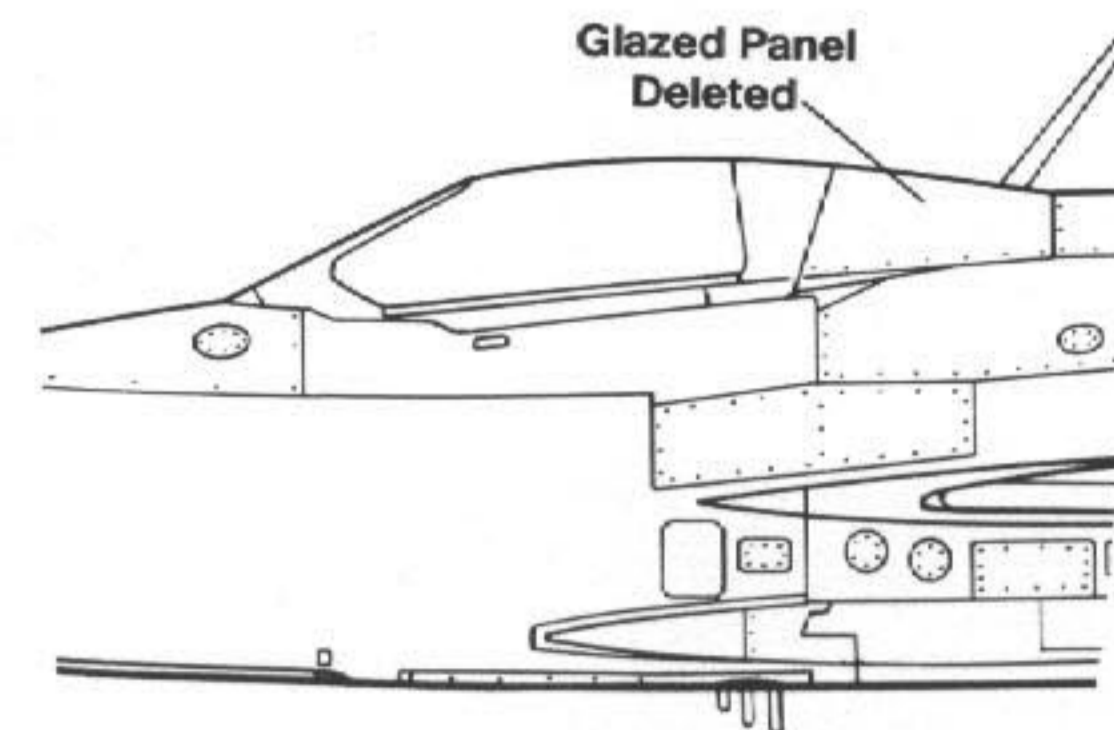
The pilot of this Czech-built MiG-21F-13 inspects the nosewheel during his preflight inspection. The Czech-built MiG-21F-13 differed from the Soviet-built Fishbed C in that the clear panel behind the cockpit was deleted and faired over. (Norm Taylor)

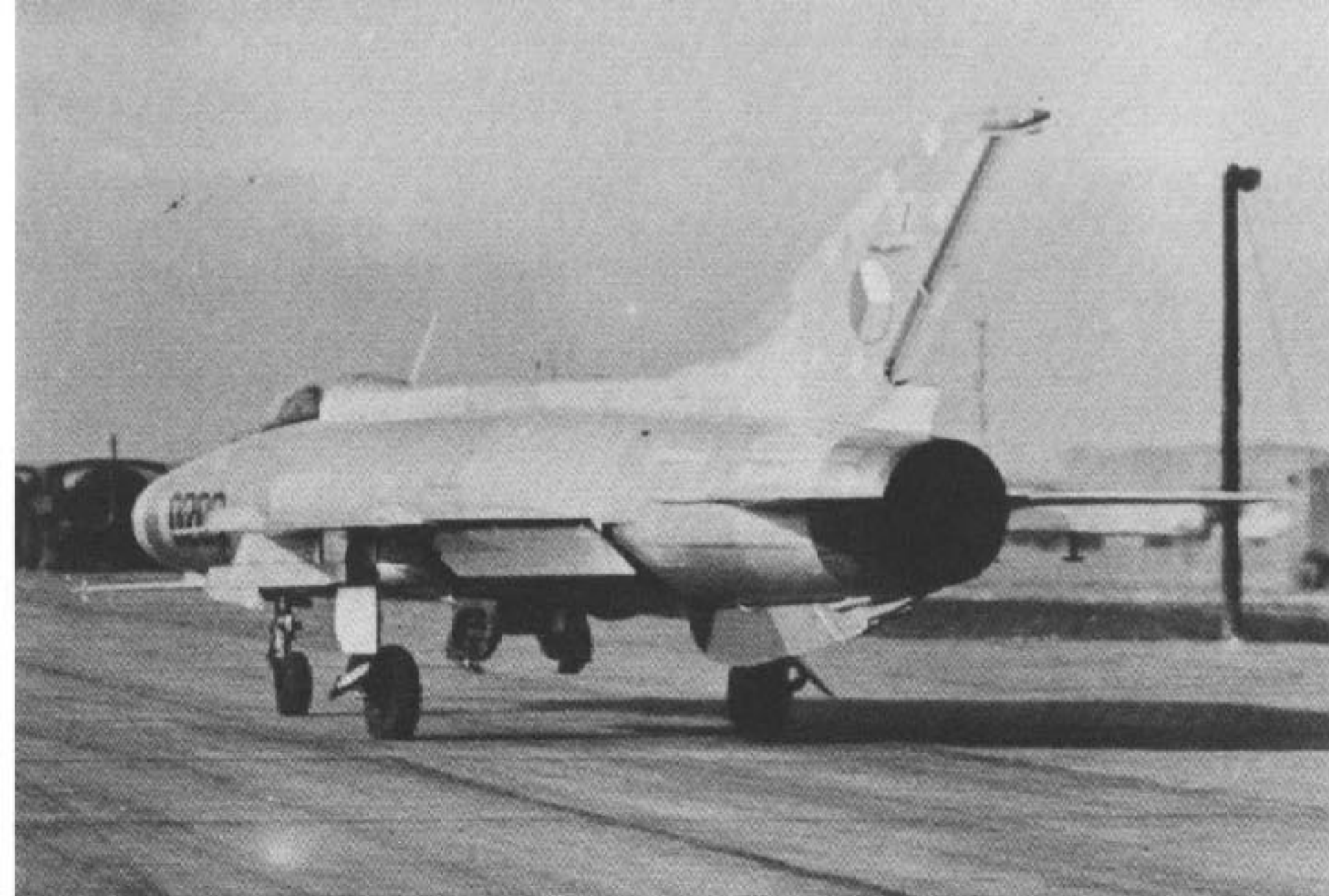
### Czech-Built MiG-21F-13

Soviet MiG-21F-13



Czech-Built MiG-21F-13





A Fishbed C of the Czech Air Force returns from a mission with the trailing edge flaps lowered. The MiG-21F-13 was built under license at the Aero factory at Vodochody near Prague. A total of 194 aircraft were built between 1962 and 1973. (Norm Taylor)



This Czech Air Force MiG-21F-13 Fishbed C, Black 9902, has both the forward and rear speed brakes deployed. The aircraft has Red protective covers over the air intake and the suck-in door on the fuselage side above the NR 30 cannon. (Norm Taylor)

A number of Czech Air Force MiG-21F-13 were camouflaged in a two tone Green camouflage for the tactical reconnaissance mission. The four digit Black tactical number had a thin White outline. Many Czech Fishbed Cs served into the early 1990s in the trainer role. (Hans-Heiri Stapfer Collection)

A pair of Czech-built MiG-21F-13 Fishbed Cs take off on another mission. The lead Fishbed, Black 0201, is unusual in that the shock cone is painted White; normally the shock cone was painted in a Dark Green color. (Norm Taylor)







A pair of MiG-21F-12s, each armed with K-13 (AA-2 Atoll) air-to-air missiles, on final approach for a formation landing at Ravaniemi Air Base, Lapland, Finland during August of 1979. (Jyrki Laukkanen)

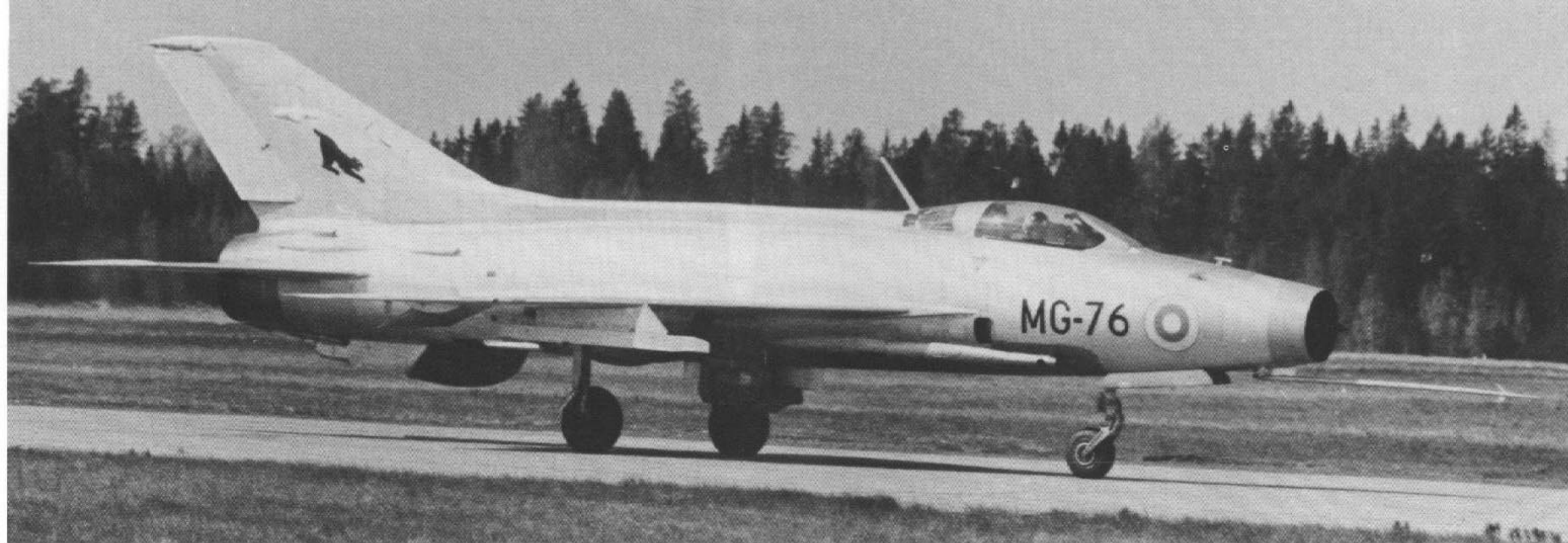


The MiG-21s exported to Finland were given the designation MiG-21F-12, although they were identical to standard Soviet MiG-21F-13 Fishbed C. This Finnish Air Force Fishbed, lifting off from Halli Air Base during May of 1974, is assigned to the 31st Fighter Squadron. (Jyrki Laukkanen)

The braking parachute of this MiG-21F-12 is fully deployed as the aircraft rolls out after returning from a search and rescue mission. The Fishbed is carrying a Valmet manufactured rescue pods on the underwing pylon. (Jyrki Laukkanen)

Finnish Air Force pilot LT Jyrki Laukkanen in front of MG-31, one of the overall natural metal MiG-21F-12 Fishbed Cs he flew while assigned to the 31st Fighter Squadron. (Jyrki Laukkanen)



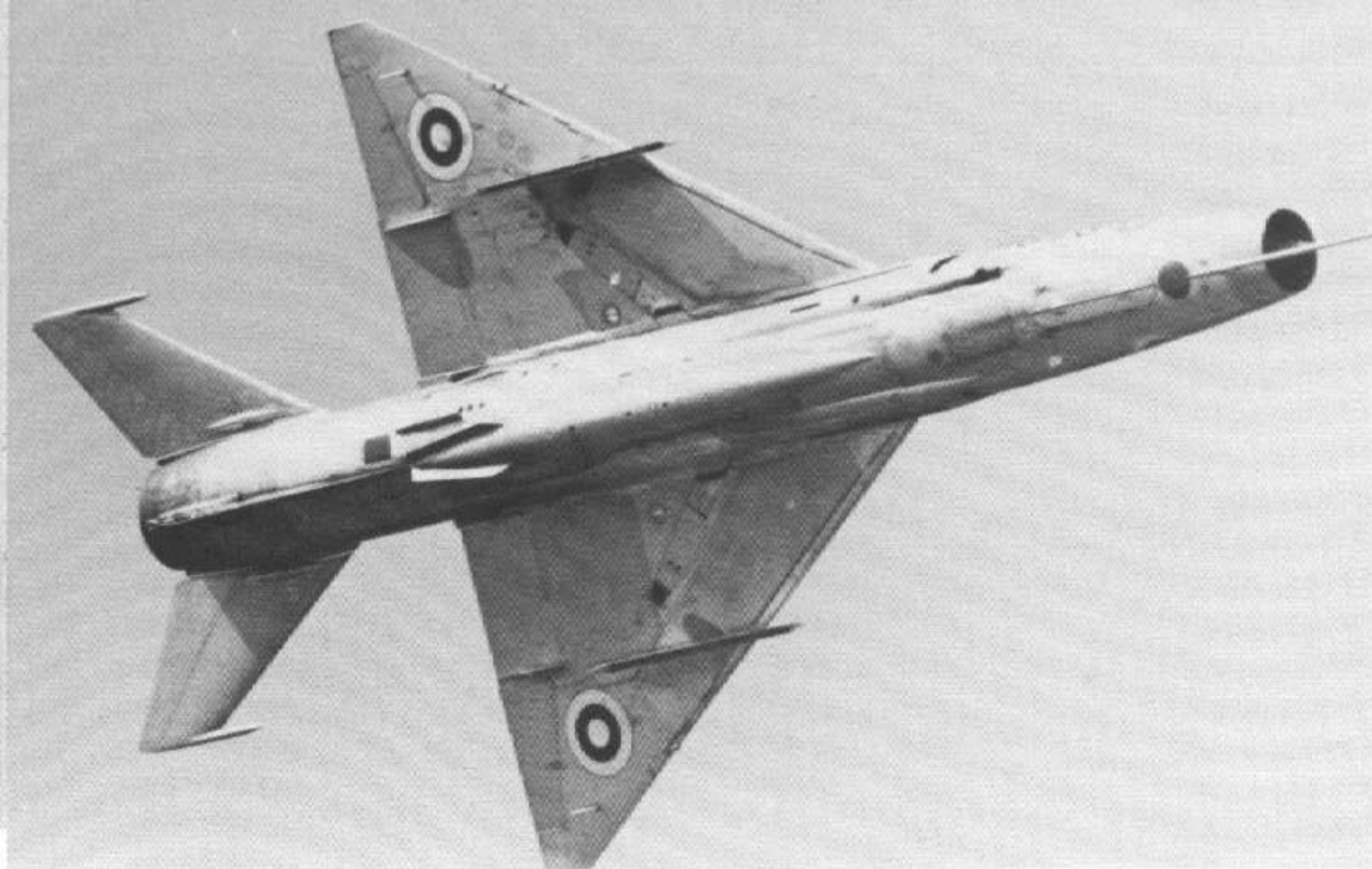


The Finnish Air Force received its first Fishbed Cs in 1963 and operated the MiG-21F-12 for seventeen years in the air defense role. After being replaced by later MiG-21 variants, the Fishbed Cs were transferred to a tactical reconnaissance unit. (Jyrki Laukkanen)

This early MiG-21F-12 Fishbed C, landing at Halli Air Base in southern Finland during 1974, has the braking parachute and both sets of speed brakes fully deployed. The aircraft has missile rails installed on the underwing pylons. (Jyrki Laukkanen)

The drag chute is just deploying as this MiG-21F-12 lands at Halli Air Base. The Black Lynx on the tail identifies this Fishbed as being assigned to *Havittajalentolaivue 31* (31st Fighter Squadron) of the *Ilmavoimat* (Finnish Air Force). (Jyrki Laukkanen)





A MiG-21F-12 breaks away during a high speed low level pass over Halli Air Base during May of 1974. The Fishbed C carried a single 30mm cannon on the starboard side of the fuselage underside. (Jyrki Laukkanen)



A Finnish Air Force MiG-21F-12 lands at its home base with the trailing edge wing flaps fully deployed. The Finnish national insignia was carried on both the upper wing surfaces just inboard of the wing fence and was repeated on the wing undersurfaces. (Jyrki Laukkanen)

The pilot of this Finnish MiG-21F-12 steps out of the cockpit onto the crew boarding ladder. The nosewheel has a tow bar attached to allow ground crewmen to maneuver the fighter from one parking spot to another. (Jyrki Laukkanen)

MG-91, a Finnish Air Force MiG-21F-13 Fishbed C, taxis out for another mission. The aircraft carries a K-13 (4A-2 ATOLL) air-to-air missile on the wing pylon. (Jyrki Laukkanen)





MG-76 was the personal MiG-21F-12 assigned to Finnish Air Force pilot Jyrki Laukkanen. His name was painted on the fin above the Black Lynx squadron marking of HavLLv 31. (Jyrki Laukkanen)

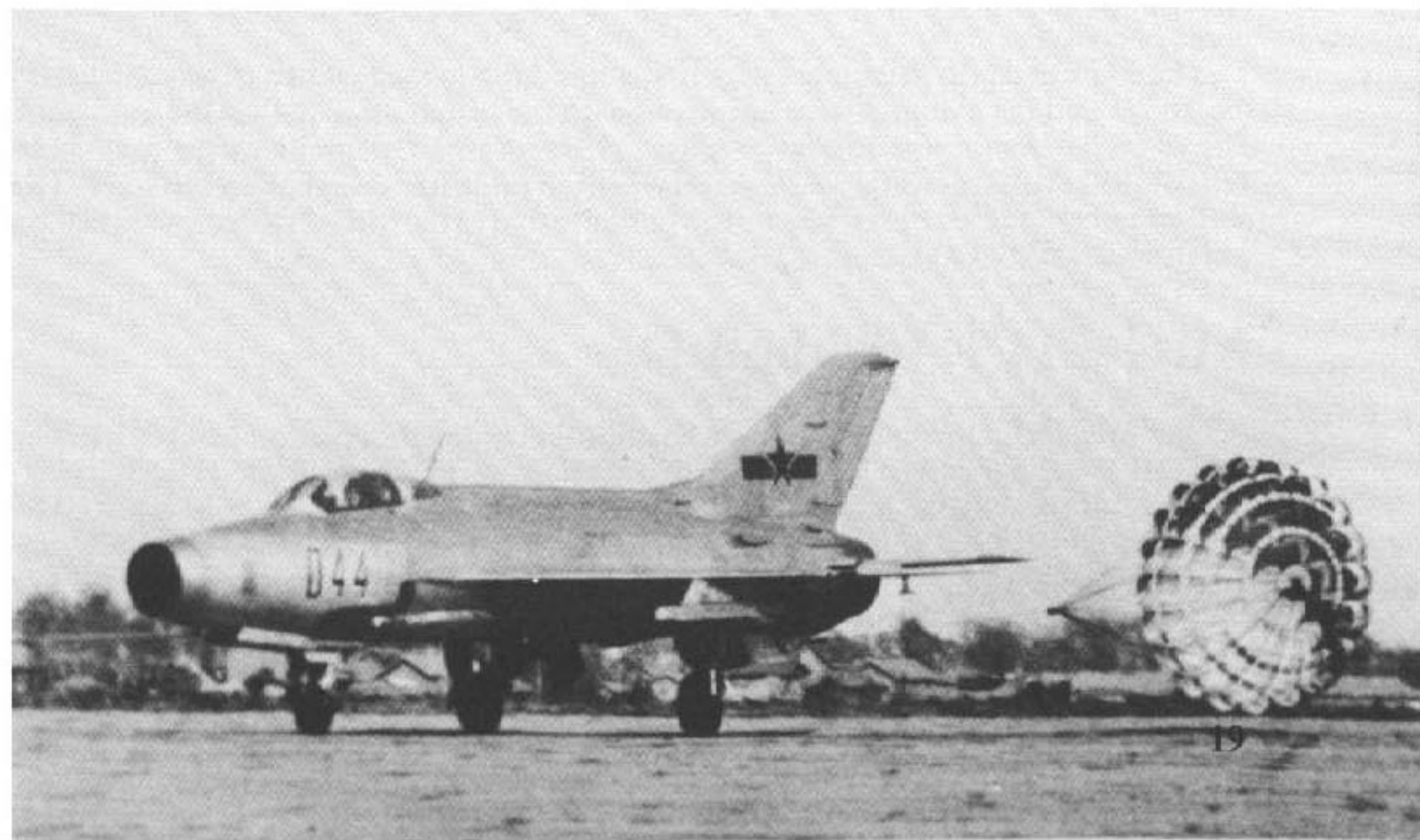


An early MiG-21F-12 Fishbed C flies over dense cloud cover in Finland. This MiG-21 carries the insignia of the Finnish tactical reconnaissance unit that received the Fishbed Cs after the 31st FS re-equipped with later model Fishbeds. (Jyrki Laukkanen)

A MiG-21F-12 Fishbed C, armed with a pair of IR homing K-13 (AA-2 Atoll) air-to-air missiles, taxis in after a mission. The MiG-21F's lack of all weather instrumentation seriously restricted its tactical usefulness, especially in the harsh Finnish climate. (Jyrki Laukkanen)



An early Air Force of the Peoples Liberation Army J-7 I Fishbed C deploys its braking parachute on landing. The Chinese-built J-7 I differed from the MiG-21F-13 in that it retained both internal guns. (via A. Grandolini)



# Second Generation MiG-21 Fishbeds

The second generation MiG-21s featured a number of modifications intended to extend its endurance and give the fighter a better all weather capability through the installation of an upgraded radar system. Second generation Fishbeds were also representative of the trend towards dedicated missile carrying fighters with no internal cannon armament. Soviet doctrine agreed with that of the United States and officials in both countries felt that improvements in air-to-air missiles made internal cannon armament unnecessary. Combat experience in Vietnam later proved how wrong this doctrine was.

## MiG-21P

The first Fishbed version that represented this trend was the Ye-7/1 prototype, which was an aerodynamically refined version of the Ye-6T using the same R-11F-300 power plant as the MiG-21F series.

The nose section was enlarged in diameter from 690MM (27.16 inches) on the Fishbed C to 910MM (35.8 inches) on the Ye-7/1. This was done to incorporate a TsD-30T radar antenna. The dorsal spine was also enlarged to accept a 170 liter (44.9 gallon) fuel tank in the fuselage behind the cockpit and the separate clear rear portion of the canopy was deleted. The air intake shock cone was also enlarged and the VHF blade antenna on the dorsal spine was relocated more to the rear. The airflow relief doors on the sides of the nose were also relocated more to the rear.

The prototype's speed brakes differed from the earlier MiG-21F series in that the large speed brakes under the forward fuselage were replaced by two smaller speed brakes which were higher on the fuselage side. The main landing gear was also modified and the main wheel well doors were enlarged as was the landing gear fairing in the fuselage side. The air data boom was relocated from below the nose to a position on top of the nose. The underfuselage front Odd Rods IFF antenna was relocated from behind to in front of the nosewheel door.

The starboard NR-30 cannon, which was standard on the Fishbed C, was deleted on the Ye-7/1 and the avionics were improved with the installation of a KAP-1 auto pilot. The Ye-7/1 flew for the first time on 10 August 1958 with P.M. Ostapenko at the controls. In June of 1960 a small preproduction series was built under the designation MiG-21P. The performance of these aircraft was quite similar to that of the MiG-21F except the ceiling which was now 19,100 meters (62,664 feet).

## MiG-21PF Fishbed D

The MiG-21P was ordered into production under the designation MiG-21PF. The MiG-21PF was basically a MiG-21P with a more powerful 13,118 lbst R-11F2-300 afterburning turbojet engine and modified jet exhaust. The TsD-30T radar was replaced by an improved RP-21 Sapphire (NATO designation Spin Scan) and the ASP-5NDN gun-sight was replaced by a PK-1 sight. The armament of the MiG-21PF was restricted to a pair of K-13 (AA-2 Atoll) air-to-air infrared missiles or a pair of R-5 (AA-1 Alaki) radar homing air-to-air missiles. The same pylon could also carry rocket pods, bombs and

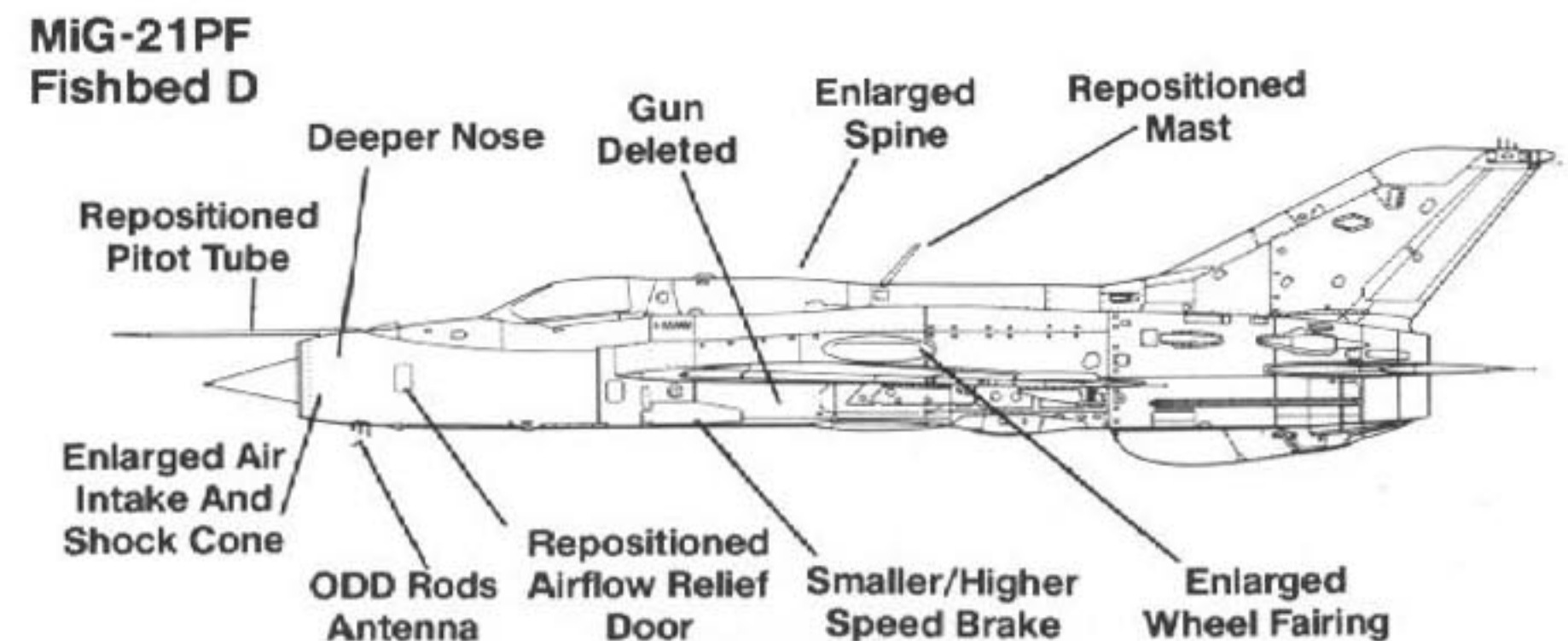
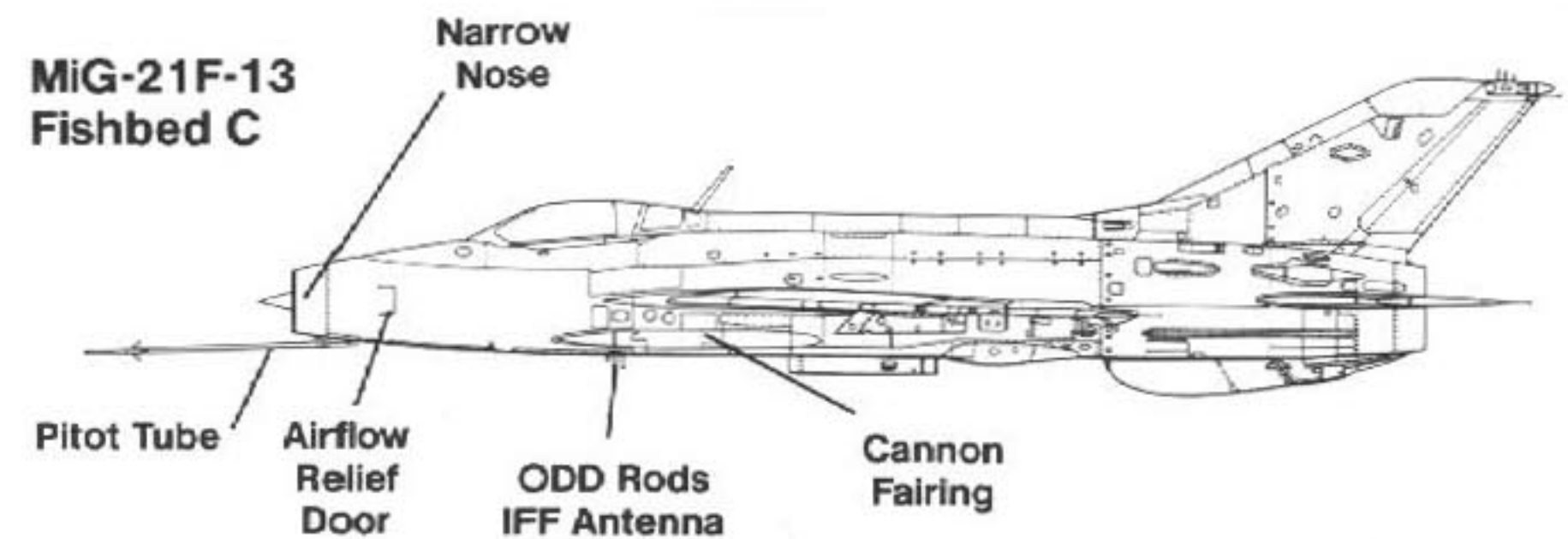
unguided rockets for the ground attack role.

While early MiG-21PFs had the braking parachute housed in a compartment on the port side of the fuselage in front of the ventral fin, late production aircraft had a parachute container at the base of the rudder. These late production MiG-21PFs also had a wider chord vertical fin and the more advanced RP-21M Sapphire radar system, which replaced the earlier RP-21. When the new aircraft was first observed by the West, NATO assigned it the reporting name Fishbed D.

Production of the MiG-21PF began during 1962 at Zavod 21 in Gorky for the Soviet Air Forces. In 1964, when the production of the MiG-21PF ended at Gorky, the entire production line was moved to the *Znamya Trudy* factory in Moscow where production for export customers continued until 1968. All Warsaw Pact member nations were equipped with the MiG-21PF from 1964 onwards and the type was also delivered in large numbers to friendly countries in the Middle East, Asia and Cuba.

The MiG-21PF and later MiG-21PFMs delivered to East Germany were extensively modified in equipment and avionics at the overhaul facility in Dresden which had been built originally as an aircraft factory for Il-14 transports. Externally the modified East German aircraft could be distinguished from standard Fishbed Ds by the addition of a mud guard panel below the air flow relief door. Foreign Fishbeds overhauled at Dresden also received this modification.

### Fuselage Development



## MiG-21PFV

The MiG-21PFV was a special version of the MiG-21PF exclusively produced for North Vietnam at the *Znamya Truda* factory and were specially prepared for the humid and hot climate of Southeast Asia. MiG-21PFV were externally similar to standard Soviet MiG-21PFs but the RP-21 radar was replaced by a less sophisticated R-2L radar. The nimble MiG-21PFV was an unexpected threat for USAF crews over Vietnam, but Vietnamese pilots generally preferred the MiG-17F Fresco C over the MiG-21 Fishbed, due in no small part to the gun armament of the MiG-17.

## MiG-21FL

The MiG-21FL was a special variant built for the Indian Air Force which was also built in India under license at Hindustani Aircraft Ltd. Externally these aircraft were identical to the late production MiG-21PF with the RP-21 radar being replaced by the R-2L radar. The MiG-21FL was powered by a 13,670lbst R-11F-300 instead of the standard R-11F2-300 power plant used on the standard MiG-21PF. The first Soviet built MiG-21FLs arrived in June of 1964 and were assigned to No 28 Squadron. By December of 1971 some eight squadrons were equipped with the Fishbed D. During the 1971 India/Pakistan war IAF MiG-21FLs were reported to have scored kills against Pakistani F-104s, Shenyang F-6s (MiG-19s) and F-86 Sabres, as well as flying ground attack sorties with bombs and rocket pods.

The MiG-21FL was built at the Hindustani Aeronautics Ltd. plant (HAL) at Nasik, while the Tumanski power plant was manufactured under license at the Koraput engine plant. The first Indian built MiG-21FL was handed over to the Indian Air Force in November of 1966.

**This pair of early production East German Air Force MiG-21PF Fishbed Ds was armed with a thirty-two shot rocket pod on the underwing pylons. The early MiG-21PF had a narrow chord fin and rudder. The camouflage was Dark Green and Earth Brown over Light Gray undersurfaces. (Hans-Heiri Stapfer Collection)**



## MiG-21PFM Fishbed F

The MiG-21PFM was a direct improvement of the MiG-21PF, which differed externally mainly in the new canopy arrangement fitted to the MiG-21PFM. The forward opening single piece canopy was replaced by a fixed windscreen and a hinged main canopy that opened to starboard. The SK ejection seat was replaced by a more advanced zero-zero KM-1 ejection seat.

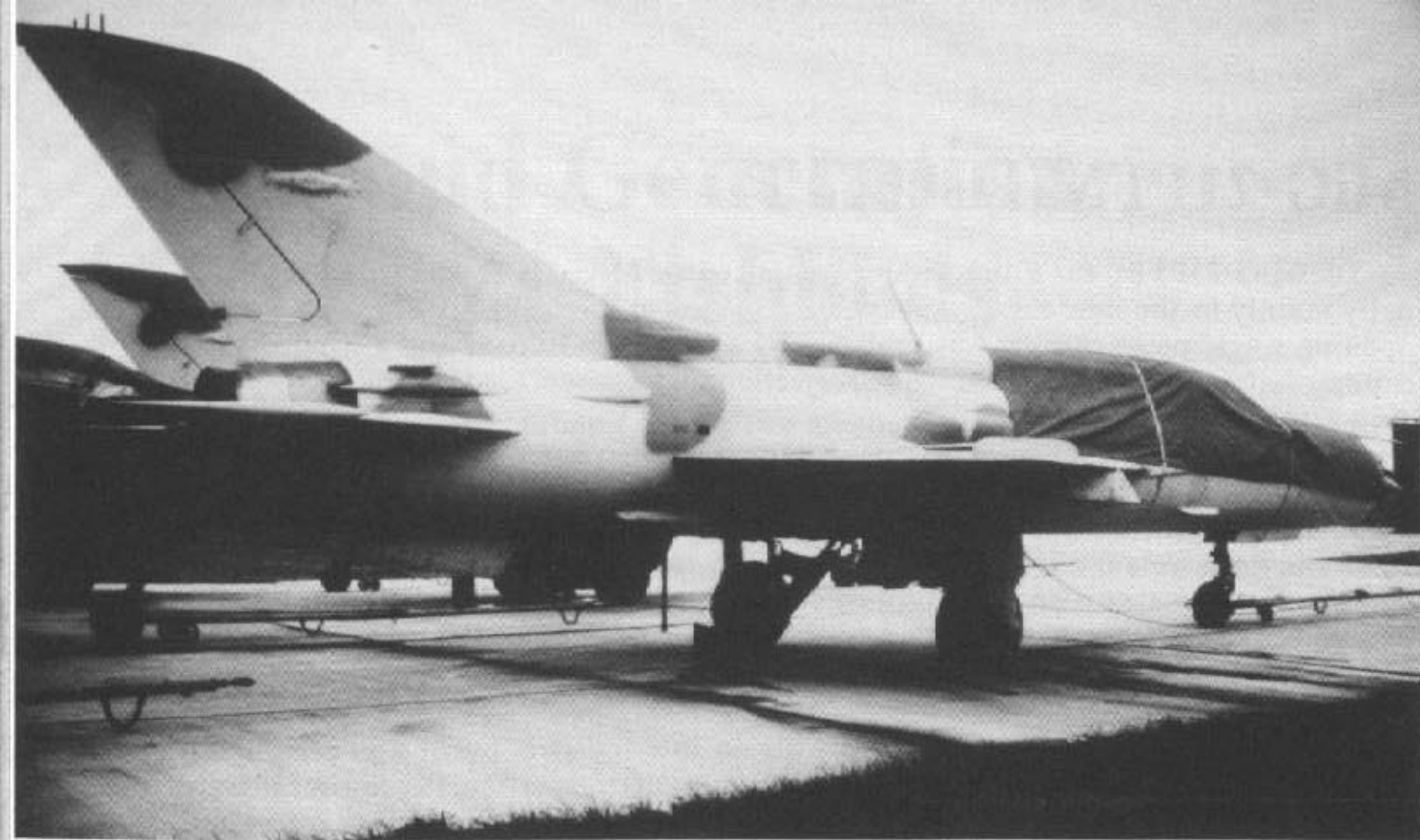
A further improvement was the introduction of blown flaps, which were also on late production MiG-21PF under the designation MiG-21PF(SPS) (also known as MiG-21PFS). Bleed air from the compressor section was ejected over the upper flap surface when the flaps were lowered which dramatically improved the Fishbed's takeoff and landing characteristics. The Tumanskij engine adopted from the MiG-21PF was modified in order to be used with the blown flap system and was designated R-11F2S-300. Aircraft with the blown flap system could be identified by the large flap actuator fairing on the wing undersurface.

The MiG-21PFM was not equipped with an internal gun, but it was possible to mount a 290 kg (639 pound) GP-9 gun pod on the fuselage centerline. These aircraft were referred to as MiG-21PFM-Ks. The GP-9 gun pod replaced the centerline pylon and contained a twin barrelled GSh-23L 23MM cannon with 200 rounds of ammunition. When the GP-9 pod was fitted, an optical ASP-PF-21 gunsight was also fitted which could also be used for aiming UB-16-57U rocket pods or for dropping bombs. The GP-9 modification was also made available for the MiG-21FLs being built in India. Modification kits were shipped to India where they were installed at Indian Air Force repair depots.

Originally the MiG-21PFM did not carry a rearview mirror on top of the canopy but a few examples were subsequently modified with a rearview mirror. All MiG-21PFMs of the Mongolian Air Force were modified with this rearview mirror and most of them were

**Early production Fishbed Ds of the Polish Air Force line the ramp of a Polish fighter base. The exhausts of the aircraft have been covered by Red protective covers to keep debris out of the engines and have small gust locks installed at the base of the rudder to keep it from swinging. (Hans-Heiri Stapfer Collection)**





This former Iraqi Air Force MiG-21PF was being overhauled at Dresden, East Germany when Germany was reunited. During the cold war years a number of various Fishbeds from Middle East and African customers were overhauled at Dresden. This aircraft was impounded by the German government when the UN sanctions against Iraq were put in place. (Air Forces Monthly via David Oliver)

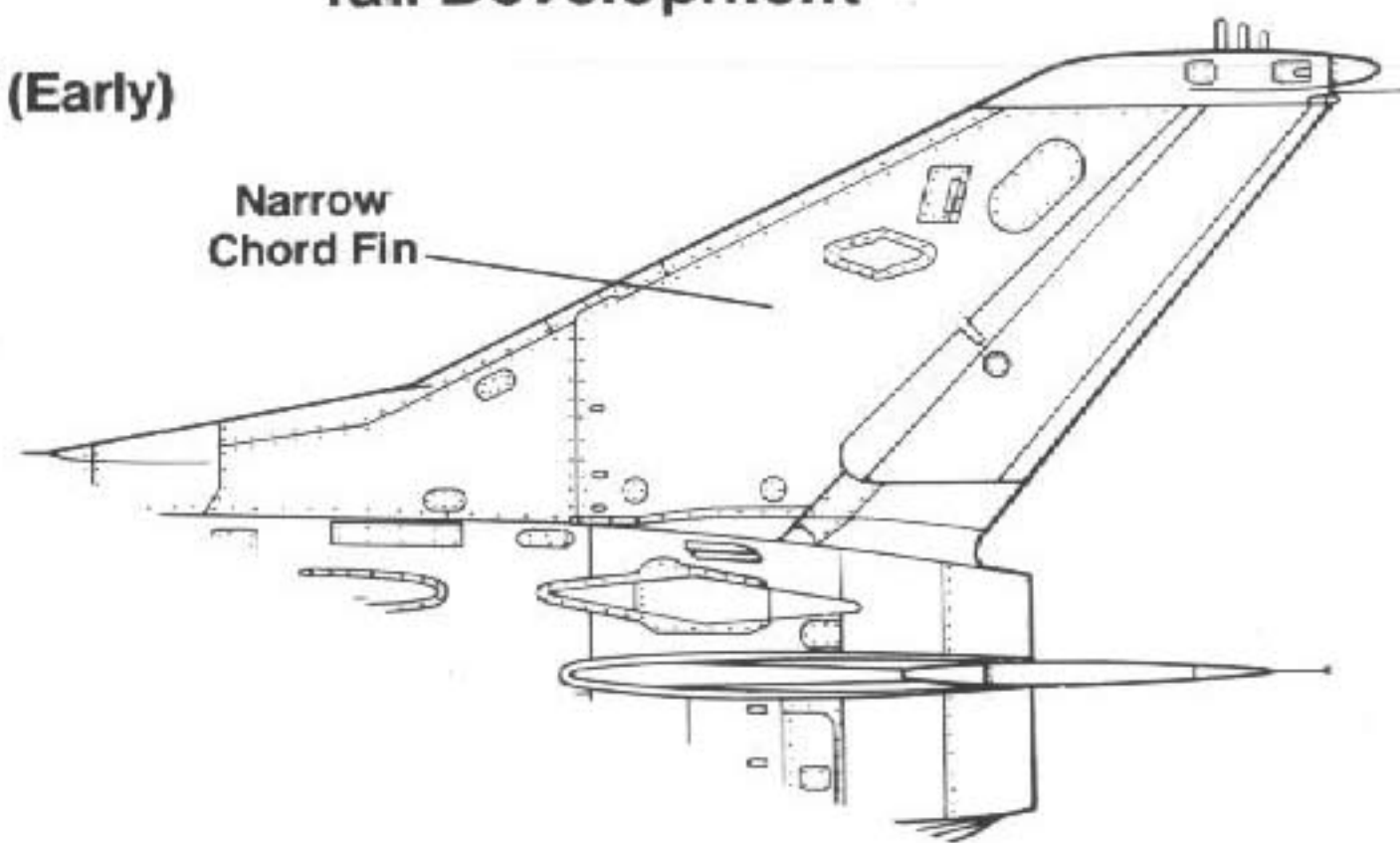
Polish Air Force MiG-21PF/PFM Fishbed Ds being stripped of usable parts before being scrapped. The lead MiG-21 is a PFM variant and carries the unit marking of the 1st Fighter Regiment Warszawa based at Minsk-Mazowiecki (the crest is that of the city of Warsaw). (via Rene van Woezik)



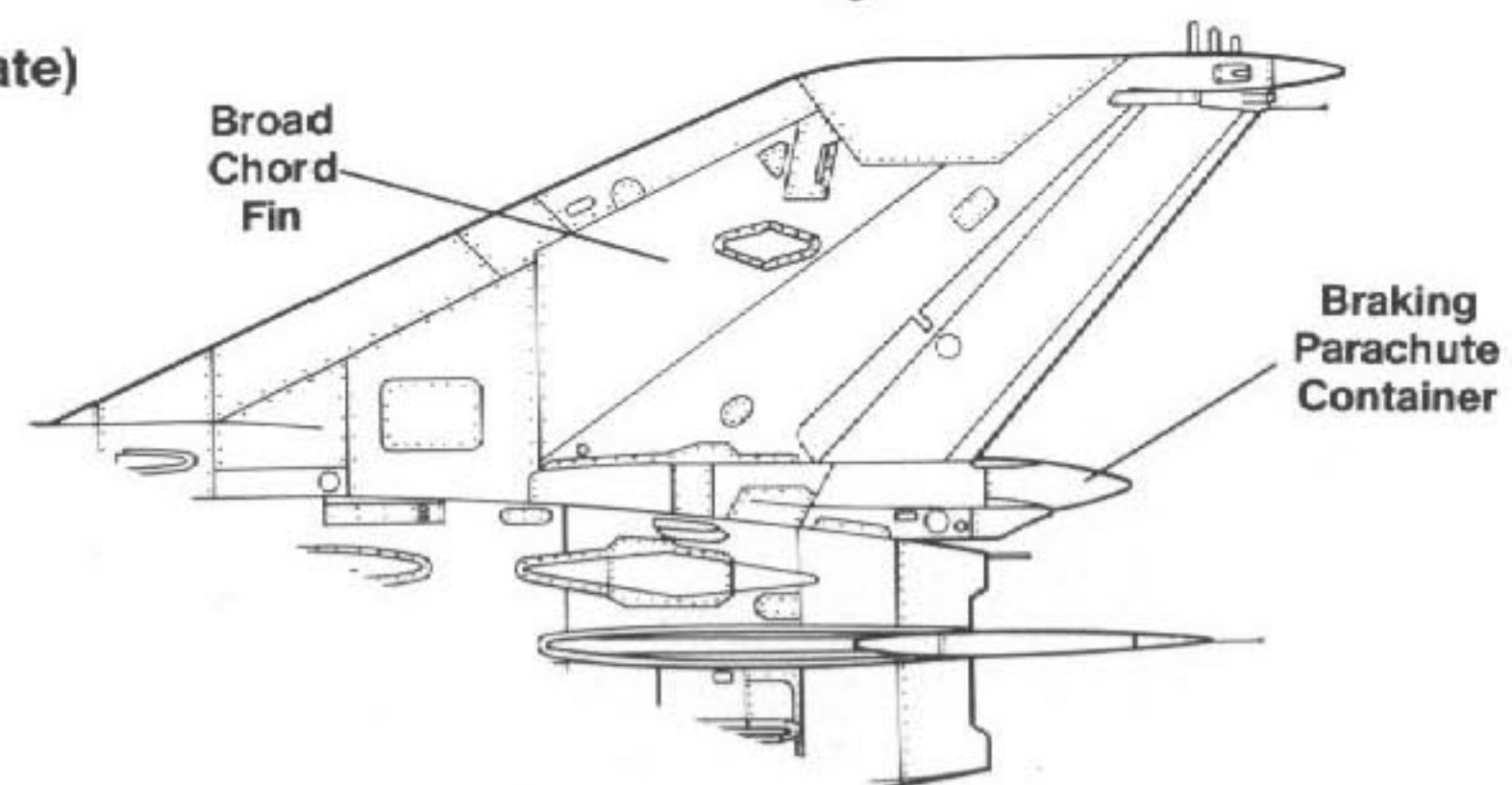
Red 22 was a late production Soviet Air Force MiG-21PF Fishbed D. The Fishbed D had an enlarged spine, larger main wheel doors and a larger main wheel fairing on the fuselage side. (Hans-Heiri Stapfer Collection)

### Tail Development

MiG-21PF (Early)



MiG-21PF (Late)



outfitted with a GP-9 gun pod.

The MiG-21PFM was built between 1964 and 1965 at Zavod 21 for the Soviet Air Force before the production facilities were transferred to Moscow where all the export Fishbed Ds were built (1966 to 1968).

## Ye-8(MiG-23)

During 1961 a project for a completely redesigned dedicated interceptor variant of the MiG-21 was started under the designation Ye-8. The basis for this new project was a heavily modified MiG-21PF airframe with the air intake moved to a position under the cockpit to make room for the RP-21 radar antenna.

There were two prototypes, the Ye-8/1 and Ye-8/2; both aircraft received the public designation MiG-23. The Ye-8 had blown flaps, canards and was powered by an improved R-11F power plant with the designation R-21F. The first prototype made its maiden flight on 17 April 1962 with G. K. Mossolov at the controls. Due to engine problems, the aircraft had to be abandoned during a test flight on 11 September 1962 and G.K. Mossolov was seriously injured when he ejected.

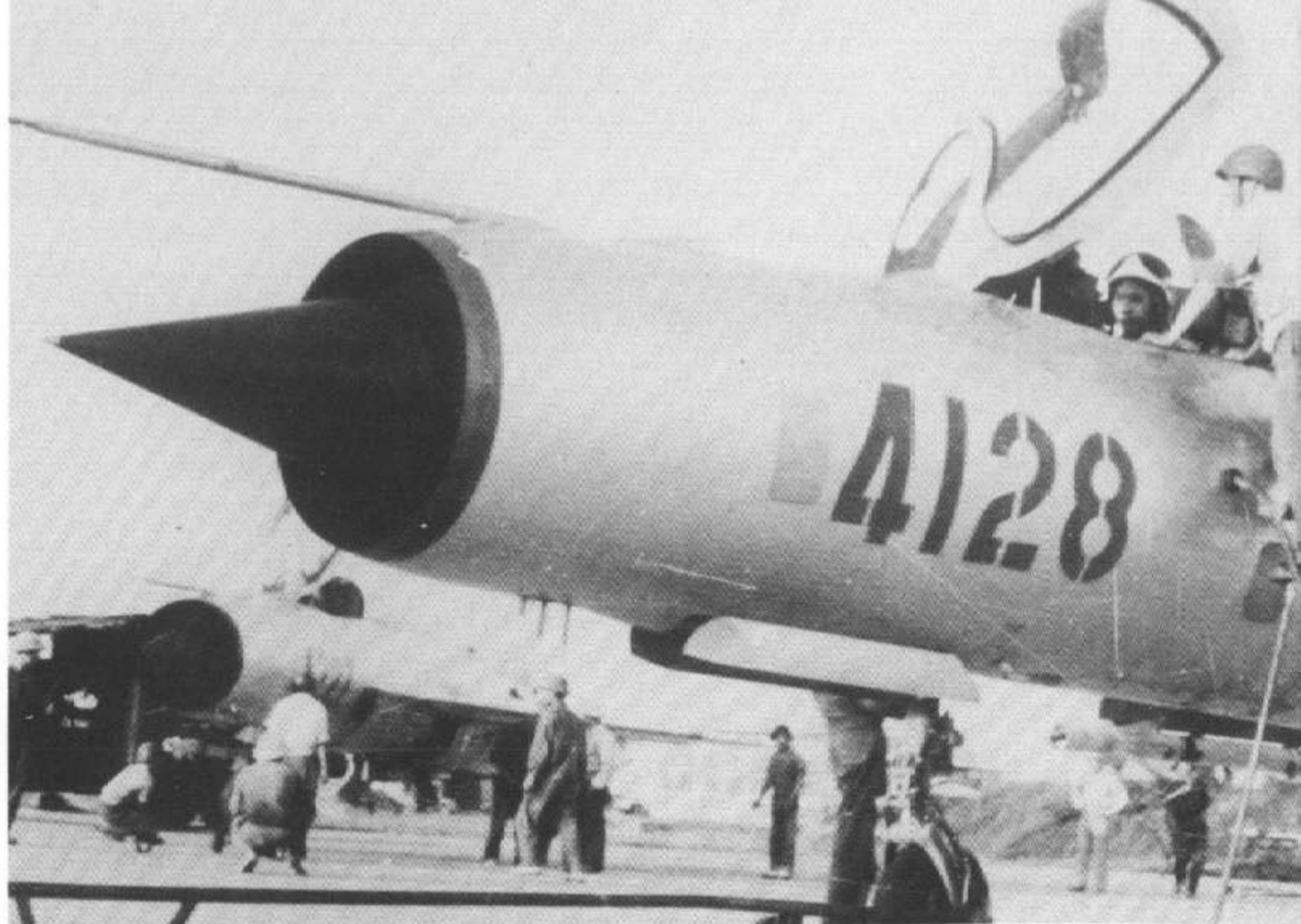
The second prototype first flew on 29 July 1962 and at least thirteen flights were recorded. The crash of the Ye-8/1 grounded the second prototype for investigation of the engine problem. Finally it was decided to abandon any work on the Ye-8 and the project was quietly phased out and the designation MiG-23 was retained for later use.

## MiG-21PD Fishbed G

The MiG-21PD was an experimental aircraft with STOL capacities given the MiG-OKB designation Ye-7PD.

The aircraft was a standard MiG-21PFM modified with two Kolyesov RD-36-55 lift engines in the rear fuselage bay. To house the lift engines, the fuselage was lengthened by 900MM (35.34 inches). The two RD-36-55 engines were used only during takeoff and

**North Vietnamese pilots underwent flight training in the Soviet Union in the MiG-21PF under the watchful eye of Soviet instructors. The lettering on the fuselage side, *Тренажер*, means trainer. (Hans-Heiri Stapfer Collection)**



**A ground crewman assists the pilot of this North Vietnamese MiG-21PFV strap in for his next mission. The MiG-21PFV was a special tropical version for the hot and humid climatic conditions in Southeast Asia and had the RP-2 air intercept radar replaced by a less powerful R-2L AI radar. (Hans-Heiri Stapfer Collection)**

landing and a large door on top the fuselage opened whenever the RD-36-55 were operated to supply additional air to the engines.

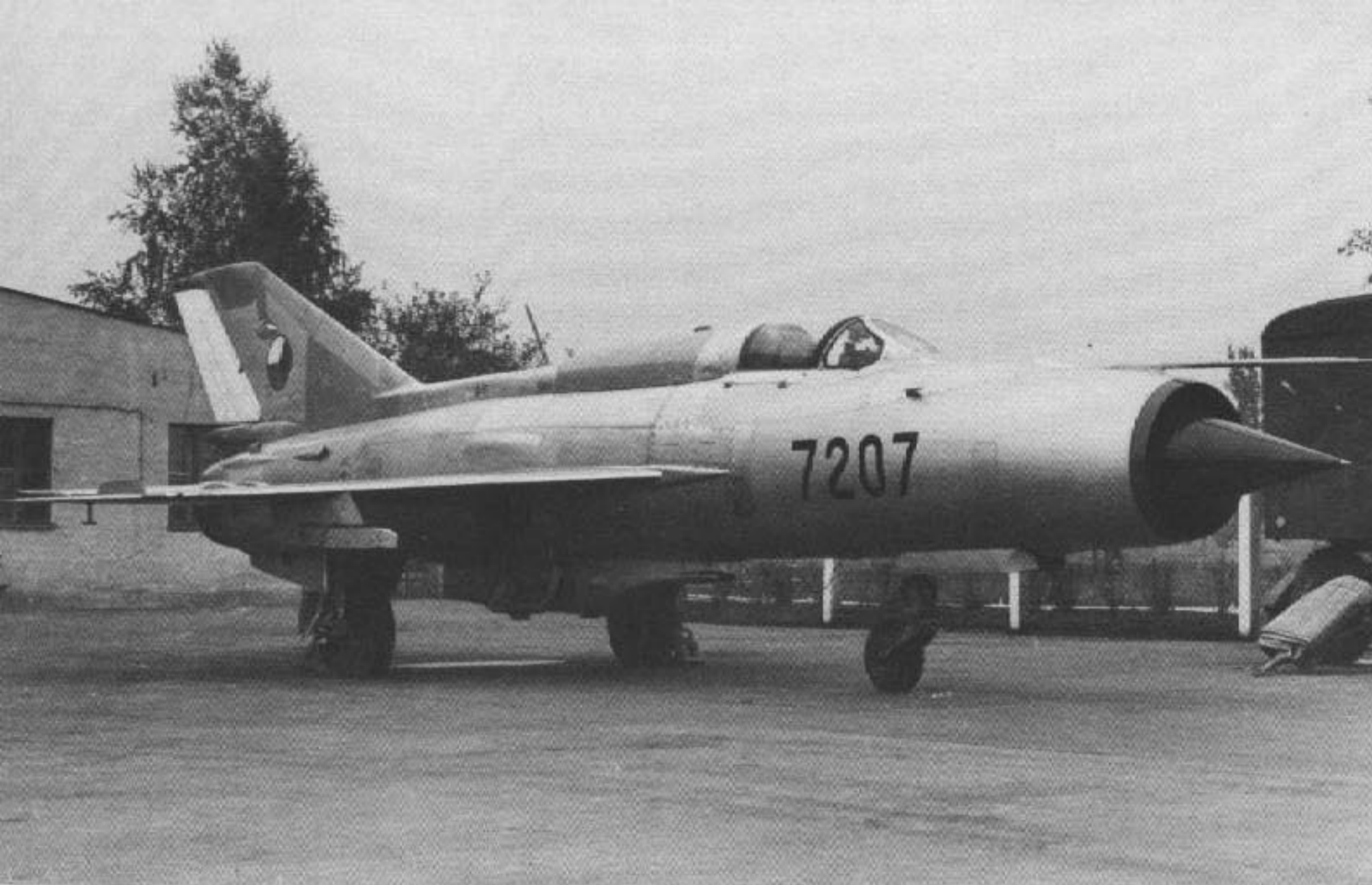
The first flight of the MiG-21PD was made on 16 June 1966 with P.M. Ostapyenko at the controls. Flight trials lasted until late 1967. MiG OKB officials finally decided that the extra weight of the engines led to an inferior performance compared to standard MiG-21s and the entire project was cancelled.

The MiG-21PD was shown to the public during the air display at Domodedovo Air Base near Moscow during the Summer of 1967. Afterwards NATO officials gave the MiG-21PD the reporting name Fishbed G.

**White 01, a late production MiG-21PF Fishbed D on display in Moscow, is armed with a UB-32A thirty-two shot rocket pod on the wing pylons and a GP-9 GSh-23L 23MM gun pod on the fuselage centerline. (James Staley)**







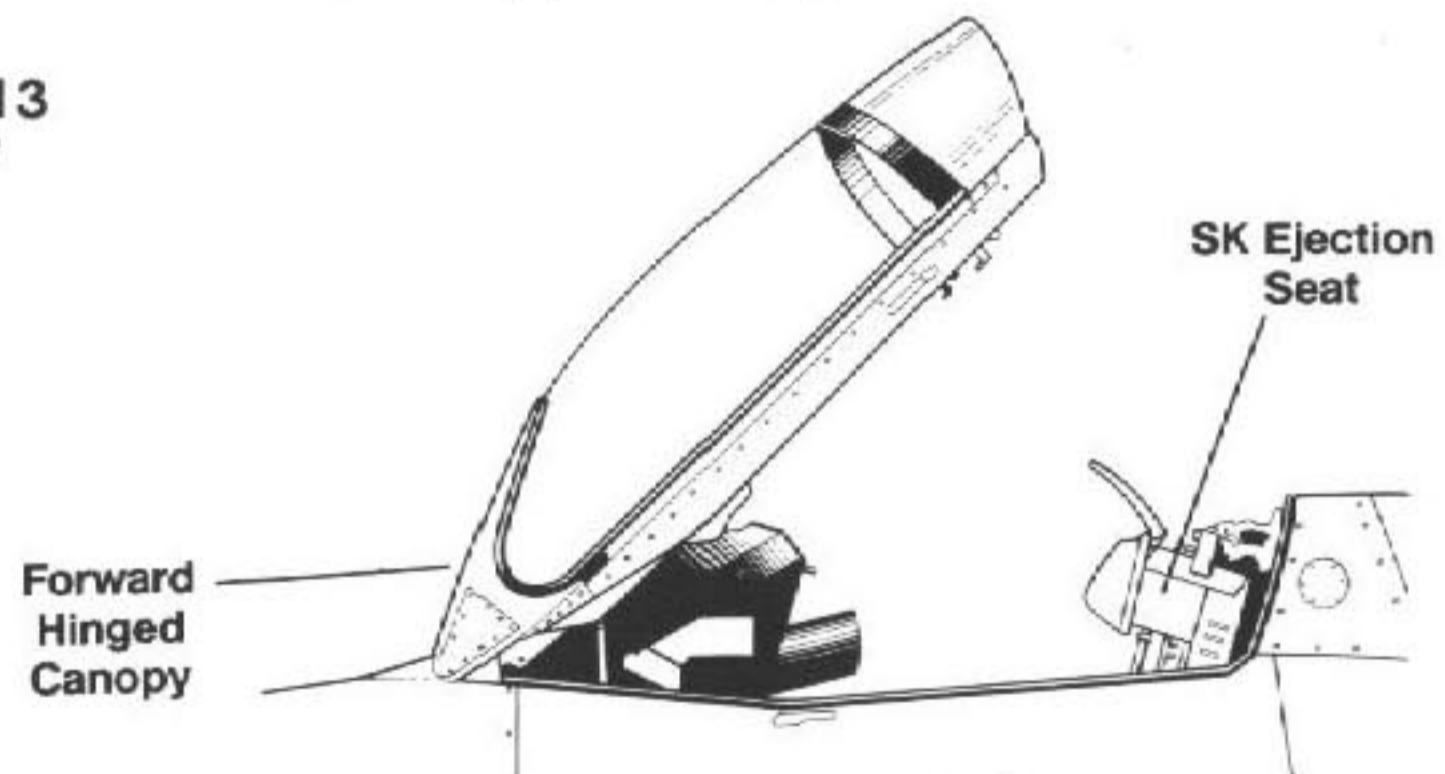
The side hinged canopy is one of the identification features of the MiG-21PFM Fishbed F. This Czech Air Force Fishbed F is carrying a GP-9 gun pod on the centerline, an option rarely seen on Warsaw Pact Fishbeds. (Don Spring/AIR)



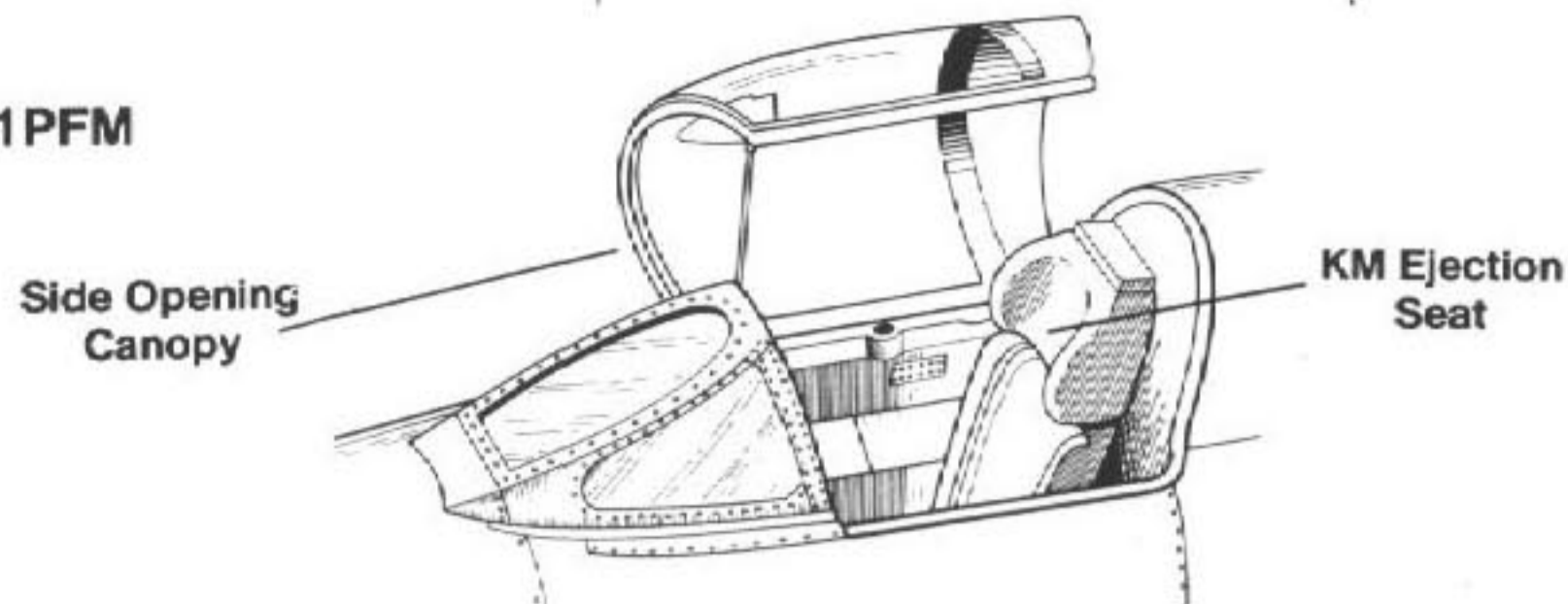
Romanian Air Force MiG-21PFMs carried the national markings on the fuselage, fin and wing undersurface, but not on the upper wing surfaces. Romanian pilots were known to have high training standards and are usually better trained than the average Warsaw Pact Fishbed pilot. (Hans-Heiri Stapfer Collection)

### Canopy Development

MiG-21F-13  
MiG-21PF



MiG-21PFM



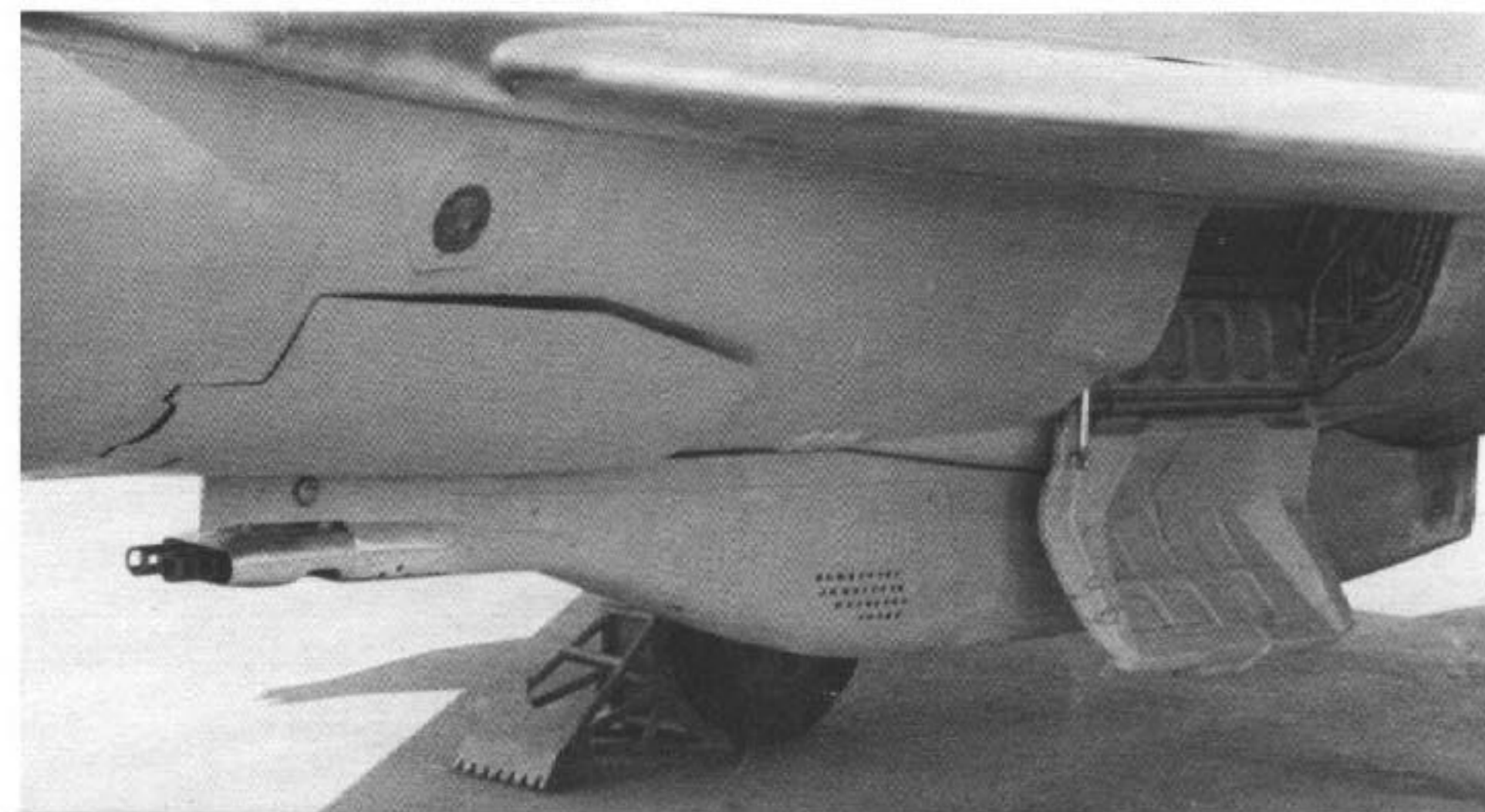
The wide chord fin was incorporated to improve stability and the under fin location of the braking parachute helped keep the aircraft on the runway centerline when landing. (Don Spring/AIR)





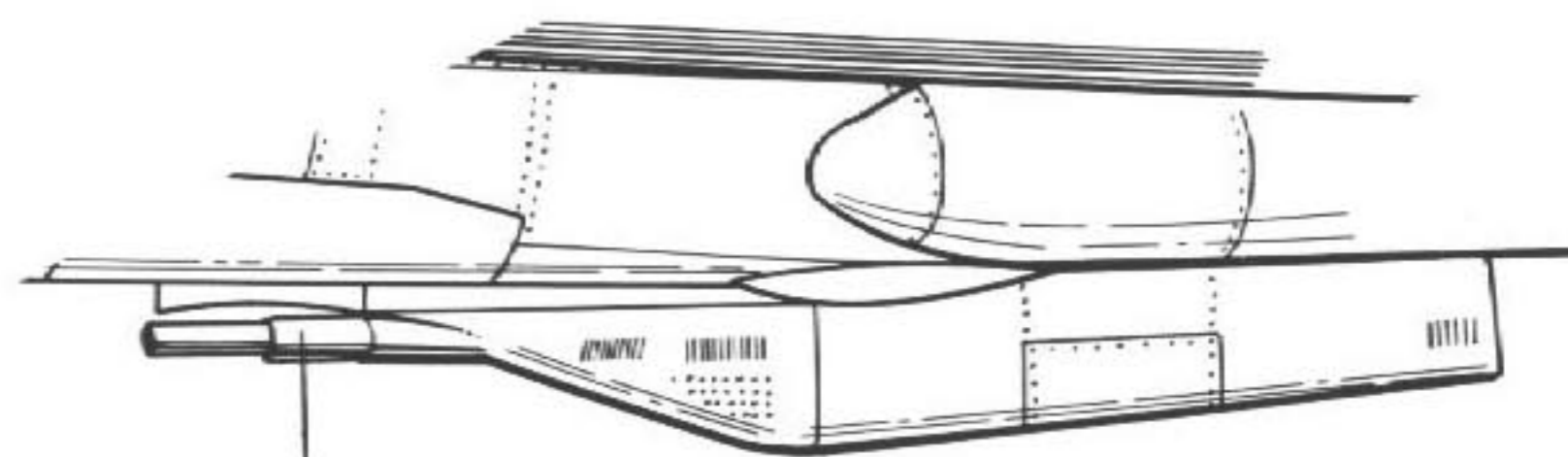
The increased diameter of the air intake is another feature that sets the MiG-21PF/PFM apart from the earlier Fishbed C. The center shock cone also housed the radar antenna for the RP-21 Sapphire air intercept radar. (Don Sperring/AIR)

The GP-9 cannon pod on the centerline of this MiG-21PFM Fishbed F houses a twin barreled GSh-23L 23MM cannon and some 200 rounds of ammunition. The pod weighs some 639 pounds fully loaded. (James Staley)



## GP-9 Gun Pod

MiG-21PF/PFM/FL



Twin Barreled GSh-23L  
23MM Cannon

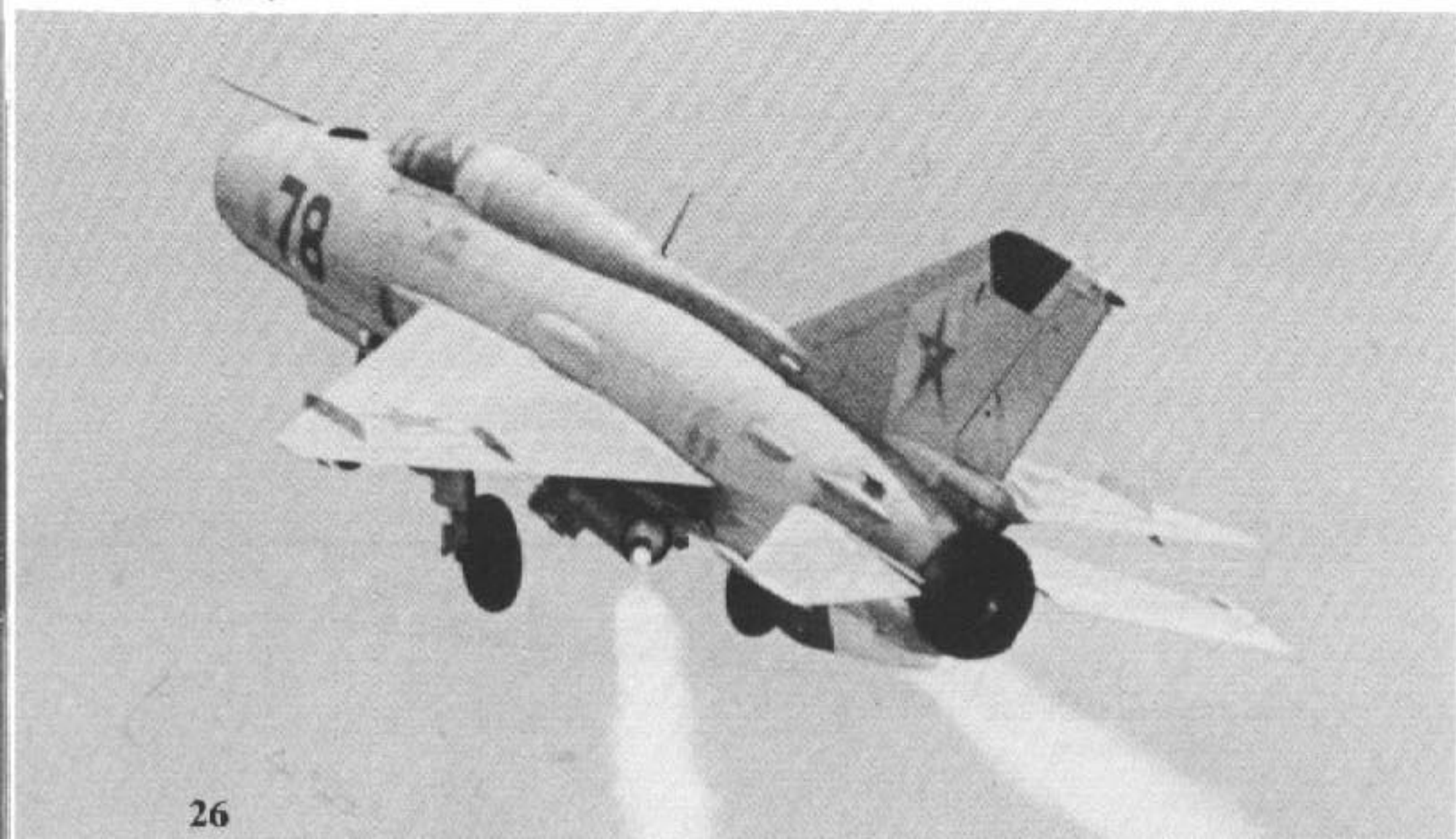


The MiG-21PFM was the first of the Fishbed series to incorporate a side opening canopy. The ejection seat used on the PFM was the KM-1 zero-zero ejection seat. The aircraft in the background are a MiG-21F-13 Fishbed C and a MiG-15 Fagot (left). (Don Spring/AIR)

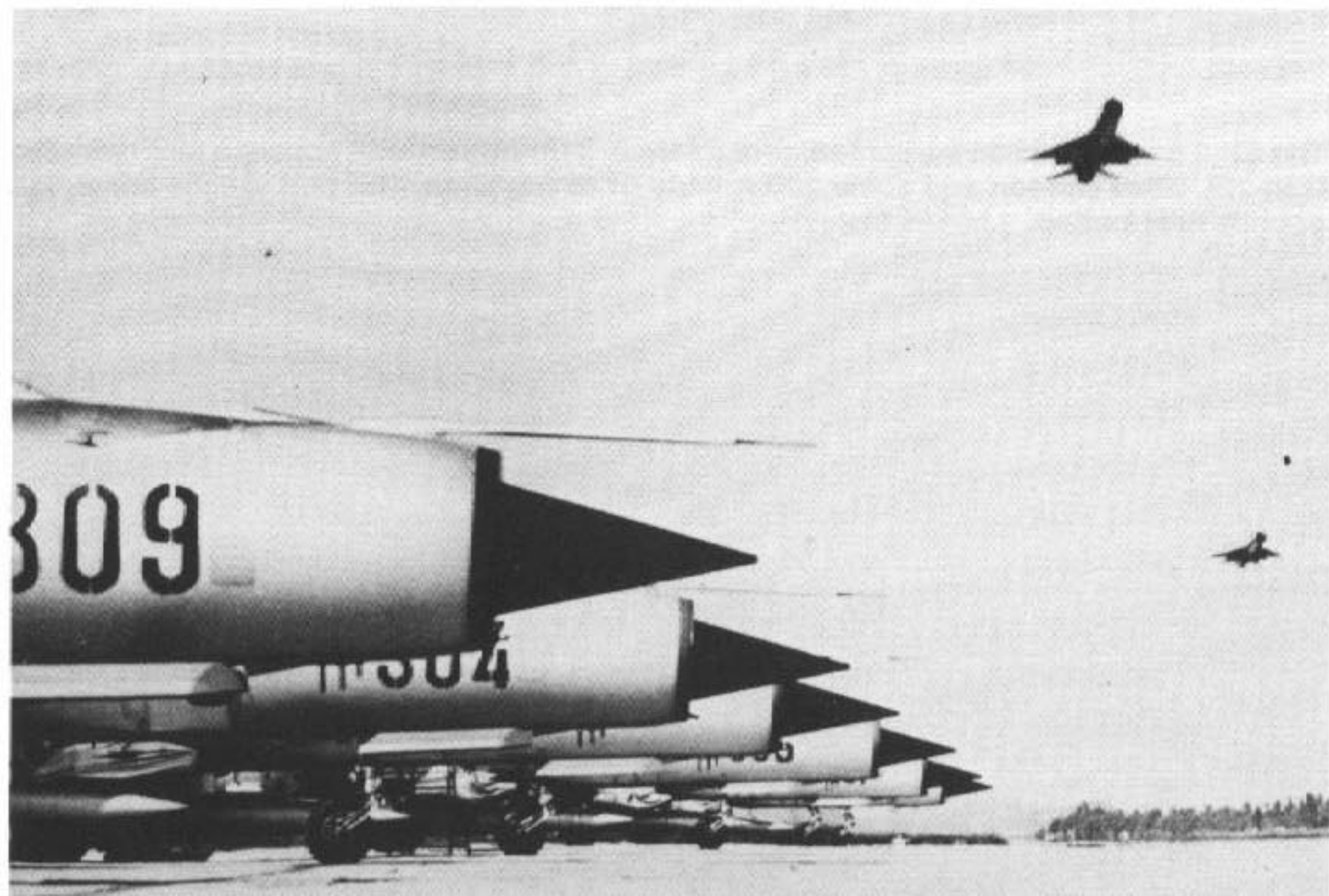


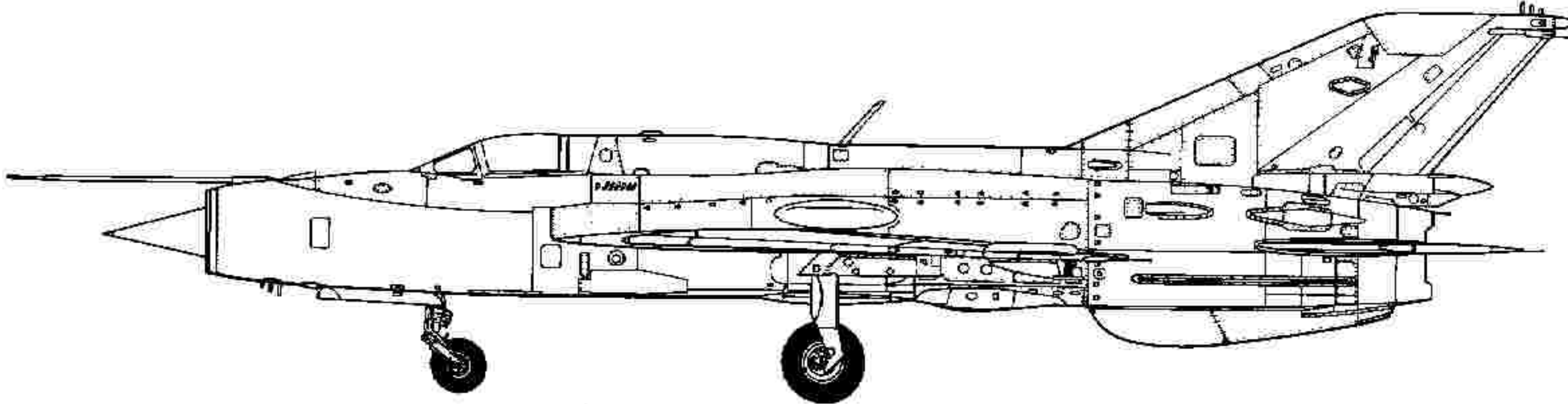
This MiG-21PFM, Red 002, of the Mongolian Air Force has been retrofitted with a rearview mirror on the upper canopy framing. Additionally, a number of Mongolian Fishbed Fs also carry the GP-9 gun pod as standard equipment. (Hans-Heiri Stapfer Collection)

Red 78, a Soviet Air Force MiG-21PFM Fishbed F, takes off from Domodedovo Air Base using a pair of SPRD-99 Rocket Assist Take Off units (RATO) during the Summer of 1967. (Norm Taylor)



North Korean Air Force MiG-21PFMs line the ramp of a North Korean air base. The tactical numbers on these overall Natural Metal aircraft are in Red. Very little is known about North Korean Fishbed operations. (Hans-Heiri Stapfer Collection)





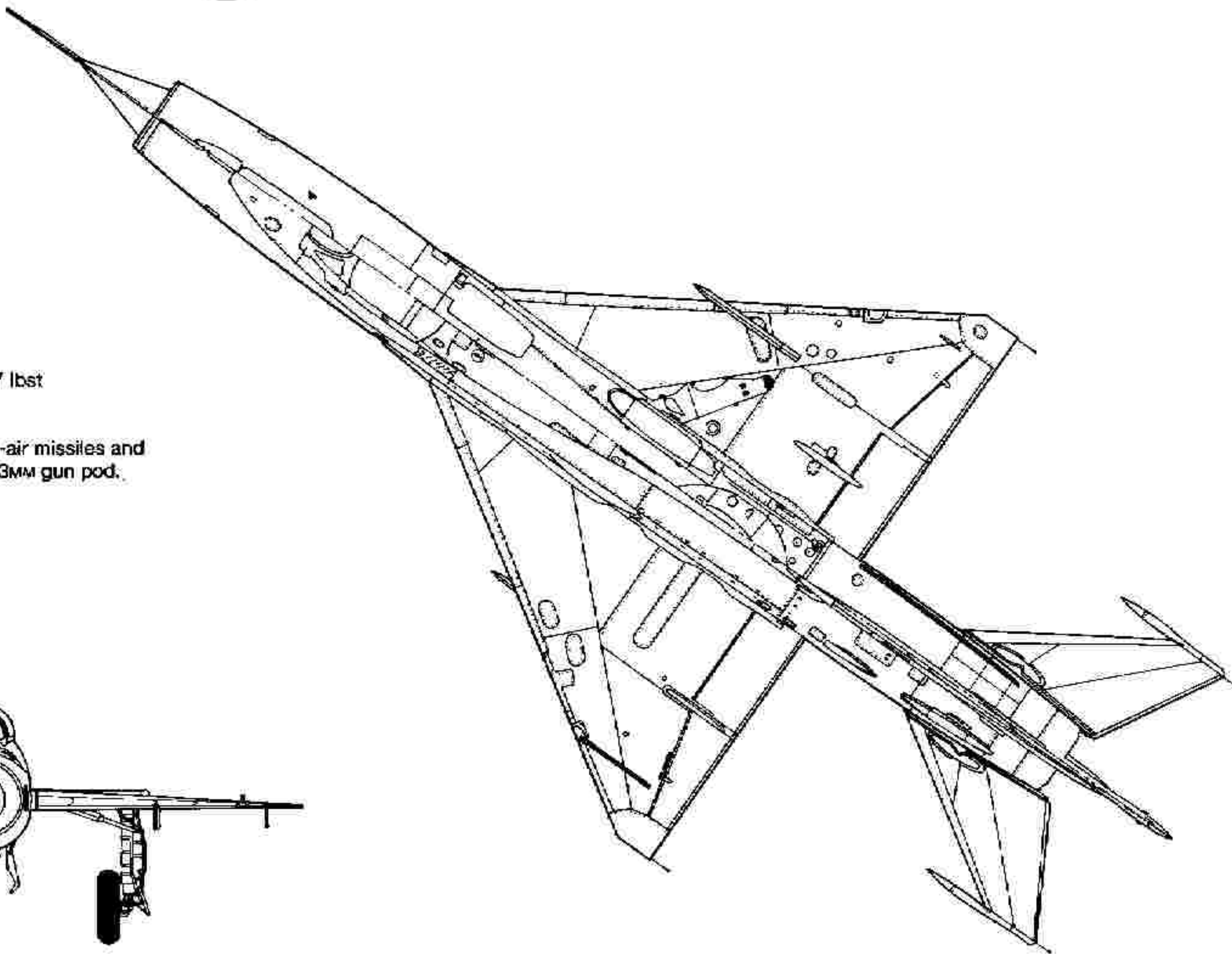
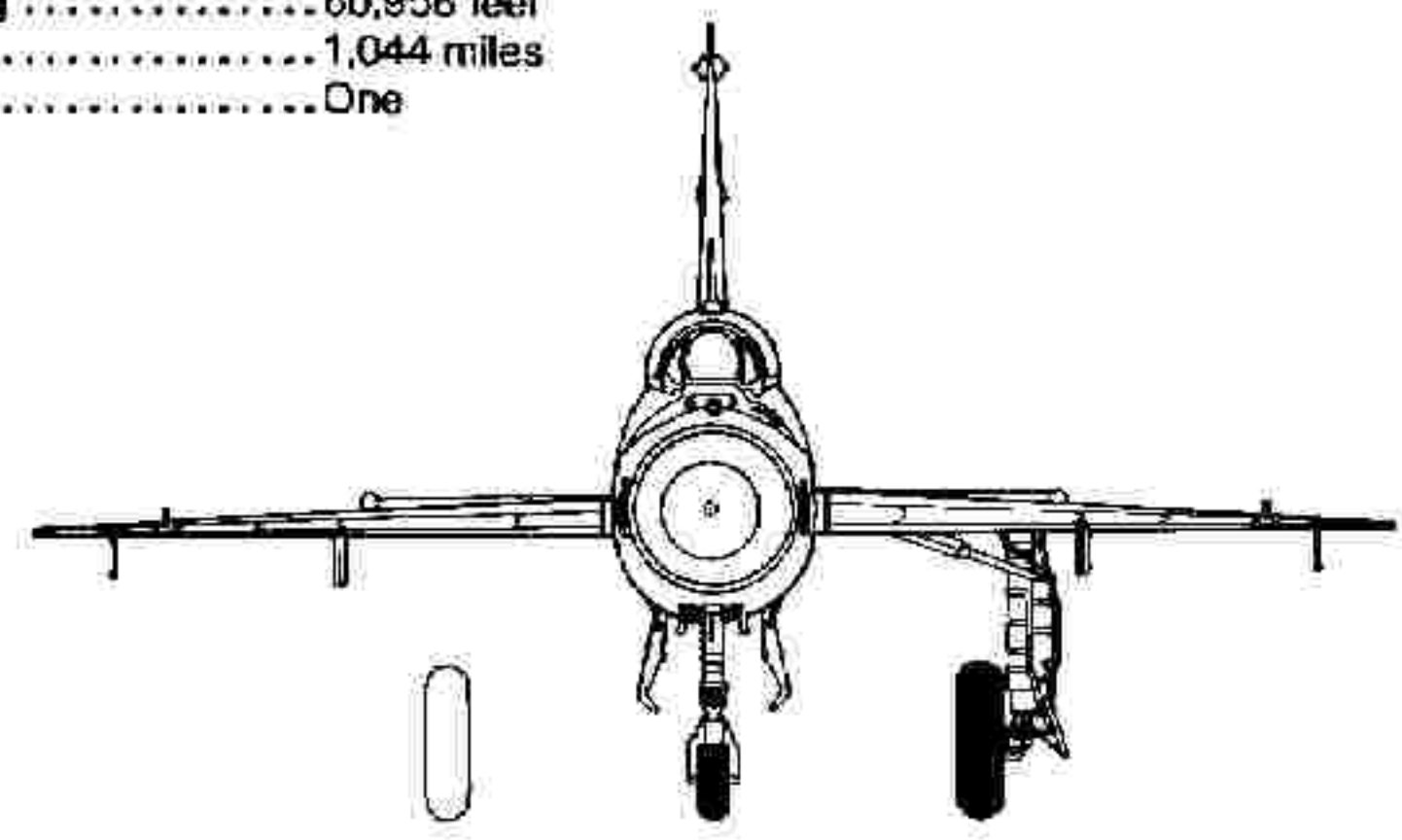
## Specifications

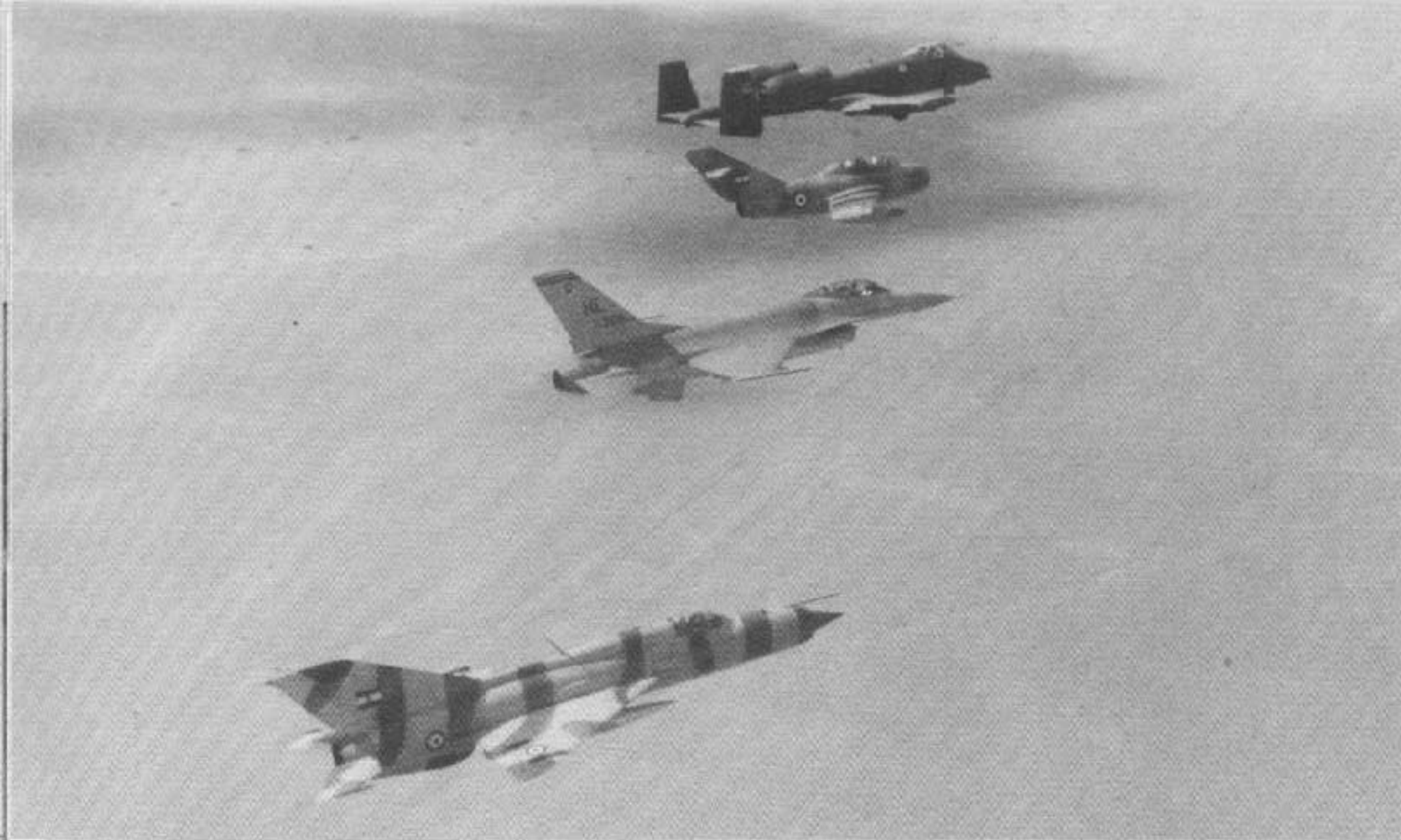
### MiG-21 PFM Fishbed F

**Wingspan** ..... 23 feet  
**Length** ..... 47 feet 6 inches  
**Height** ..... 13 feet 2 inches  
**Empty Weight** ..... 11,420 pounds  
**Maximum Weight** ..... 17,086 pounds  
**Powerplant** ..... One Tumansky 13,117 lbst  
 R-11F2-300 turbojet

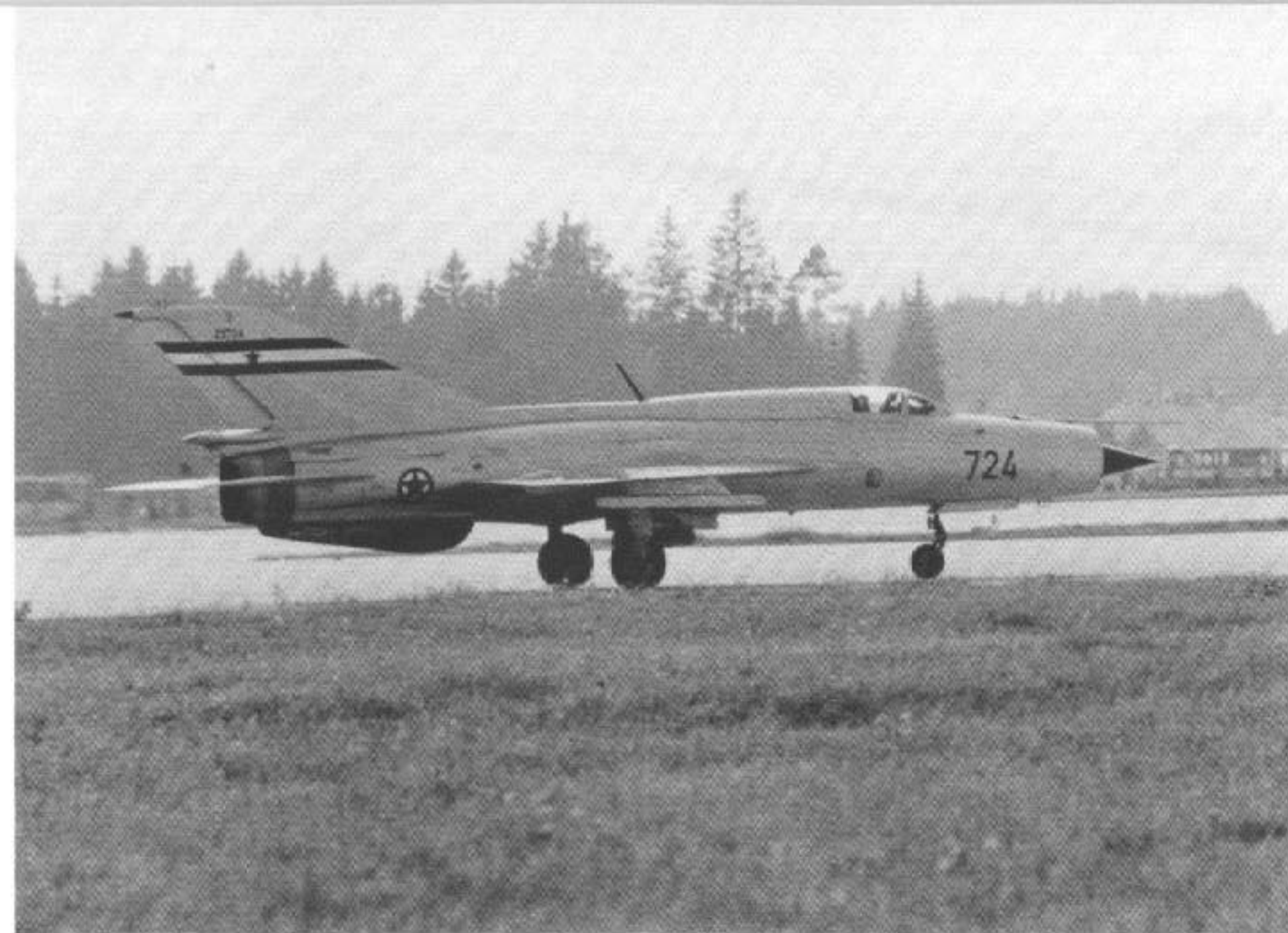
**Armament** ..... Two K-13 (AA-2) air-to-air missiles and  
 provision for a GP-9 23mm gun pod.

**Performance**  
**Maximum Speed** ..... 1,352 mph  
**Service ceiling** ..... 60,958 feet  
**Range** ..... 1,044 miles  
**Crew** ..... One



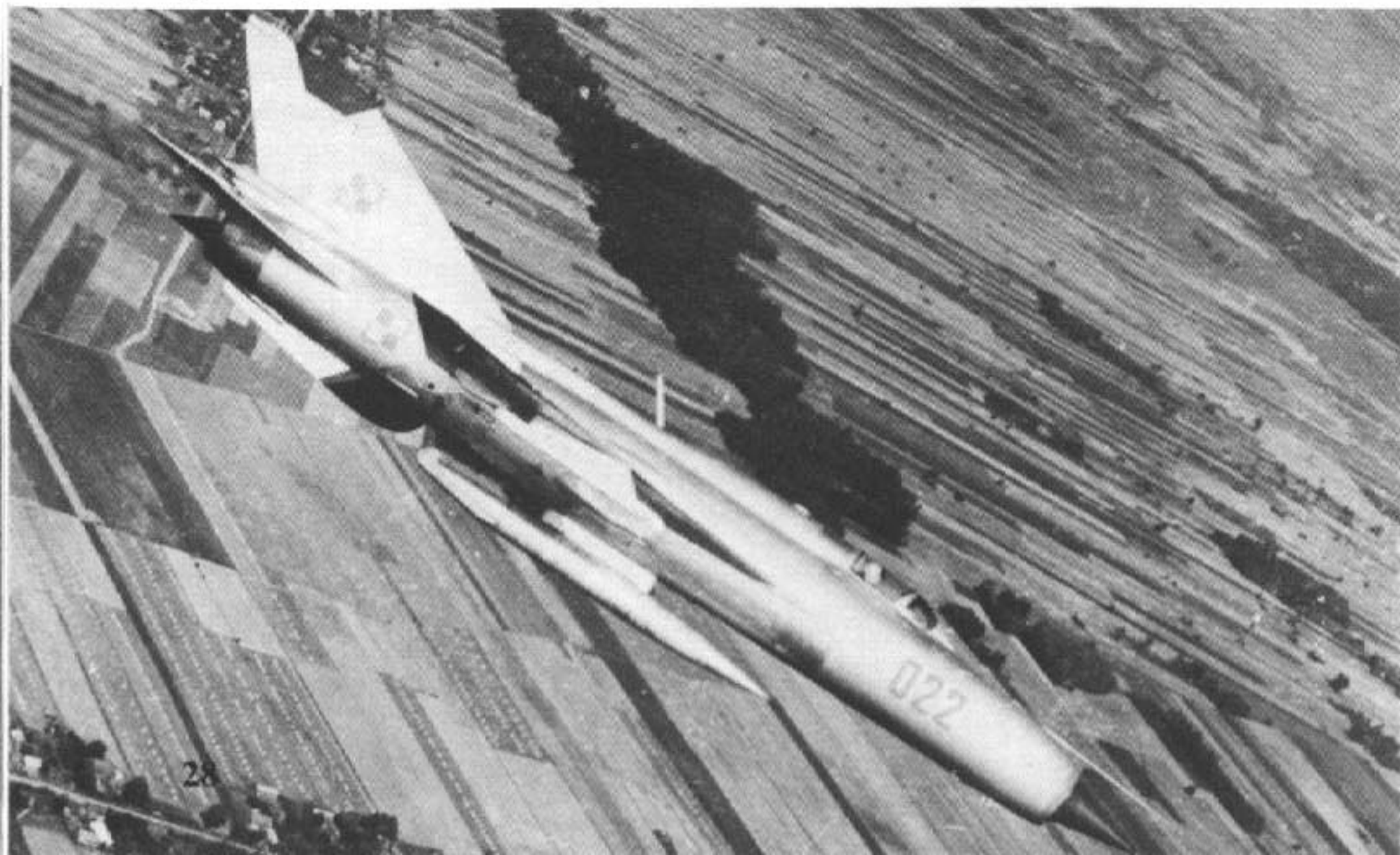


A mixed formation of the Egyptian Air Force and USAF fly over the desert during Exercise Bright Star 81. The leader is a USAF A-10A followed by an EAF MiG-15UTI Midget trainer, then a USAF F-16A and finally an EAF MiG-21PFM Fishbed F. (USAF)



This Yugoslav Air Force MiG-21PFM Fishbed F carries an overall Light Gray air superiority camouflage that was first applied to MiG-21s during the early to mid-1970s. (Don Spering/AIR)

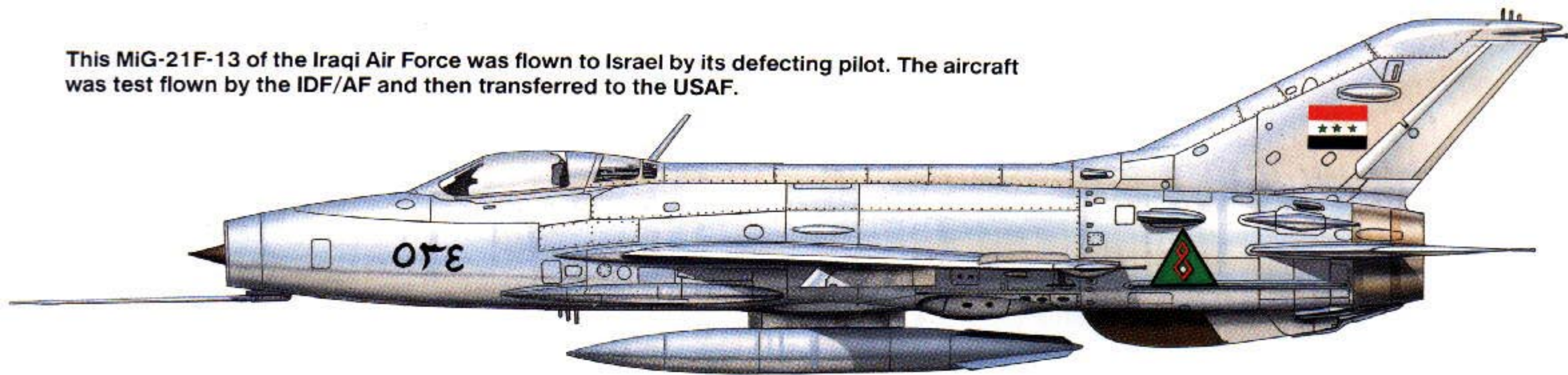
This Polish Air Force MiG-21PFM, Red 022, is configured with a centerline fuel tank. Most Polish Fishbed Fs carry four digit tactical numbers. Poland is the largest Warsaw Pact MiG-21 operator (outside the Soviet Union). (Hans-Heiri Stapfer Collection)



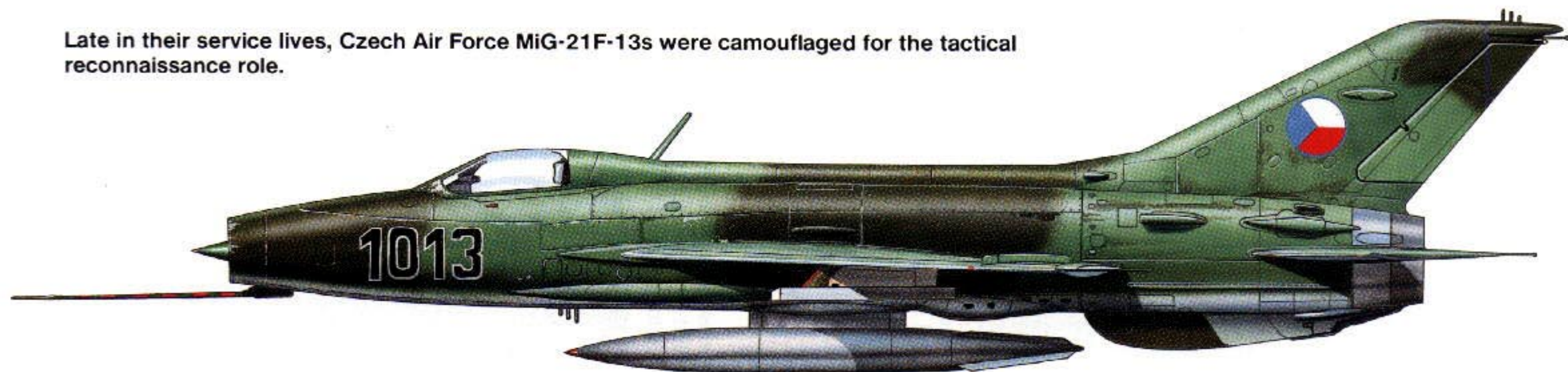
This Polish Air Force MiG-21PFM, Red 4107, parked and chocked on its hardstand at a Polish Air Force base, has the canopy covered with a tarp. The aircraft in the background is another MiG-21PFM, Red 6915. (Hans-Heiri Stapfer Collection)



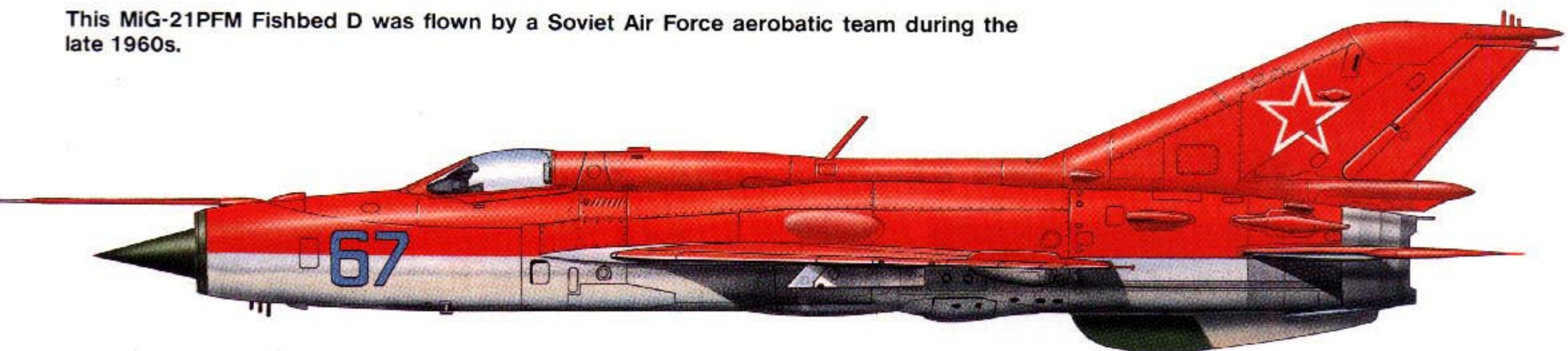
This MiG-21F-13 of the Iraqi Air Force was flown to Israel by its defecting pilot. The aircraft was test flown by the IDF/AF and then transferred to the USAF.



Late in their service lives, Czech Air Force MiG-21F-13s were camouflaged for the tactical reconnaissance role.



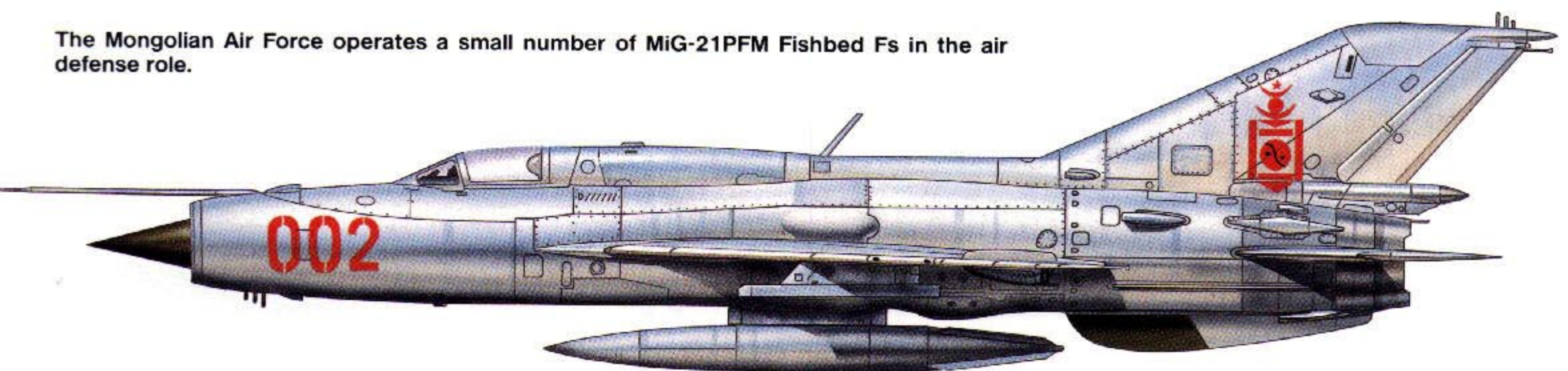
This MiG-21PFM Fishbed D was flown by a Soviet Air Force aerobatic team during the late 1960s.



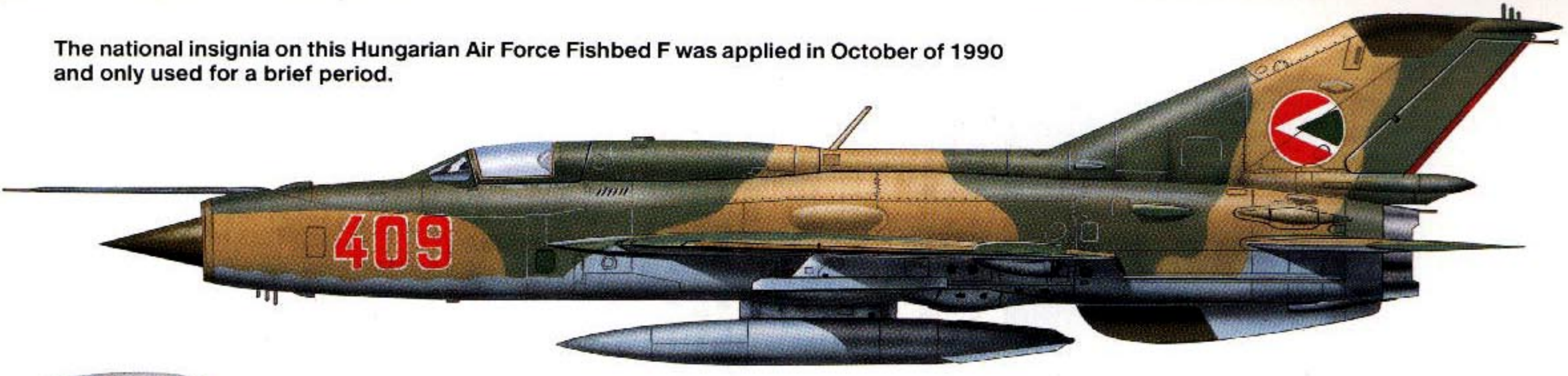
When Germany was reunited, this MiG-21PFM Fishbed F was repainted in special markings for its last flight. The West German insignia was carried for only a short period.



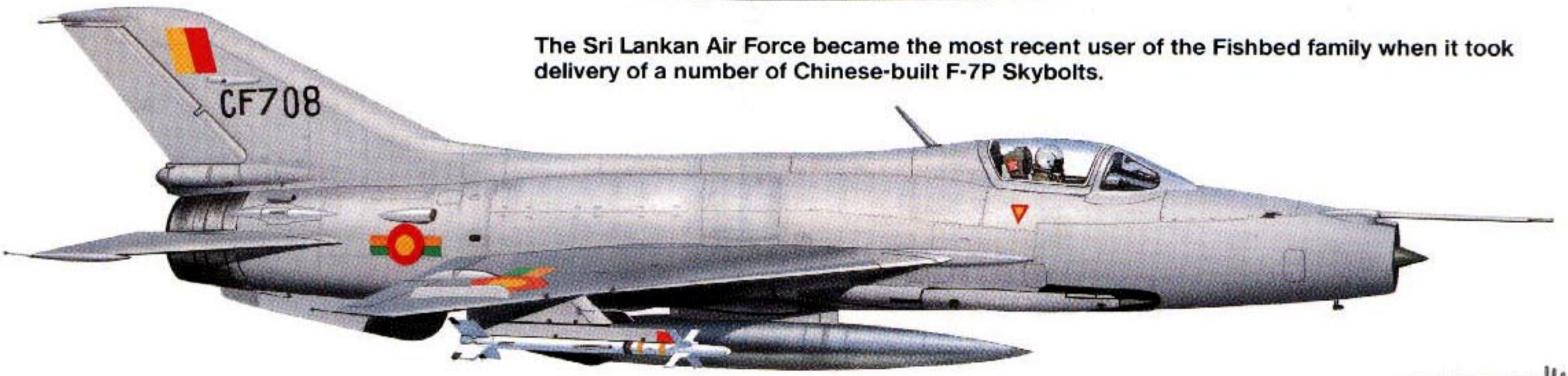
The Mongolian Air Force operates a small number of MiG-21PFM Fishbed Fs in the air defense role.



The national insignia on this Hungarian Air Force Fishbed F was applied in October of 1990 and only used for a brief period.



The Sri Lankan Air Force became the most recent user of the Fishbed family when it took delivery of a number of Chinese-built F-7P Skybolts.



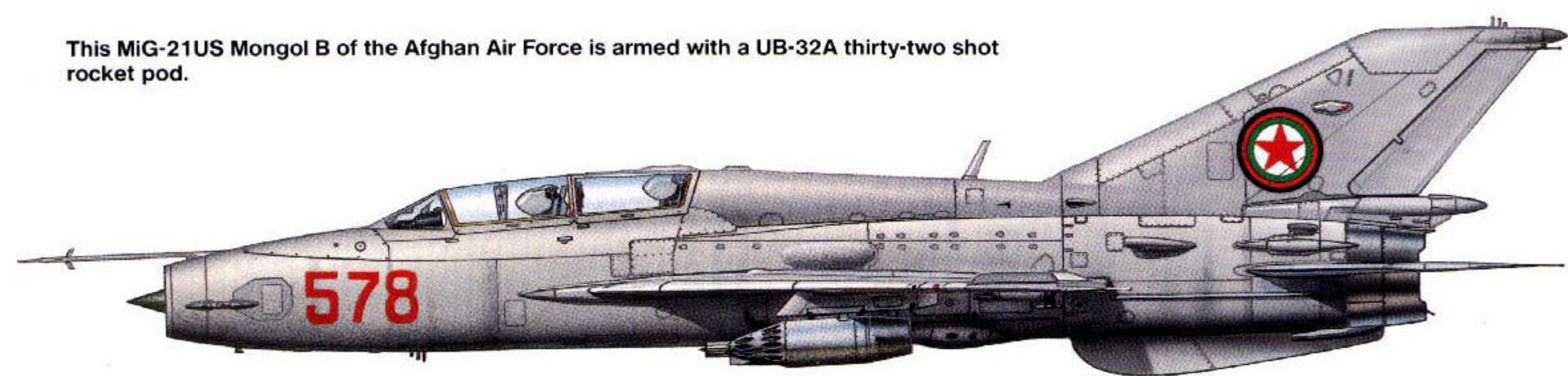
This MiG-21bis Fishbed L of the Republic of Yugoslav Air Force carries the new Yugoslav insignia adopted in late 1992.



White 17 is a Soviet Air Force MiG-21bis Fishbed L of an unidentified Guards fighter regiment.



This MiG-21US Mongol B of the Afghan Air Force is armed with a UB-32A thirty-two shot rocket pod.





This ex-East German Air Force MiG-21PFM, Red 829, is being disassembled for subsequent scrapping. Germany has scrapped over 136 MiG-21s since the country was reunited. The aircraft in the background is an Su-22M-4 Fitter K. (Marcus Fülber)



Only the ex-East German Air Force aircraft intended for flight testing received full *Bundesluftwaffe* markings while retaining its original camouflage. This East German modified PFM has a spray/debris guard panel on the fuselage. (Marcus Fülber)

The Ye-8/2 prototype carried the tactical number Red 82 on the nose. The aircraft was developed from the MiG-21PF with a solid radar nose and the air intake moved under the fuselage. The Ye-8/2 flew for the first time on 29 June 1962 and made thirteen test flights before the crash of the first prototype Ye-8/1, Red 81, grounded the aircraft. (Hans-Heiri Stapfer Collection)



The MiG-21DP was a converted MiG-21PFM with two RD-36-55 lift engines in the fuselage. The STOL version of the Fishbed was demonstrated in the Summer 1967 at the Domodedovo Air Display and it was given the NATO reporting name Fishbed G. (Hans-Heiri Stapfer Collection)





# Third Generation MiG-21 Fishbeds

Third generation MiG-21s were developed to give the Fishbed a further increase in both range and weapons load. This was due in large part to criticisms leveled at earlier generation Fishbeds flown in combat in both Vietnam and in the Arab/Israeli wars. The third generation Fishbed doubled the fighter's firepower through incorporation of a semi-internal cannon and additional underwing missile pylons. The improvements came with a cost and the third generation Fishbed lost some of the agility and nimble flight characteristics of the MiG-21F-13 Fishbed C.

## MiG-21R Fishbed H

The MiG-21R tactical reconnaissance fighter was the first third generation Fishbed to enter production and it differed from the earlier second generation MiG-21s in a number of ways. The dorsal spine was wider and deeper to house an additional 340 liter (89.8 gallon) fuel tank, increasing the total internal fuel capacity to 2,800 liters (739.69 gallons). An additional set of underwing pylons was added outboard of the existing pylons, which were plumbed to accept a 490 liter drop tank (129.44 gallon).

The long dorsal VHF blade antenna found on the Fishbed D and Fishbed F was deleted on the MiG-21R and a small air intake was added to the dorsal spine just behind the cockpit. Another change from the second generation MiG-21 was the introduction of an angle of attack sensor to the port side of the nose in front of the cockpit. This sensor was tied into an AP-155 autopilot.

The air data boom, placed on the upper nose centerline was relocated to starboard and precision air data sensors were added to the boom. Another pitot tube was added to the starboard side of the fuselage forward of the cockpit.

The MiG-21R was equipped with a reconnaissance pod mounted on the fuselage centerline and Radar Warning Receiver (RWR) electronic countermeasures jammer pods mounted on the wingtips. Several different pods could be carried including the "D" pod and "R" pod which differed in the cameras installed. The MiG-21R could be flown without the reconnaissance pod, becoming a missile only interceptor fighter.

The avionics suite of the MiG-21R included an AP-155 autopilot, a SP0-3 radar warning system and a TsD-30 radar in the nose cone. The MiG-21R was built at Zavod 21 in Gorky for both the Soviet Air Force and for export customers (between 1965 and 1971).

Like most Fishbed variants, the MiG-21R was progressively upgraded. Early MiG-21Rs lacked a rearview mirror on the upper canopy framing, while late production MiG-21Rs had a Ts-27AMSh rearview mirror mounted on the upper canopy framing. The NATO reporting name for the MiG-21R was Fishbed H.

## MiG-21S

The MiG-21S, the first third generation interceptor/air superiority fighter, was developed from the MiG-21R. It differed from the MiG-21R in that it did not carry the RWR pods on the wingtips and had a GP-9 cannon pod installed in place of the reconnaissance pod

on the fuselage centerline. Since the GP-9 gun pod caused significant drag, it was often removed with the MiG-21S being used as a dedicated air-to-air missile carrier with four K-13 (AA-2 Atoll) AAMs. The GP-9 gun pod was viewed as only an interim solution until the semi-internal GSh-23L 23MM twin barreled 23MM cannon became available.

The MiG-21S was equipped with a new RP-22S radar (NATO designation Jay Bird) and an ASP-PF gunsight. It was powered by a 13,668 lbst R-11F2S-300 with provision for blown flaps. The MiG-21S was built between 1965 and 1968 for the Soviet Air Force (none were exported).

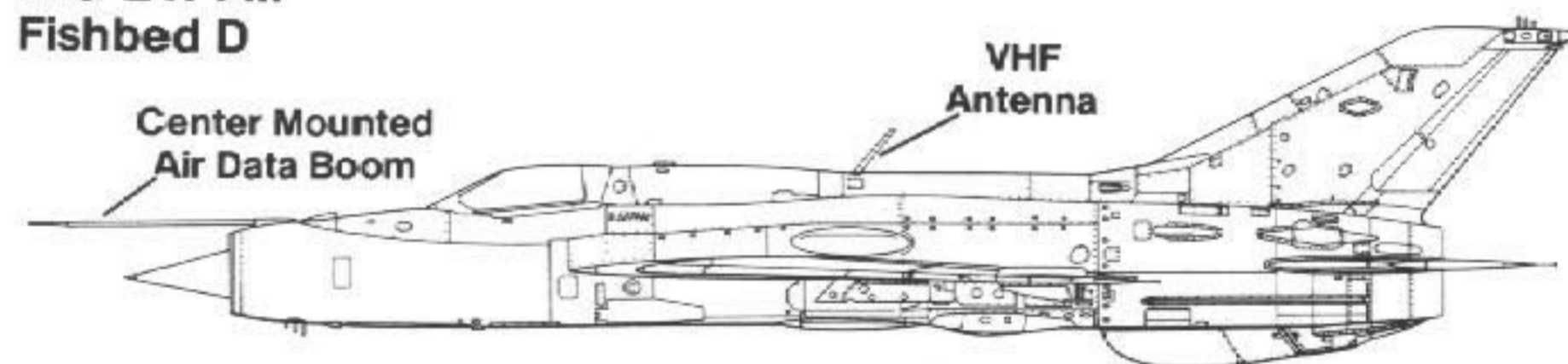
## MiG-21SM

The MiG-21SM was an improved version of the MiG-21S with an updated 14,550 lbst R-13-300 engine and a semi-internal GSh-23L cannon mounted on the fuselage centerline in front of the centerline pylon. The ammunition supply for the twin barreled cannon consisted of 200 rounds carried in a bin inside the fuselage. With the introduction of the GSh-23L cannon the gun sight was changed to the AP-PFD gun sight.

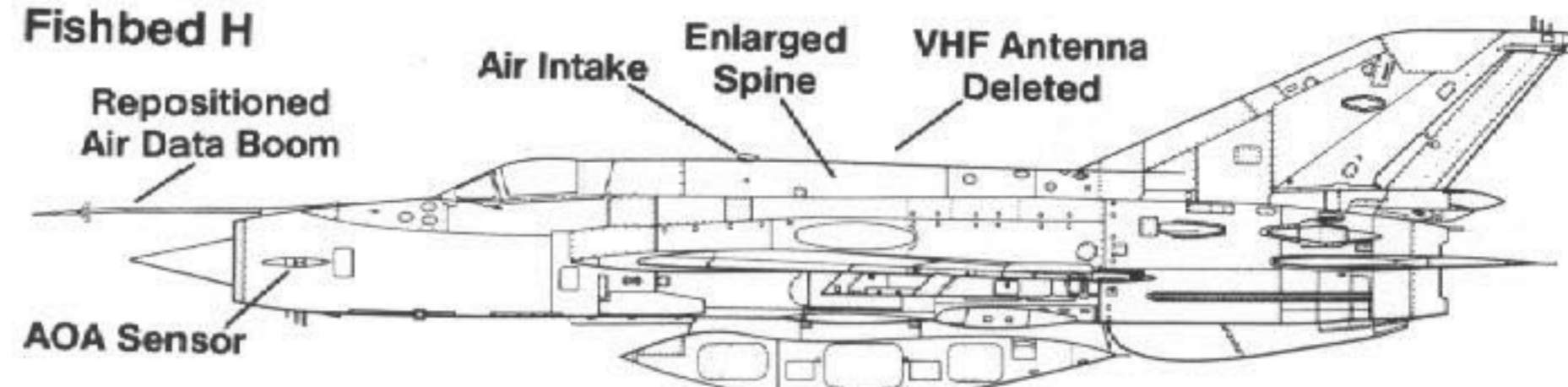
In addition to the standard underwing armament of four R-13 (AA-2 Atoll) air-to-air missiles, the MiG-21SM could also carry bombs (up to 500 kg/1,102 pounds), UB-16-57U sixteen shot and UB-32A thirty-two shot rocket pods and other standard Soviet air-to-ground ordnance. The MiG-21SM was built between 1968 and 1974 for the Soviet Air Force at Zavod 21 in Gorky (it was not exported). Originally the MiG-21SM had no rearview mirror on top of the canopy or gun blast panels, although these were sometimes retrofitted, making the modified MiG-21SMs externally identical to the later MiG-21MF.

### Fuselage Development

MiG-21PFM  
Fishbed D



MiG-21R  
Fishbed H





This Polish Air Force MiG-21R Fishbed H, Red 2097, is equipped with a D type reconnaissance pod, 490 liter drop tanks on the outboard wing pylons and a R-60MK (AA-8 Aphid) missile rail on the inboard pylon. (Hans-Heiri Stapfer Collection)

## MiG-21M

The MiG-21M was the export version of the MiG-21SM and differed from the SM in that they were powered by the 13,668 lbst R-11F2S-300 engine instead of the more powerful R-13-300 power plant and had a RP-21MA radar in place of the more sophisticated RP-22S radar. These changes were typical, since it was standard Soviet doctrine not to release their latest innovations to foreign countries. The MiG-21M was built at the *Znamya Truda* factory in Moscow between 1968 and 1971 and was the first third generation MiG-21 variant to be exported outside the Soviet Union. Late production batches of the MiG-21M received an improved R-11F2SK-300 power plant.

Most MiG-21Ms were delivered in overall natural metal finish, although a few late production aircraft were delivered in an overall gloss Light Gray camouflage known as Air Superiority Gray. The MiG-21M was exported to Poland, Czechoslovakia, the German Democratic Republic and a number of other export customers. It was also built under license at the HAL plant at Nasik, India. These aircraft had the gun blast panels fitted on the fuselage and a rearview mirror, making them externally identical to the MiG-21MF.

## MiG-21MF Fishbed J

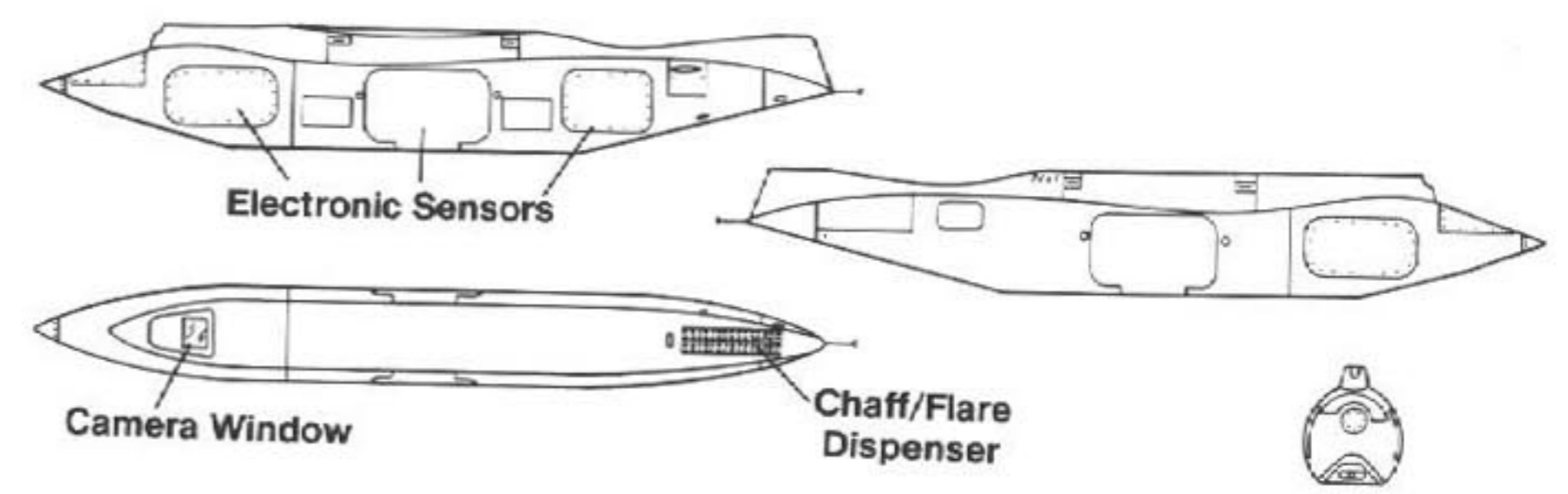
The MiG-21MF was developed from the export MiG-21M to satisfy the needs of various export customers for an uprated MiG-21M. The MiG-21MF was equipped with the lightweight 14,550 lbst R-13-300 engine and RP-22S radar used on the MiG-21SM. The internal fuel capacity of the MiG-21MF was 2,650 liters (700 gallons) and an 800 liter

This Polish Air Force MiG-21R Fishbed H does not have a reconnaissance pod installed on the centerline. It is armed with a pair of K-13 (AA-2 Atoll) IR homing air-to-air missiles which are normally carried for self-defense. (Don Spring/AIR)

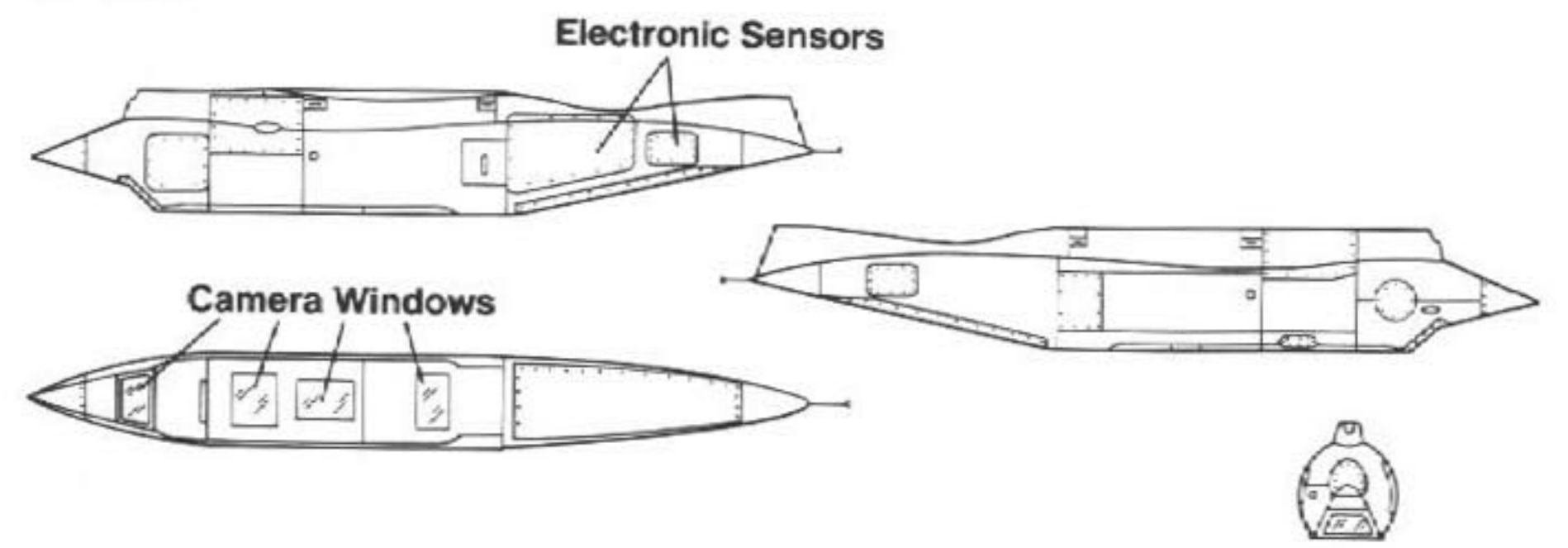


## Fishbed H Reconnaissance Pods

### "R" Pod



### "D" Pod



Besides the removable reconnaissance pod, the MiG-21R Fishbed H can be identified by the Radar Warning Receiver antenna pods on the wingtips. The K-13 (AA-2 Atoll) missile was developed from captured examples of the U.S. AIM-9 Sidewinder missile. (Don Spring/AIR)



(211 gallon) tank could be carried on the fuselage pylon along with two 490 liter (129 gallon) tanks on the outboard wing pylons. Production of the MiG-21MF began at the *Znamya Truda* facility in Moscow during 1970 and once identified by NATO as a new variant, the MiG-21MF was given the reporting name Fishbed J (this name has also been used for the MiG-21M and MiG-21SM variants).

Compared with the MiG-21SM and MiG-21M, the MiG-21MF had a number of design refinements intended to lighten the aircraft: such as the use of titanium alloy to replace some of the heavier steel airframe parts. The MiG-21MF was also equipped with an SARPP-12 flight recorder to assist with maintenance of the aircraft.

The air-to-air missile armament of the MiG-21M/SM/MF included both the R-13A (AA-2 Atoll) series of air-to-air missiles and the R-60 and R-60MK (AA-8 Aphid) short range "dog fight" missiles. The stick featured two separate triggers so that the pilot could select either the GSh-23L cannon or the air-to-air missiles, depending on the needs of the engagement.

The MiG-21MF could also be used for ground support duties and in this mode it could carry UB-16-57U or UB-32A rocket pods, S-24 240MM unguided air-to-ground rockets or bombs up to 500 kg (1,102 pounds). When the MiG-23M Flogger became available in significant numbers to fill the interceptor role, a number of third generation MiG-21s were transferred to ground attack regiments within the Soviet and Warsaw Pact air forces.

The MiG-21MF was built for export until 1974, then production was transferred to Zavod 21 at Gorky where production for the Soviet Air Force continued until 1975. Some of the Gorky produced MiG-21MF were later exported to East Germany. The last batches of Gorky produced MiG-21MFs were modified with the cockpit instrumentation and some of the avionics upgrades intended for the MiG-21bis.

The MiG-21MF saw considerably combat in Afghanistan with both Afghan and Soviet regiments. During the Iran-Iraq war (1980-1989) the Iraqi Air Force did undertake a number of air-to-air combat missions with the Fishbed, scoring at least one "ambush" kill against an IRIAF F-14 Tomcat. During Operation DESERT STORM only a few missions were flown with MiG-21MFs (at least four were shot down) and most of the aircraft

remained on the ground.

The MiG-21MF was still active in combat during 1992. When the civil war in Yugoslavia began in June of 1991, Serbian operated MiG-21MFs and MiG-21PFMs were flown in ground attack missions against Slovenian, Croatian and Bosnian held strong points and villages. During these attacks, the Fishbeds were usually armed with UB-16-57U and UB-32A rocket pods. The MiG-21s also carried domestic manufactured air-to-ground weapons and weapons systems imported from Western countries.

Quite often, the Serbian pilots in the *Yugoslovensko Ratno Vazduhoplovstvo* (Yugoslav Air Force) deliberately bombed civil targets in the former Yugoslav republics. On 25 October 1991, a Croatian pilot, CAPT Rudolf Peresin defected with his MiG-21MF Black 610. He flew from Bihac Air Base in Bosnia to Klagenfurt Airport in Austria where the Fishbed was interned along with the pilot. During the fighting in Slovenia and Croatia a number of MiG-21s were shot down by ground fire.

While the high command of the Yugoslav Air force was Serbian dominated, nearly half of the Fishbed pilots were in fact Croats. While most of them successfully escaped to Croatia, they had no aircraft to fly until several aircraft were flown to Croatia by defecting pilots. These were repainted in Croat markings and became the Fighter Flight of the Croatian Air Force. At least three MiG-21s were on strength, although one was reportedly lost to ground fire over Bosnia.

The Chinese have built a variant of the the J-7 that is externally nearly identical to the MiG-21MF. This aircraft features western electronics and have the option of carrying the French Matra Magic AAM in addition to the normal Chinese AIM-9 Sidewinder copies known as the PL-5. These aircraft remain in production for both the Air Force of the Peoples Liberation Army and for export.

**The MiG-21R Fishbed H was the first of the third generation MiG-21 family and was used for tactical reconnaissance and fighter missions. This Fishbed H of the Polish Air Force has the camera pod deleted. (Don Spring/AIR)**

**A Czech Air Force MiG-21M, Black 1114, takes off from Prerov Air Base. The aircraft had no rearview mirror on the canopy and no blast panels above the GSh-23L cannon. Later, this particular MiG-21M was retrofitted with the rearview mirror and the blast panels, making it externally identical to a MiG-21MF. (Hans-Heiri Stapfer Collection)**



## MiG-21MT

The MiG-21MT was a special version of the MiG-21M with an enlarged internal fuel tank housed in the dorsal spine giving the aircraft a total internal fuel capacity of 3,250 liters (858.5 gallons). There were only fifteen MiG-21MTs built at the *Znamya Truda* facility in Moscow, five of them being delivered to the Soviet Air Force. Externally, the MiG-21MT was identical to the MiG-21M.

## MiG-21SMT Fishbed K

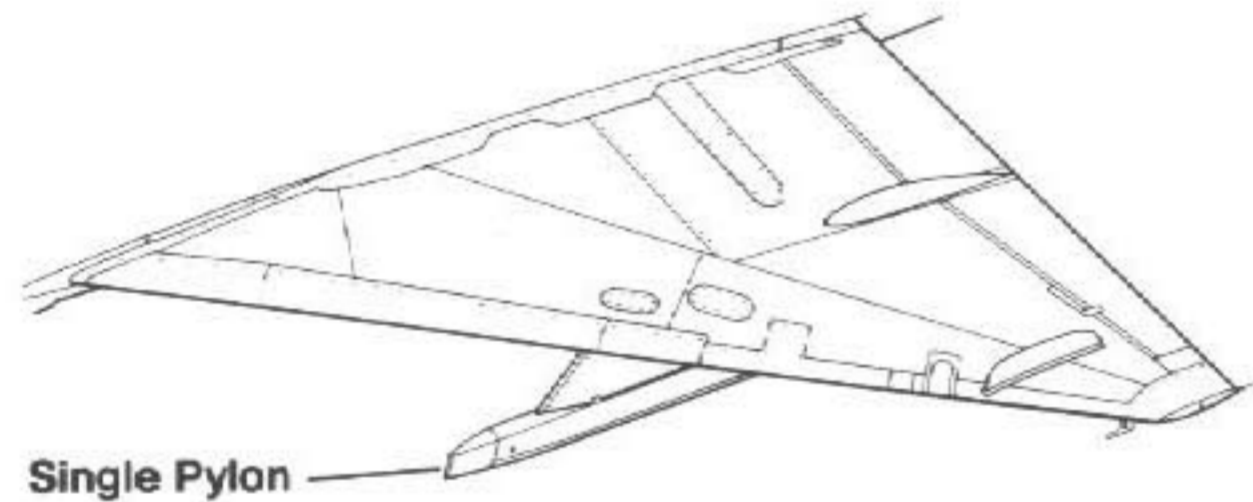
The MiG-21SMT became the last third generation MiG-21 variant built and was basically a mixture of features found on the MiG-21SM and MiG-21MT. The MiG-21SMT had the same fuel capacity as the MiG-21MT, but the tanks were rearranged and housed in a larger, bulged dorsal spine and the small air intake carried on top of the dorsal spine was repositioned to the rear. The shape of the enlarged/bulged spine had adverse effect on the aircraft's flight characteristics and the variant was not well liked by Soviet Air Force pilots. Production of the MiG-21SMT was short lived and only a relatively few MiG-21SMTs were produced (between 1971 and 1972). These aircraft were flown exclusively by the Soviet Air Force and Nato assigned the reporting name Fishbed K to this variant. Soviet forces also used the Fishbed K in the tactical nuclear weapons role carrying a single bomb on the fuselage centerline.



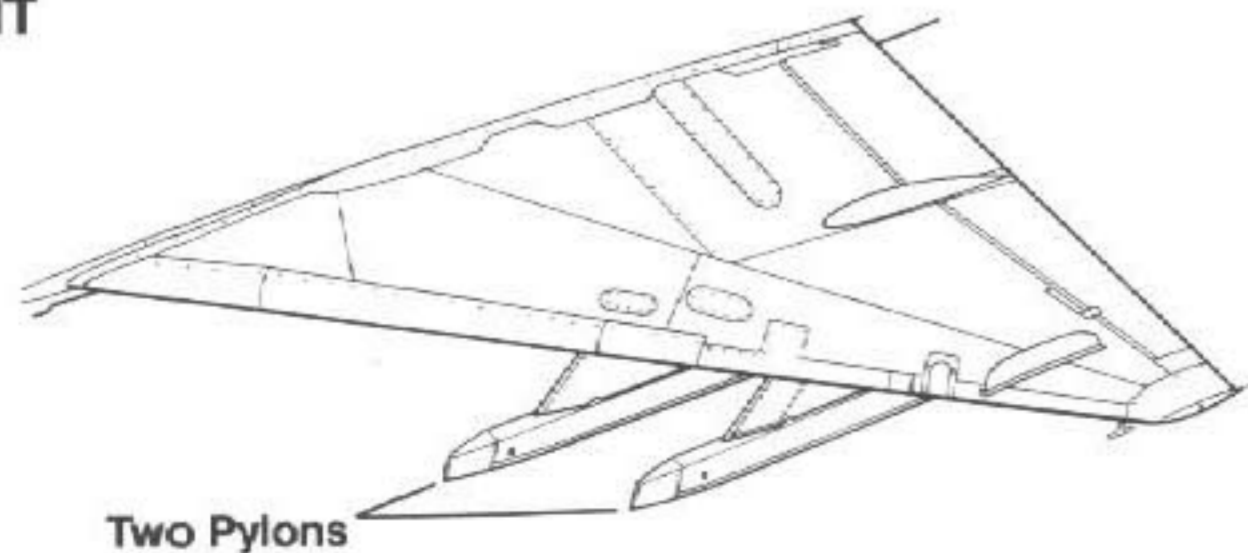
This MiG-21MF Fishbed J of the Czech Air Force is camouflaged in Olive Green and Earth Brown uppersurfaces over Light Gray undersurfaces. The camouflage pattern and paints used often varied from squadron to squadron due to the lack of a standard paint scheme. (Rene van Woezik)

### Wing Development

#### MiG-21PFM



#### MiG-21R-SMT



Yellow 30 was one of a group of Soviet Air Force MiG-21MFs that visited Reims, France on 9 June 1971. The MiG-21MF Fishbed J was powered by the Tumansky R-13-300 two spool turbojet engine which was lighter and more powerful than the earlier R-11 engine it replaced. (GERB, Klootsema)



## MiG-21I (Analog)

The MiG-21I was built as a test bed to evaluate the wing platform of the Tupolev Tu-144 Mach 2 commercial airliner. Two MiG-21S airframes were converted with a scaled down Tupolev Tu-144 wing replacing the standard fighter wing. The two aircraft were known within the MiG-OKB as Analogs.

The first MiG-21I made its maiden flight on 18 April 1968 with O.V. Gudkov at the controls. The trials lasted about a year, but shortly after acquiring the basic data needed for the Tu-144 project, the first MiG-21I was destroyed in an accident. The second MiG-21I was used for years in various test programs and is now mounted under the fuselage of a Tu-144 prototype stored in the Museum of the Air Force at Monino on the outskirts of Moscow.



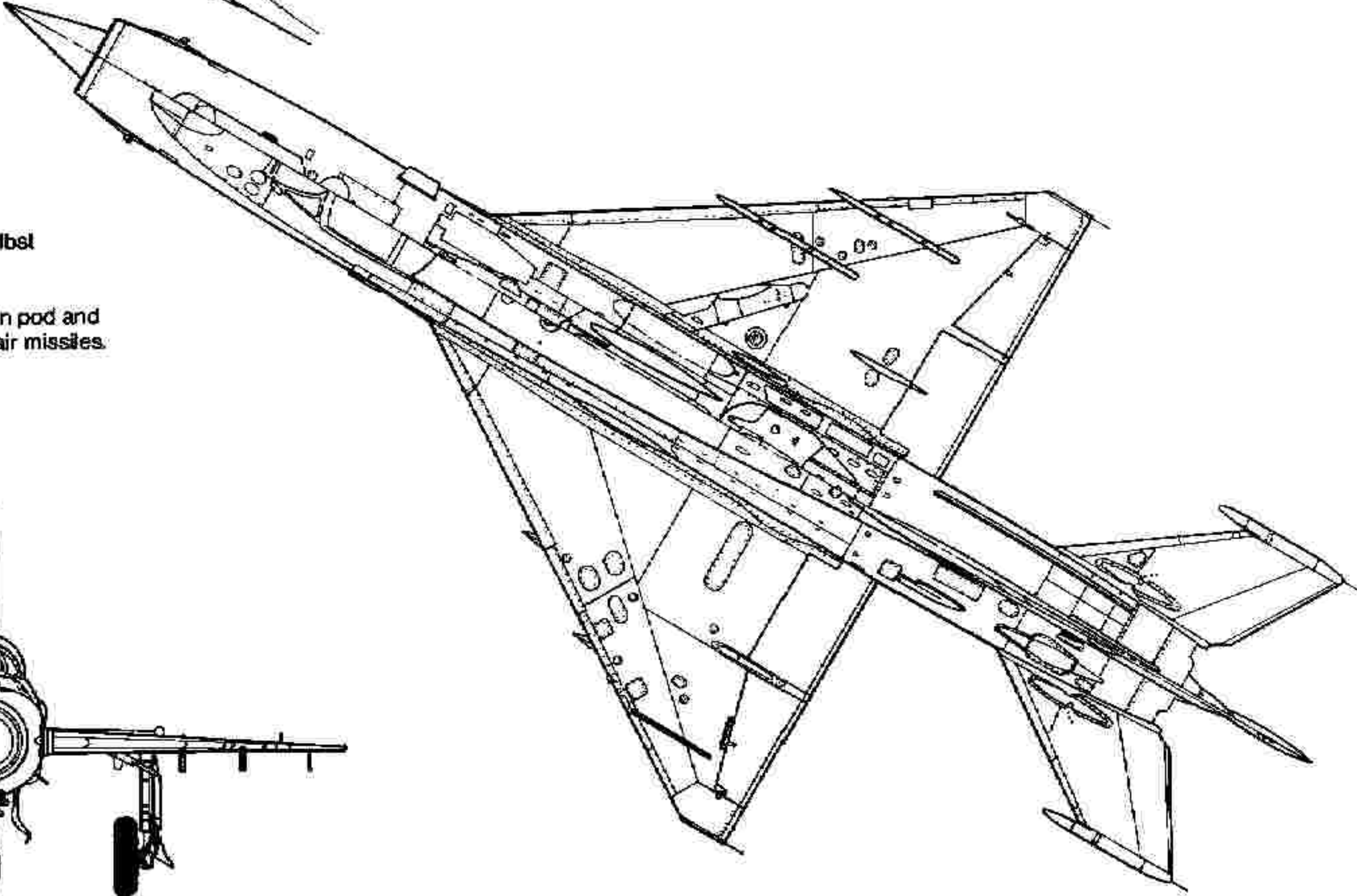
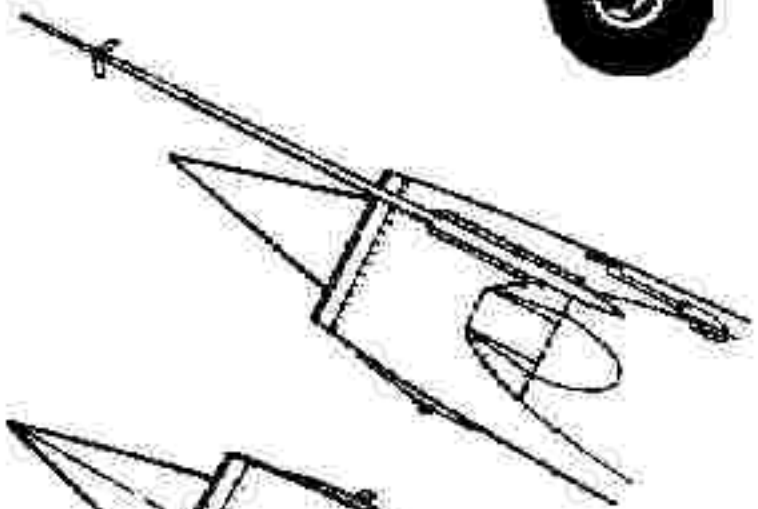
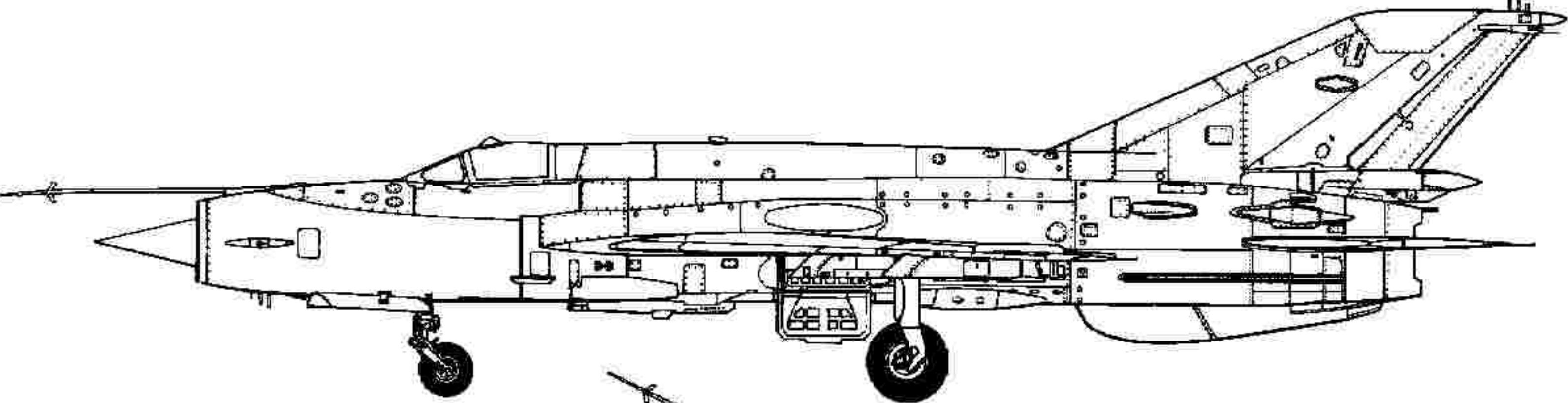
This MiG-21MF of the Czech Air Force was assigned to a ground attack regiment and was painted in an Earth Brown and Dark Olive Green tactical camouflage. When Warsaw Pact countries began receiving MiG-23s for air defense, they transferred their Fishbeds to the ground attack role. (SIGMA via Roman Sekyrka)

Black 5210 was an overall Natural Metal Czech Air Force MiG-21MF Fishbed J with the tactical number on the nose painted in a stencil style. Most Warsaw Pact countries flew the MiG-21MF in the air defense role. (SIGMA via Roman Sekyrka)



A lineup of Romanian Air Force MiG-21MF Fishbed Js carrying the old style Romanian star insignia. All Romanian Air Force Fishbeds carried four digit tactical numbers in Red with a thin White outline. (Hans-Heiri Stapfer Collection)

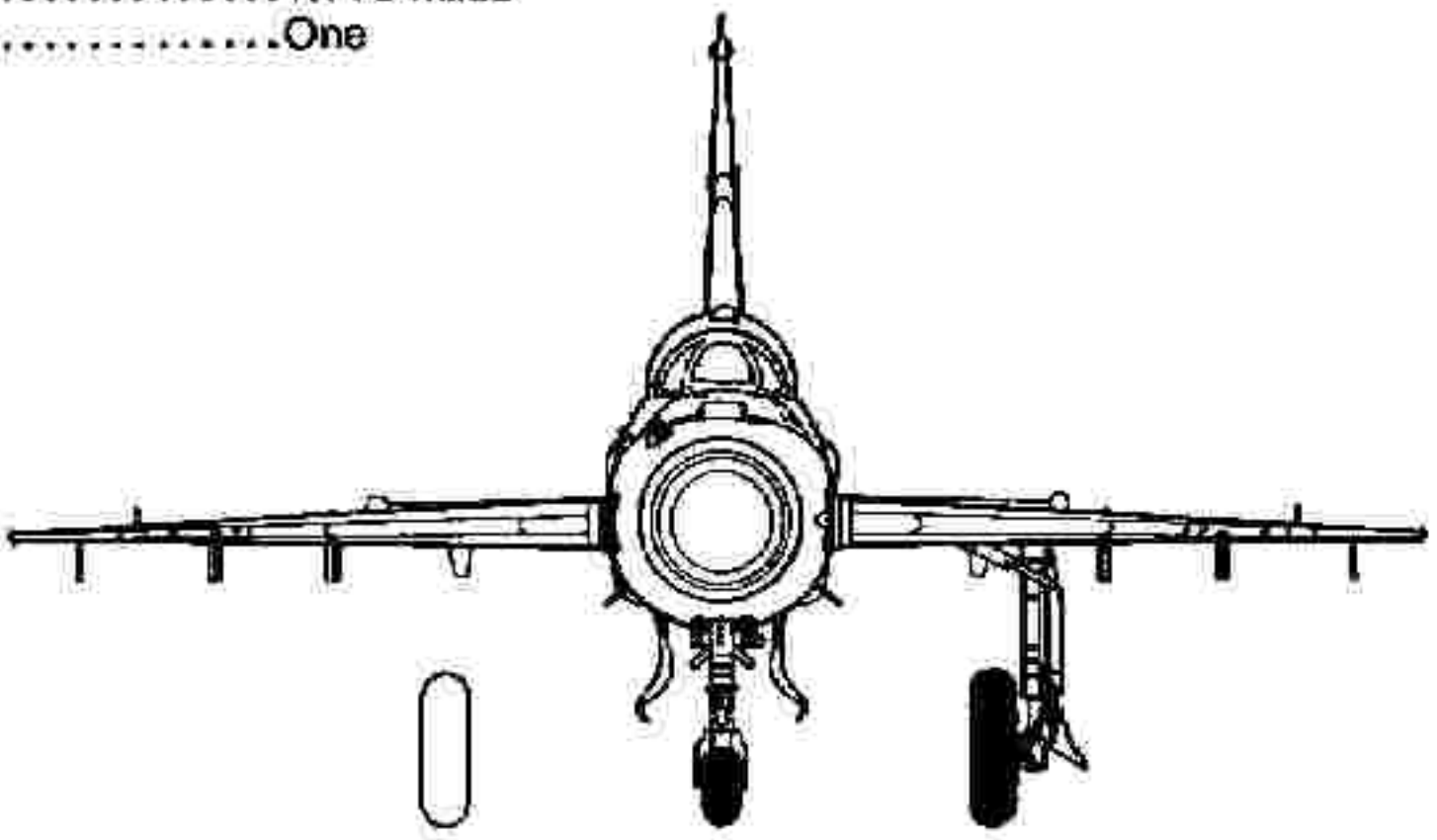




**Specifications**

**MiG-21MF Fishbed J**

- Wingspan** .....23 feet
- Length** .....47 feet 6 inches
- Height** .....13 feet 2 inches
- Empty Weight** .....12,566 pounds
- Maximum Weight** .....21,605 pounds
- Powerplants**.....One Tumansky 14,550 lbf  
R-13-300 turbojet
  
- Armament**.....One GSh-23L 23mm gun pod and  
four K-13 (AA-2) air-to-air missiles.
  
- Performance**
- Maximum Speed** .....1,351 mph
- Service ceiling** .....57,750 feet
- Range** .....1,118 miles
- Crew** .....One





Ground crewmen prepare a Polish Air Force MiG-21MF, Red 8008, for another mission. The aircraft is armed with a UB-16-57U rocket pod on the inboard wing pylon. The aircraft behind it is a MiG-21PFM Fishbed F armed with a GP-9 gun pod which is visible under the Fishbed J in the foreground. (Hans-Heiri Stapfer)



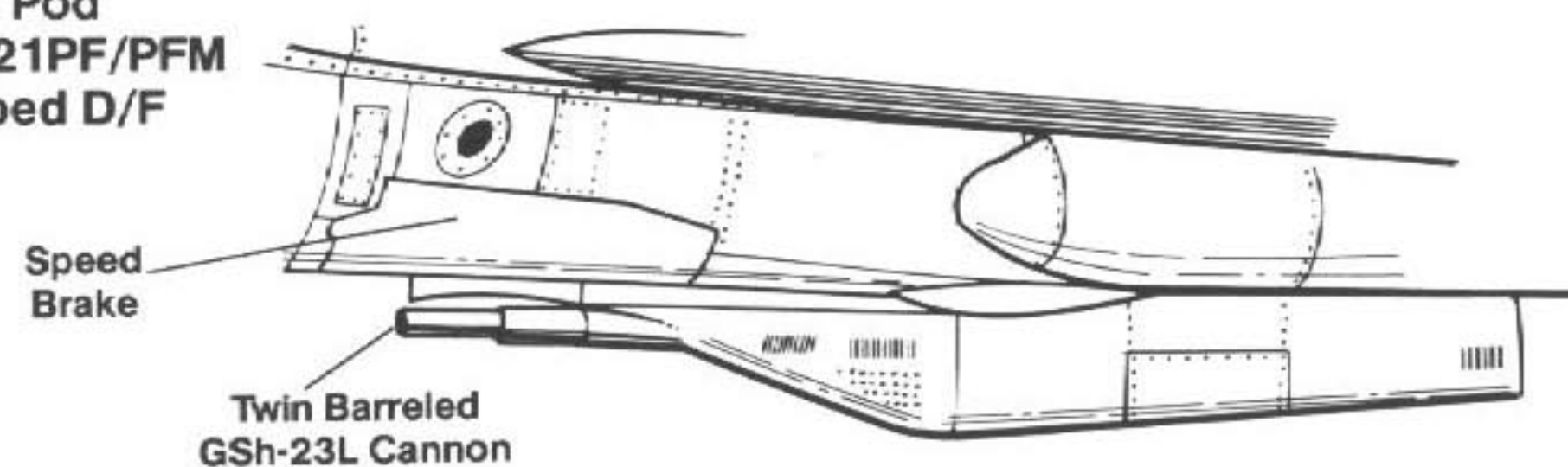
The twin barreled GSh-23L cannon was mounted semi-internal on the fuselage underside ahead of the fuselage pylon. This Soviet Air Force MiG-21MF carries an experimental 490 liter (129.4 gallon) drop tank on the centerline pylon. (Hans-Heiri Stapfer Collection)

Ground crews attach the nosewheel tow-bar to the nosewheel of an overall Air Superiority Gray MiG-21MF (Red 775) of the East German Air Force. The aircraft in the background are MiG-21UM Mongol B trainers and other camouflaged MiG-21MF Fishbed Js. (Wolfgang Tamme)

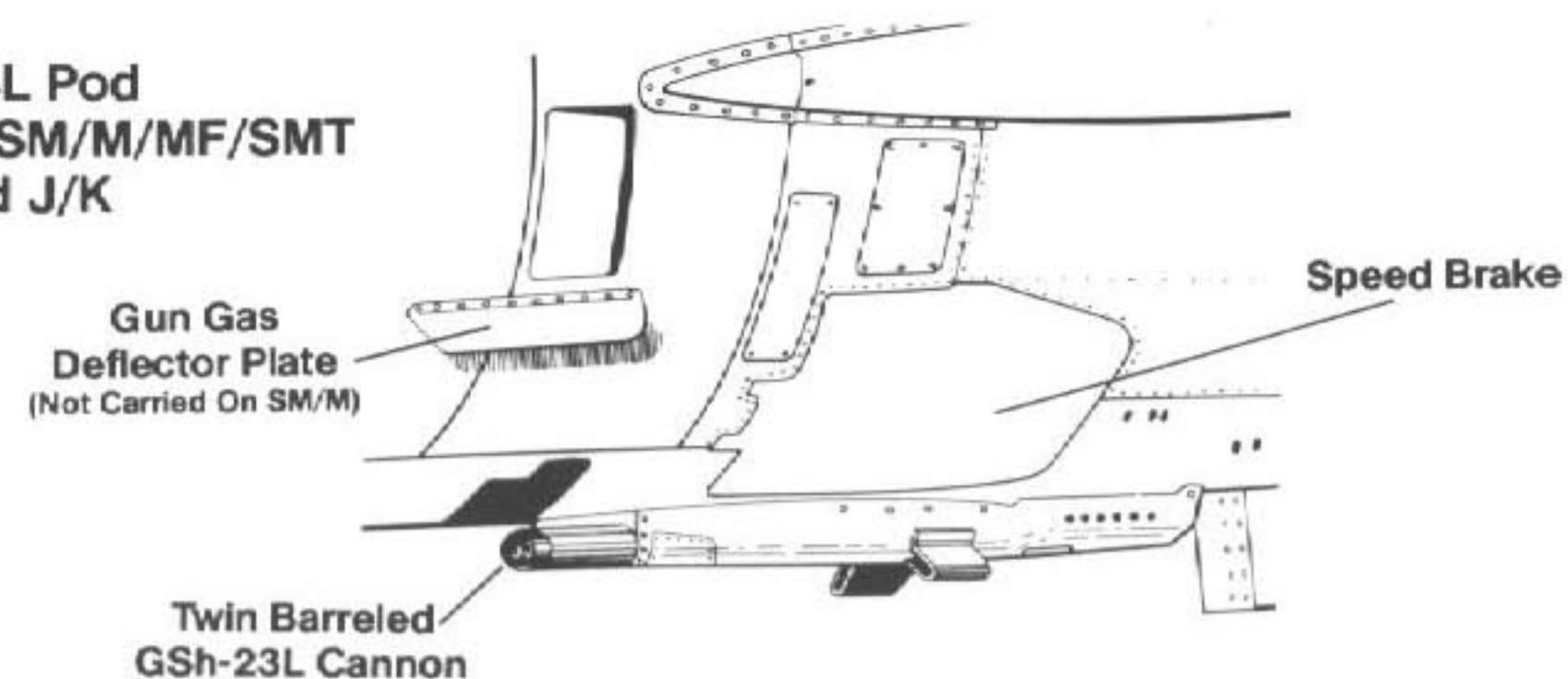


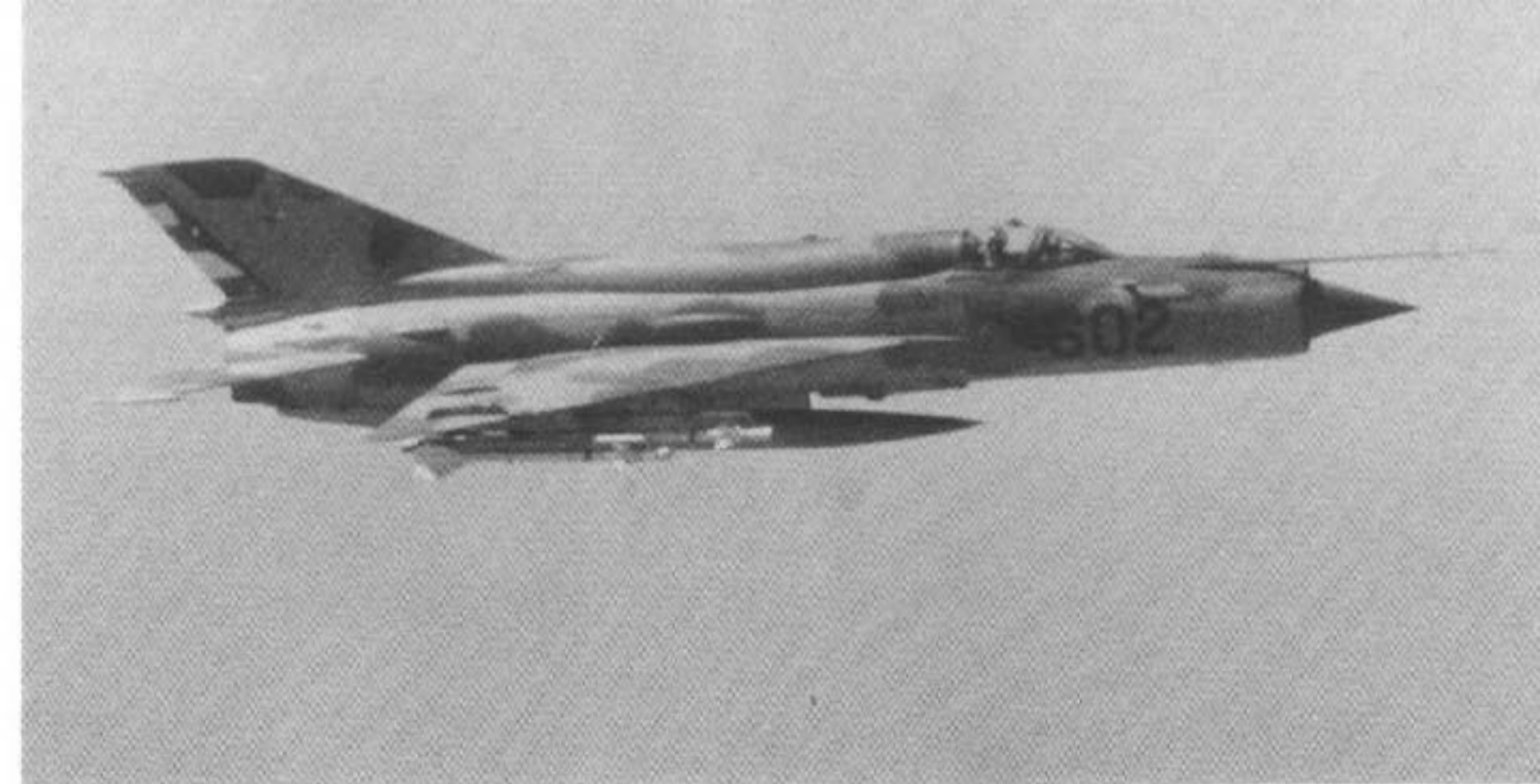
## Gun Armament

GP-9 Pod  
MiG-21PF/PFM  
Fishbed D/F



GSh-23L Pod  
MiG-21SM/M/MF/SMT  
Fishbed J/K



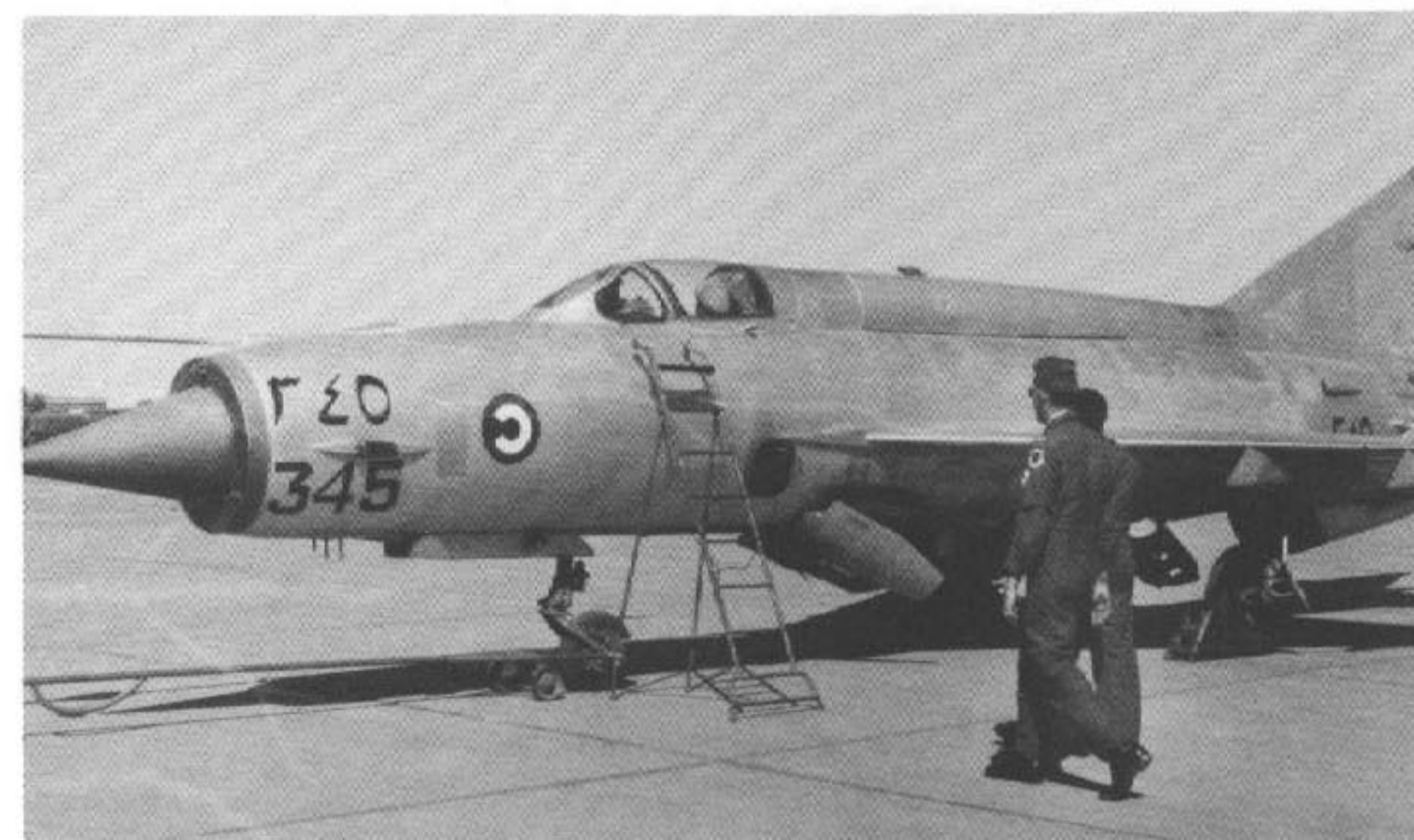


Red 602, a Cuban MiG-21MF Fishbed J, carries four K-13A (AA-2 Atoll) missiles and a 130 gallon drop tank on the centerline. Cuban Fishbeds routinely intercept aircraft flying in the Florida Straits between Cuba and Florida. (Don Linn Collection)

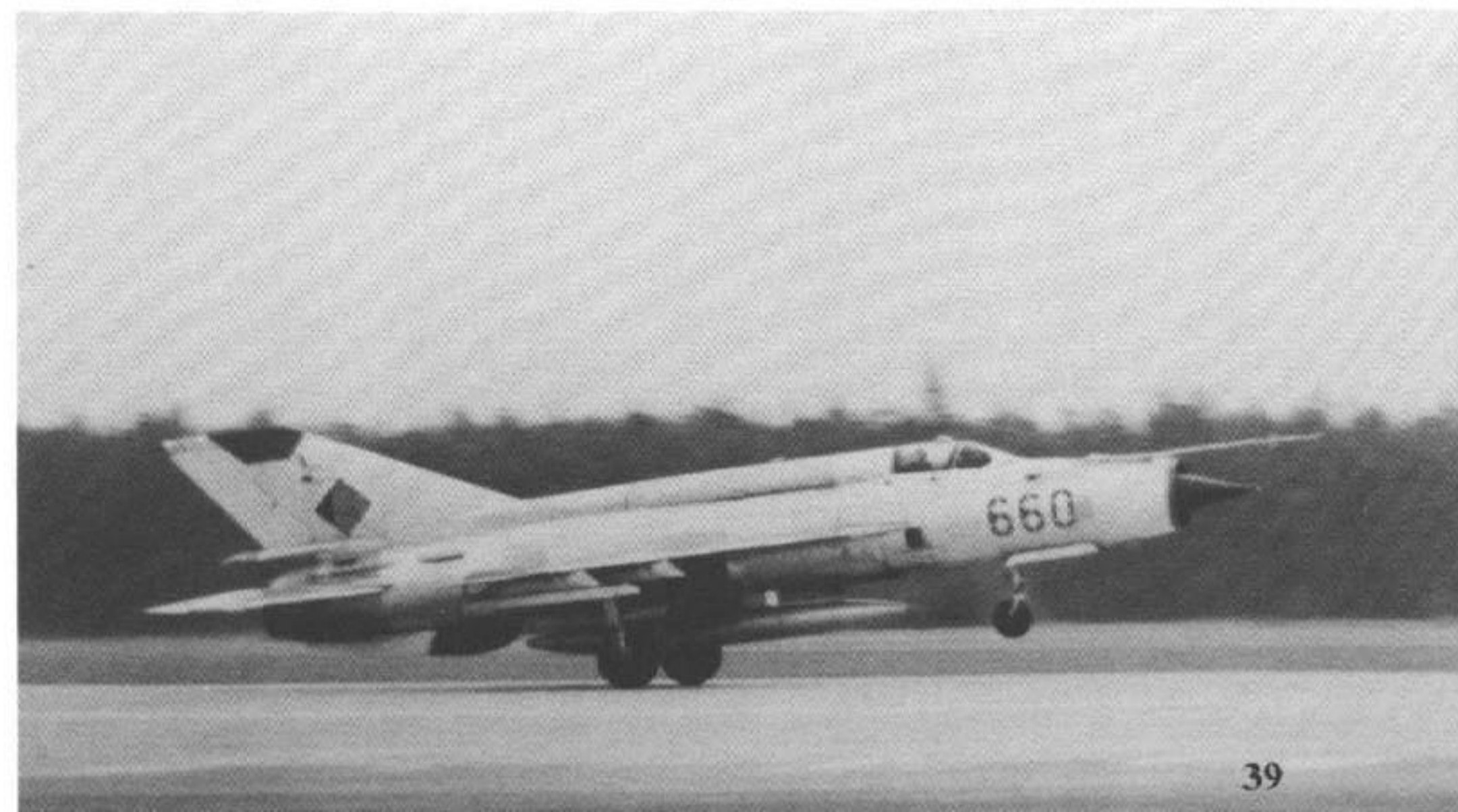


This Czech MiG-21MF Fishbed J carries a squadron insignia on the nose. These insignias were strictly forbidden during the cold war period but are now becoming common on former Warsaw Pact aircraft. The aircraft carries a 790 liter (208 gallon) tank on the centerline and a 490 liter (129 gallon) tank on the outboard wing pylon. (SIGMA via Roman Sekyrka)

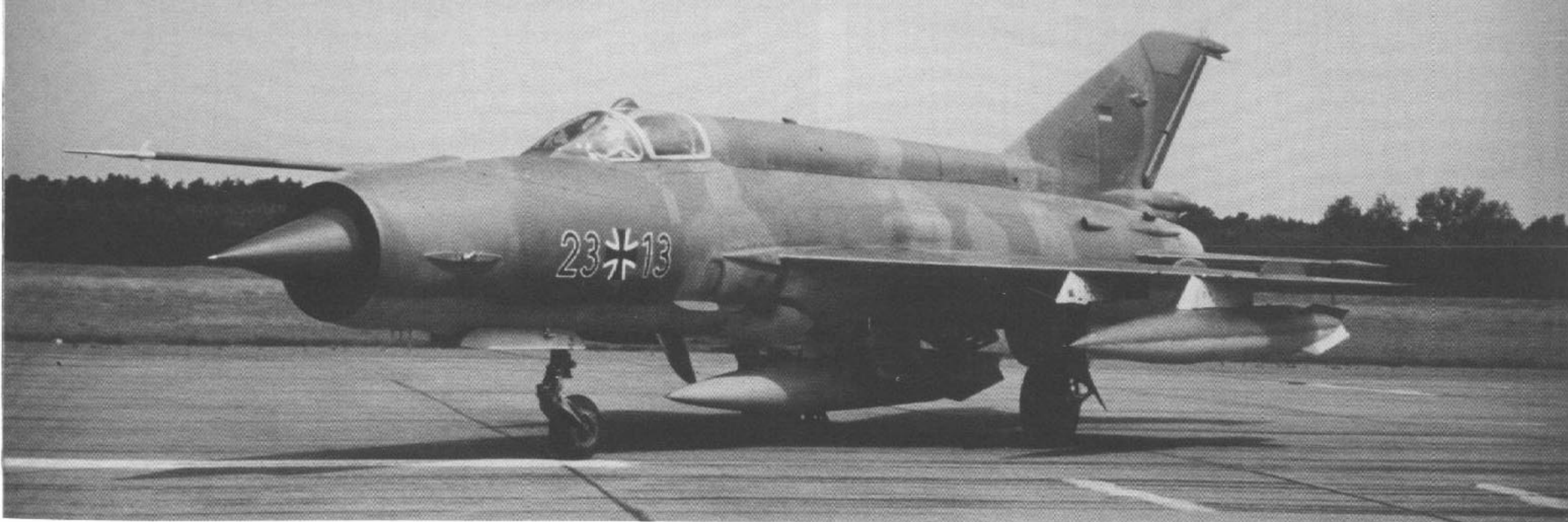
A USAF officer and a Sudanese pilot walk out to a Sudanese Air Force MiG-21M Fishbed J during 1979. The MiG-21M was a downgraded export variant of the MiG-21SM built at the *Zuamya Truda* factory in Moscow for export only. Sudanese MiG-21s carried their tactical number in both Arabic and English style numbers in Black.(USAF)



An overall Natural Metal MiG-21MF Fishbed J, Red 660, of the East German Air Force takes off from its home base on a training mission. Most East German MiG-21s were extensively modified internally while being overhauled at the Dresden repair depot. (Wolfgang Tamme via Hans-Heiri Stapfer)







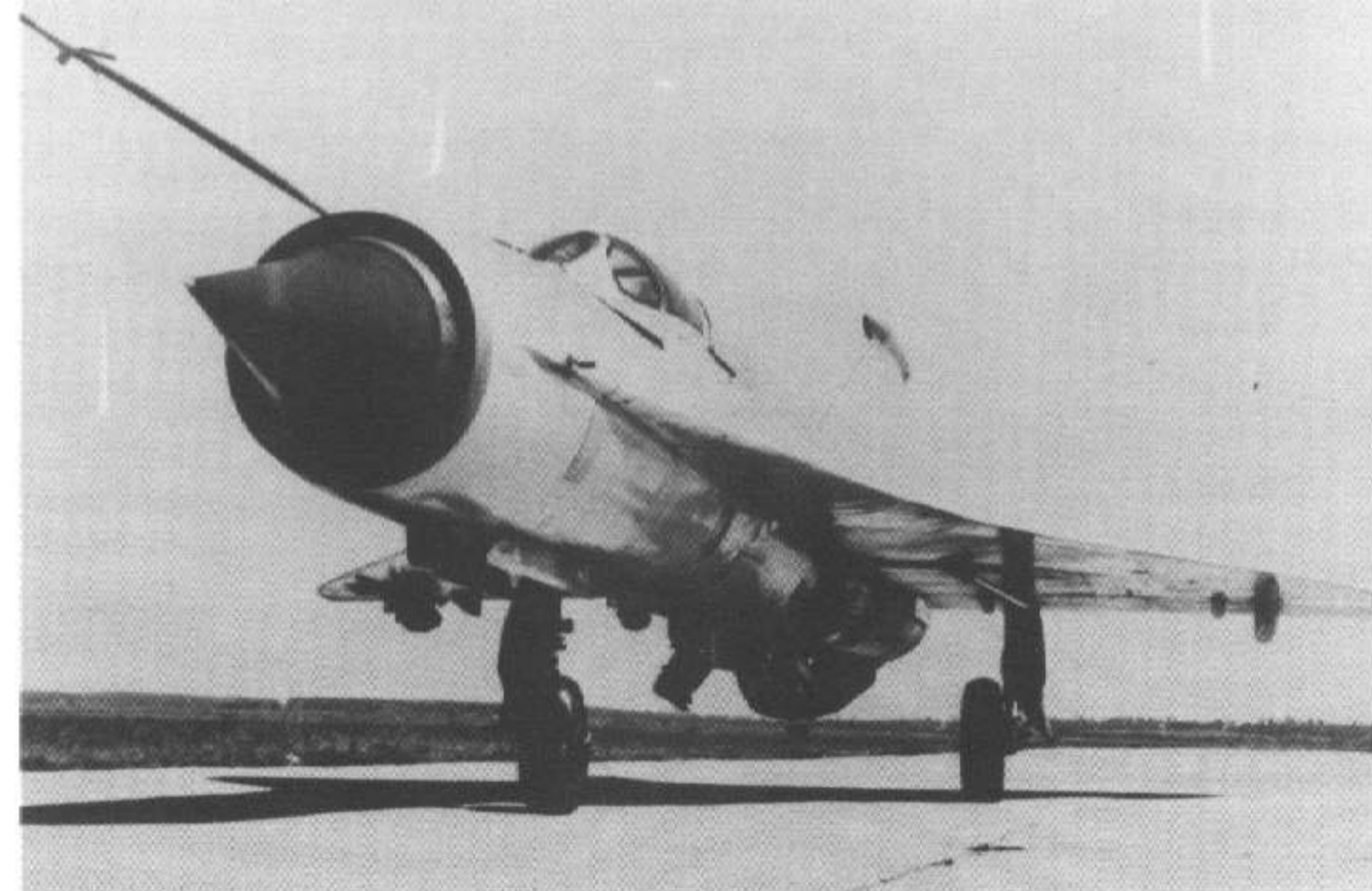
This MiG-21MF, which once belonged to the 1st Fighter Regiment, East German Air Force, was absorbed into the *Bundesluftwaffe* and was given the full German markings and the registration 23 + 13 on the nose in Black with a White outline. (Jens Schymura)

This MiG-21MF, Red 9606, carries the star national markings used by the Hungarian Air Force between November of 1949 and January of 1991. The four digit tactical number was Red with a thin White outline. There were three Fishbed regiments within the Hungarian Air Force. (Andras Nagy)

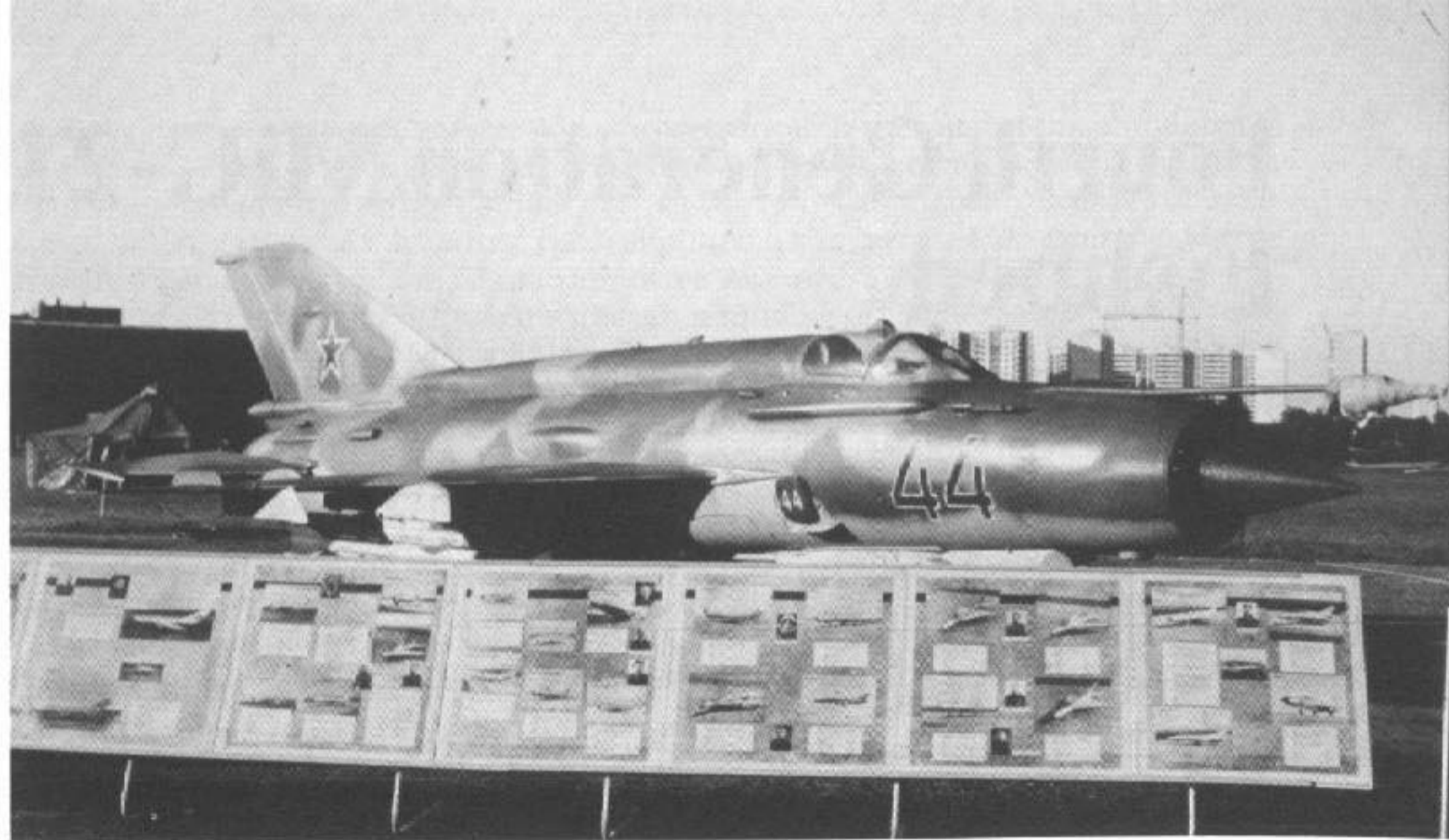


This Hungarian MiG-21MF Fishbed J, Red 8114, carries the new chevron national markings introduced during early 1991. This camouflage, Dark Tan and Dark Olive Green over Light Gray, is unique to the Hungarian Air Force. (George Punka)





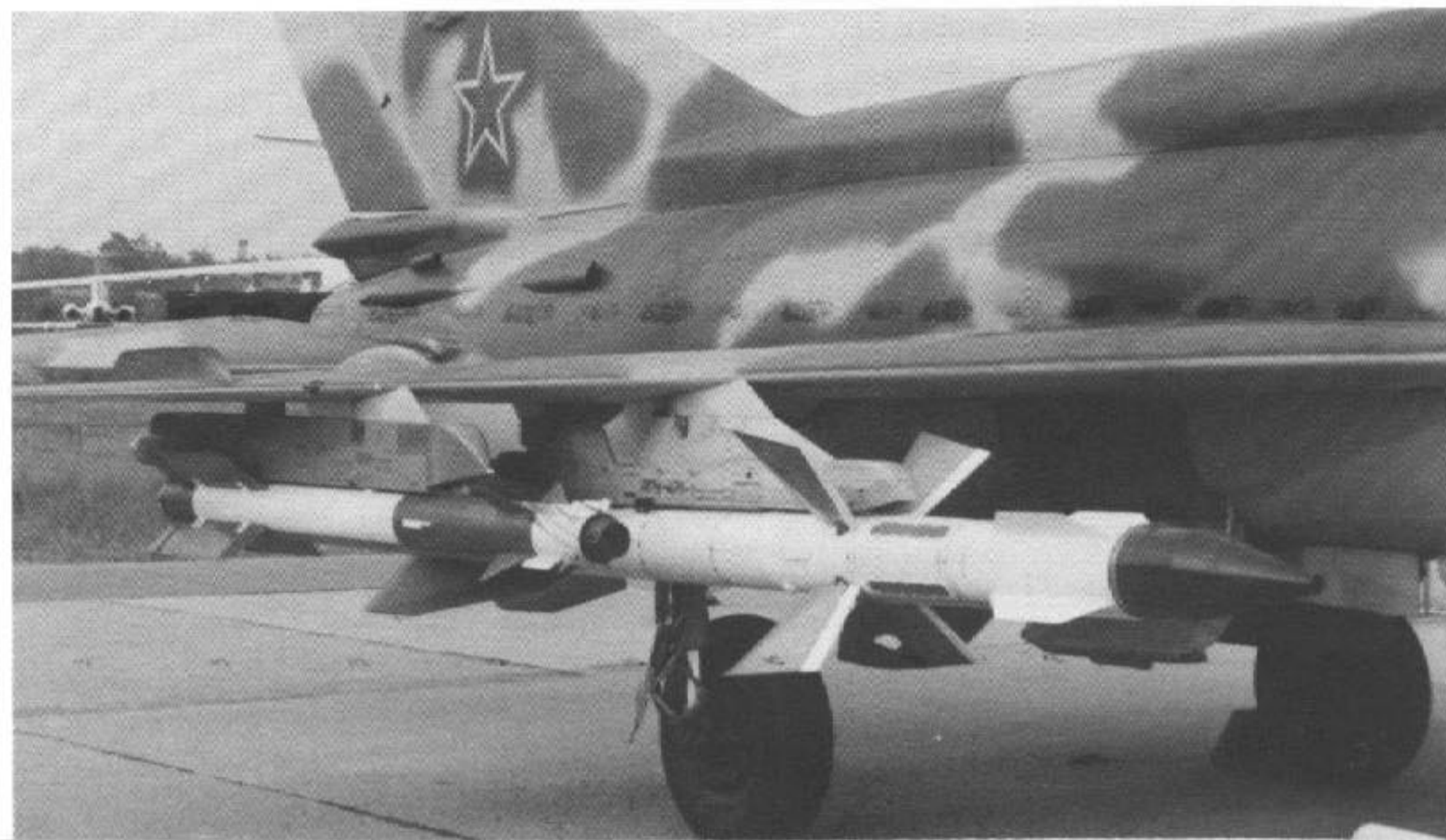
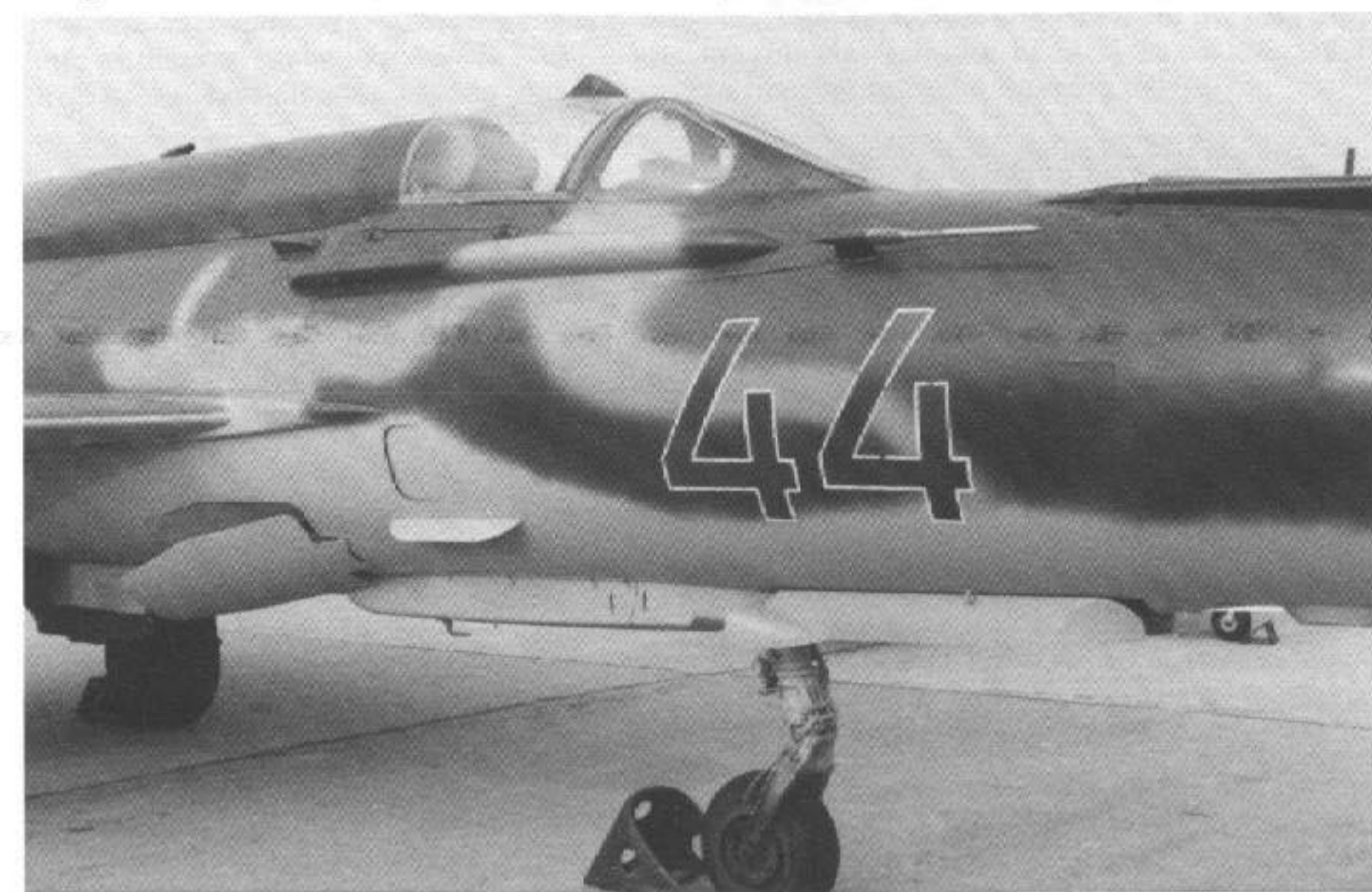
The MiG-21I Analog was a test-bed converted from a MiG-21S to test the flight characteristics of a scaled down wing of the Tupolev Tu-144 civil supersonic transport. There were two Mig-21Is built and one was destroyed in an accident. (Hans-Heiri Stapfer Collection)



This Soviet Air Force MiG-21MF, Red 44, was modified with a special antenna in a fairing mounted on the starboard side of the fuselage under the cockpit. Reportedly, this antenna was associated with an improved electronic landing aid. (Hans-Heiri Stapfer Collection)

Red 44 was further modified with a special fire control antenna in place of the GSh-23L cannon on the fuselage underside. This antenna was installed to allow the MiG-21MF Fishbed to carry and fire the R-72 (AA-10 Alamo) missile. (Hans-Heiri Stapfer Collection)

Red 44 was also modified with the same missile pylons used on the MiG-29 for the R-72 (AA-10 Alamo - inboard) and R-73 (AA-11 Archer - outboard) air-to-air missiles. The camouflage was Earth Brown, Olive Drab and Sand-Yellow over Light Gray. (Hans-Heiri Stapfer collection)



# Fourth Generation MiG-21 Fishbed

The combat record of the MiG-21 in the various areas that the aircraft had been committed to combat — from Vietnam to India to the Middle East — were carefully studied in the Soviet Union with the aim of making further improvements to the aircraft. These studies led the Soviet Air Force to determine that changes were needed to give the Fishbed an improved capability for low level combat and increased endurance while carrying a good weapons load.

The MiG-21s that had been produced up through the third generation were built for medium and high altitude combat, not low level combat. In February of 1971 the MiG OKB began to develop an entirely new variant of the MiG-21 optimized for low level combat.

Internally the redesign of the Fishbed was so complete that the new version was closer to a completely new design than a simple update of an existing variant. Externally, however, this new MiG-21 was very similar to the earlier MiG-21MF Fishbed J.

## MiG-21bis Fishbed L

The MiG OKB began with the basic airframe of the MiG-21MF and completely redesigned and improved its internal structure. To save weight most of the steel airframe components were replaced with titanium components. The cockpit instrumentation was replaced with the same type that was used on the MiG-23 Flogger and much of the avionics used in the MiG-23 were also incorporated into the new MiG-21, including an updated radar system and the RSBN automatic landing system.

The aircraft was powered by a 16,535 lbst Tumansky R-25-300 turbojet that featured an improved afterburner system. This afterburner responded more quickly to throttle movements and its lower fuel consumption coupled with an increase in internal fuel capacity, to 2,880 liters (760.8 gallons), increased the aircraft's endurance. This new variant was given the designation MiG-21bis and when NATO identified the aircraft it assigned the variant the reporting name Fishbed L.

Externally, the MiG-21bis differed very little from the earlier MiG-21MF Fishbed J. One identifying feature was the shape of the dorsal spine. The spine on the MiG-21bis was wider, deeper and was faired further back into the vertical fin, nearly to the braking parachute bullet fairing.

The first production MiG-21bis fighters were delivered to the Soviet Air Force in February of 1972 and production continued at Zavod 21 until 1974. All MiG-21bis fighters were built in this facility, both for Soviet service and export customers.

The MiG-21bis was delivered, in relatively small numbers, to all members of the Warsaw Pact. In 1977, some three years after the production line at Gorky was closed, the first of some twenty-eight MiG-21bis Fishbed Ls were delivered to Finland where they replaced the Fishbed Cs of the 31st Fighter Squadron.

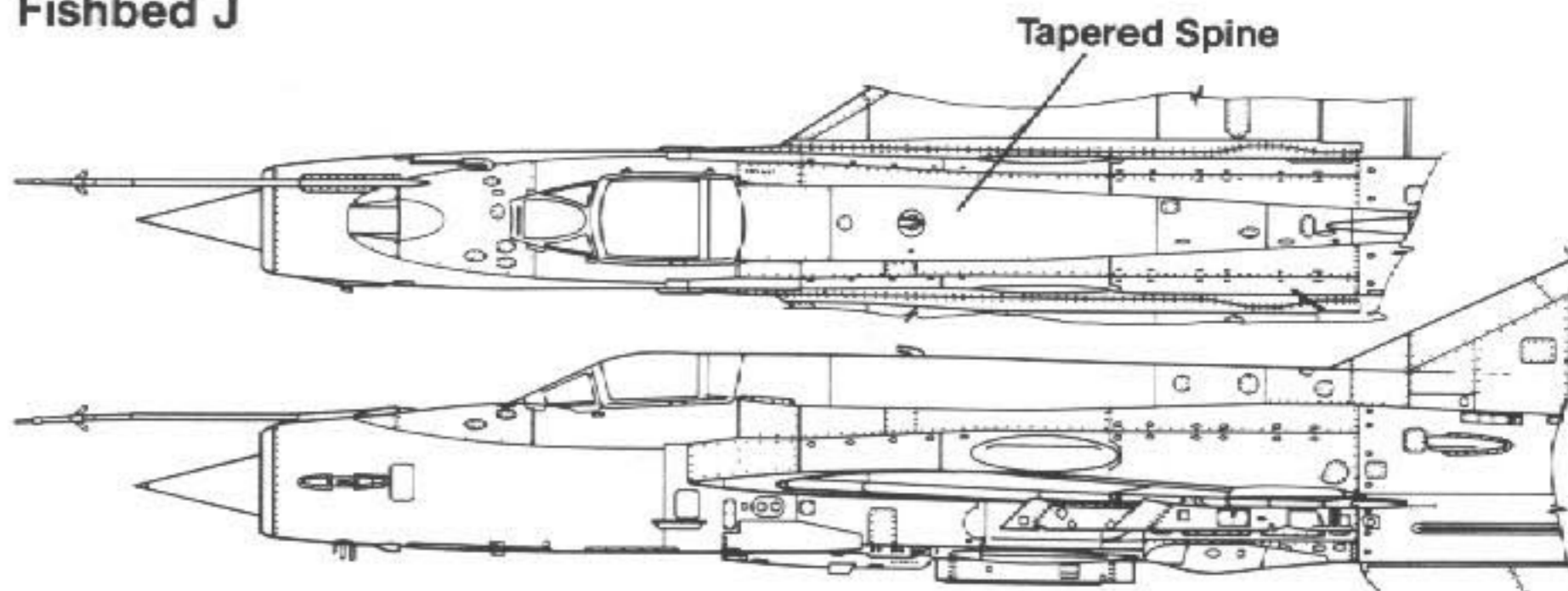
Although the MiG-21bis was not built under license in India, some 220 aircraft were assembled from components shipped to the HAL plant at Nasik from the Soviet Union. Assembly work continued at Nasik until 1987.



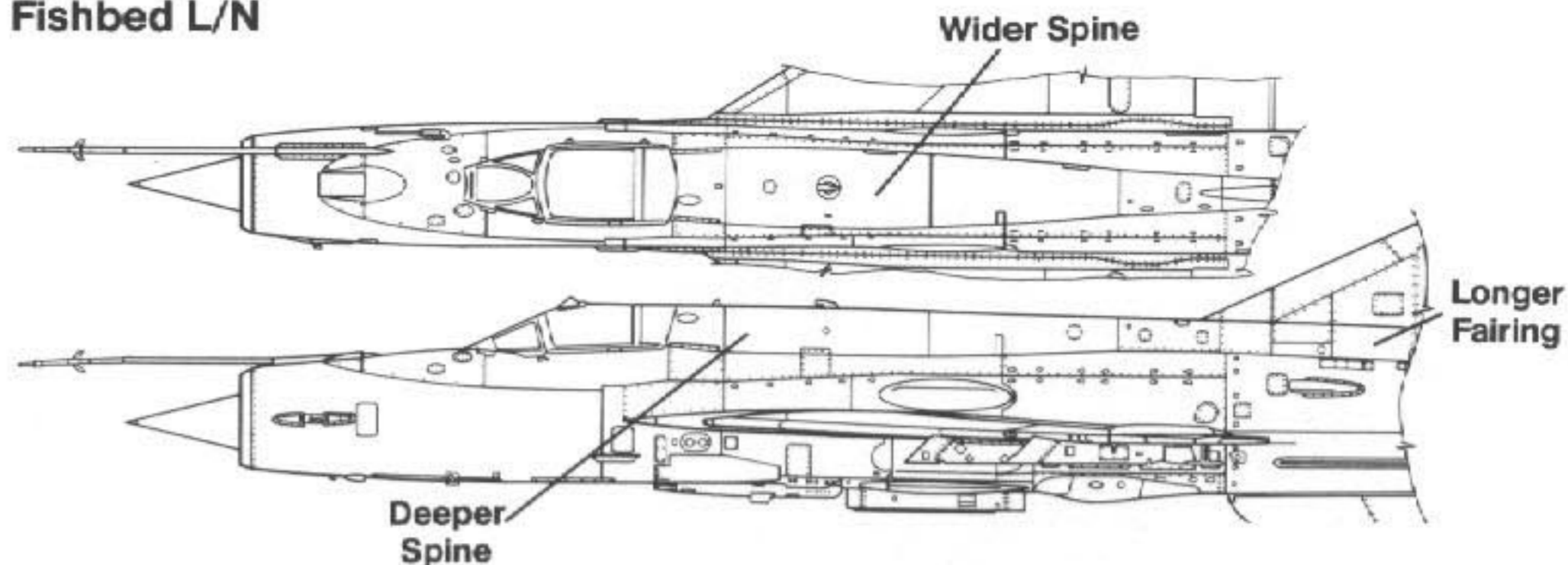
These Soviet Air Force MiG-21bis fighters paid a goodwill visit to Finland giving the West its first information on this Fishbed variant. Shortly after the visit NATO gave the MiG-21bis the reporting name Fishbed L. (Hans-Heiri Stapfer Collection)

## Spine Development

MiG-21MF  
Fishbed J



MiG-21bis  
Fishbed L/N



The MiG-21bis is very effective as a low to medium altitude fighter, but it still suffers from a few long standing weaknesses, including its air intercept radar. The radar has an acquisition range of less than twenty miles and has no look-down capability to search for and track low flying aircraft/cruise missiles. Another weakness is the aircraft's short range, which has been a problem that has persisted from the early Fishbed Cs, despite the additional internal fuel tanks in the spine.

The MiG-21bis saw considerable combat in the Afghanistan war being flown by both the Soviet and Afghan Air Forces. The Limited Contingent of Soviet Forces in Afghanistan, called *OKSVA* for short, used the MiG-21bis for close air support against the Mujahideen rebels. There were at least two units equipped with the MiG-21bis; the 27th Fighter Regiment and the 115th Fighter Regiment, both of which were based at Shindand. The fighting in Afghanistan revealed that the Fishbed, along with the other Soviet fixed wing aircraft such as the MiG-27 Flogger D and the Su-17M Fitter K, were not well suited for this type of combat operation, being designed for conventional war in Europe.

MiG-21s would usually attack from high altitude since low altitude attack runs made them vulnerable to small arms fire and American made Redeye and Stinger shoulder launched surface-to-air missiles. The most often used air-to-ground weapon was the UB-32A thirty-two shot rocket pod. Attack runs were often flown at flat angles and high air-speeds making precision aiming of rockets nearly impossible. As a result the rockets usually impacted in the stony hills far from the rebel positions.

The Afghan Air Force was initially equipped with about forty MiG-21MF and MiG-21bis fighters when the Soviets invaded the country in December of 1980. These aircraft equipped three squadrons of an air defense regiment. At least four aircraft were written off during accidents and a number were lost in combat. When the Soviets withdrew from Afghanistan a number of former Soviet Air Force Fishbeds were transferred to the Afghan Air Force to make up for these losses.

The Iraqi Air Force had (before the Gulf War) some 150 MiG-21MF and MiG-21bis fighters on strength. Numerically it was the most important aircraft of Saddam Hussain's air force. The MiG-21 was used in the air defense, escort and ground support roles.

During the Iran-Iraq war which started on 22 September 1980, MiG-21s were used with limited success against Iranian F-4s and F-5s attacking Iraqi targets. One factor limiting the MiG-21's effectiveness as an interceptor was the inefficient ground control

intercept system and the GCI controllers who were to guide the interceptors to the enemy aircraft. As a result of the poor coordination between the GCI controllers and the MiGs, Iranian aircraft often performed strikes deep inside Iraq without being detected or intercepted. Shortly after the war started, India supplied a number of HAL assembled MiG-21bis Fishbed Ls to Iraq, and China supplied a number of J-7Bs through Egypt.

During the early stages of the war with Iran, a number of Fishbeds scored confirmed kills with French supplied Matra Magic air-to-air missiles. Work to mate the Fishbed weapons system with the Matra Magic began during 1984 and a number of MiG-21s were rewired to accept the French missile. Iraqi pilots, who were trained by Soviet, Indian, British and French instructors, praised the handling characteristics of the MiG-21 but found its weapons load and range rather insufficient. In combat, Iraqi MiG-21s scored several kills including at least one Iranian AH-1J Sea Cobra, shot down by an Iraqi MiG-21bis. Iraqi pilots were also trained to perform ground attack as well as interception missions and the MiG-21bis was used to attack Iranian ground troops.

When Operation DESERT STORM began there were about 95 MiG-21bis Fishbed Ls and MiG-21MF Fishbed Js assigned to air defense squadrons based at Al Taqaddum, Jalibah, Balad, Kirkuk and Talil. There were another six Fishbeds (including several earlier MiG-21PFMs) being overhauled at the aircraft overhaul facility in Dresden, Germany when hostilities started and these aircraft were impounded by the German government and have not been returned to Iraq.

During the Gulf War, the MiG-21s saw very little combat. A number of MiG-21s were destroyed on the ground and others were captured at Talil Air Base in southern Iraq by Coalition troops. On 17 January 1991, two U.S. Navy F/A-18s of VFA-81 aboard USS SARATOGA (CV-60) shot down two MiG-21s that tried to intercept their strike group. Both were hit with AIM-9 Sidewinder AAMs from head-on. On 6 February 1991, CAPT Thomas N. Dietz of the 36th TFW, flying an F-15C, and his wingman, 1LT Robert Hehemann, scrambled to intercept four Iraqi Air Force aircraft which were trying to

**This overall Natural Metal MiG-21bis, Red 26, carries the Red Excellent Aircraft maintenance badge on the nose in front of the tactical number. This award was given for crews that maintained particularly high maintenance standards. (Hans-Heiri Stapfer Collection)**

**The MiG-21bis Fishbed L entered VVS service in February of 1972. The larger dorsal spine held additional fuel and avionics and the aircraft was also capable of carry three 130 gallon drop tanks, two on wing pylons and one on the centerline. (Don Spring/AIR)**

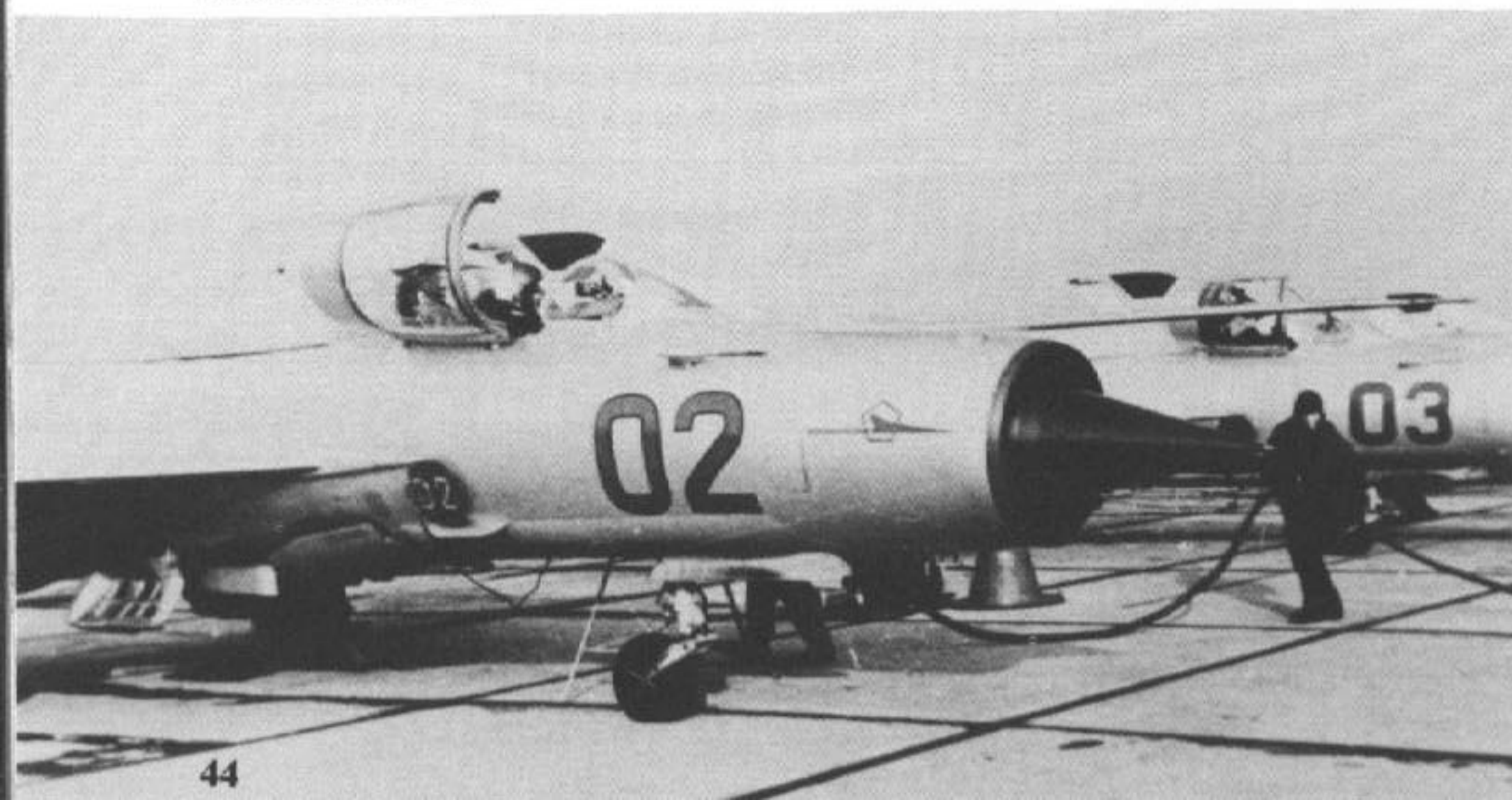


reach the Islamic Republic of Iran. While 1LT Hehemann engaged and shot down two IRAF Su-25K Frogfoot ground attack aircraft, CAPT Dietz shot down two MiG-21s, scoring both kills with AIM-9 Sidewinders. These two Fishbed kills were the only USAF victories over MiG-21s during the Gulf War.

In 1978, the Hungarian Air Force received its first MiG-21bis which were allocated to the *Stromfeld Aurel* Fighter Regiment at Papa and the *Kapos* Fighter Regiment at Taszar. The Hungarians used traditional names of famous Hungarian persons, cities and rivers for their units and the Papa based regiment was named after GEN Stromfeld, who had commanded the Hungarian army which won a battle against the Czechs in 1919. The Taszar based MiG-21bis unit was named after the Kapos river.

Since the disestablishment of the Warsaw Pact, the Hungarian Air force has changed its national markings twice. The Red Star marking carried by the Fishbeds under the former communist government was initially replaced by a White and Green chevron inside a Red circle. This marking was short lived being replaced, on 31 January 1991, by the traditional Red/White/Green chevron national insignia similar to the one used on Hungarian aircraft during the Second World War.

A Soviet Air Force MiG-21bis Fishbed L, Red 02, is refueled prior a mission. The tactical number was repeated on the Red air intake relief cover in White. While externally similar to the Fishbed J, internally the MiG-21bis is a new aircraft. (Hans-Heiri Stapfer Collection)



## MiG-21bis-SAU Fishbed N

The MiG-21bis-SAU was the ultimate variant of the MiG-21bis Fishbed L. Externally it could be distinguished from the earlier MiG-21bis by the additional antenna fitted under the air intake and by another small antenna above the rudder. Internally, the MiG-21bis-SAU was upgraded with improved avionics similar to late production MiG-23M Floggers. All MiG-21bis-SAU, including export variants, were built at Zavod 21 and NATO gave this final MiG-21 variant the reporting name Fishbed N. The MiG-21 production line was closed in 1974 and production was shifted to the more advanced MiG-23M Flogger. The only Warsaw Pact nation to receive the MiG-21bis-SAU was East Germany.

Former East German Fishbeds were stored until late 1992, when it was announced that some 136 MiG-21s of various sub-types would be scrapped. The terms of the European arms limitation treaty did not allow for these aircraft be absorbed into the German *Bundesluftwaffe*. Two MiG-21MF Fishbed Js and MiG-21bis Fishbed Ns were transferred to the Experimental Center of the Luftwaffe WTD 61 at Manching, Bavaria for evaluation.

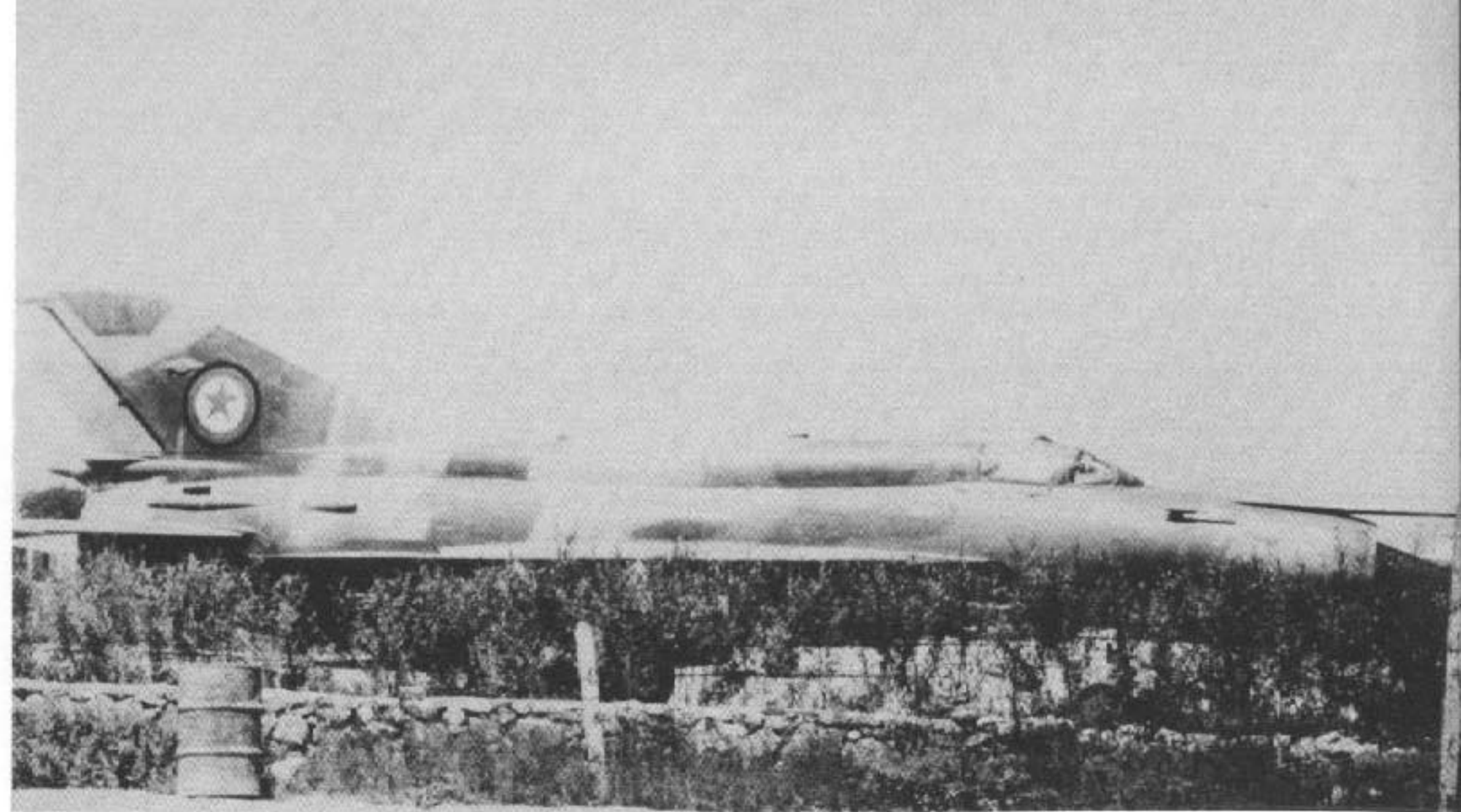
All former East German MiG-21s received a West German four digit code for inventory registration purposes; however, only those which were cleared for flight testing were painted with national insignia. All other aircraft were painted with the registration codes (in Black) and their former East German national marking and three digit tactical number were overpainted.

The tactical number on the nose of this overall Air Superiority Gray Soviet Air Force MiG-21bis Fishbed L is Blue with a thin Black outline. The spine of the Fishbed L was faired farther back into the vertical fin than the earlier Fishbed J. (NASM)



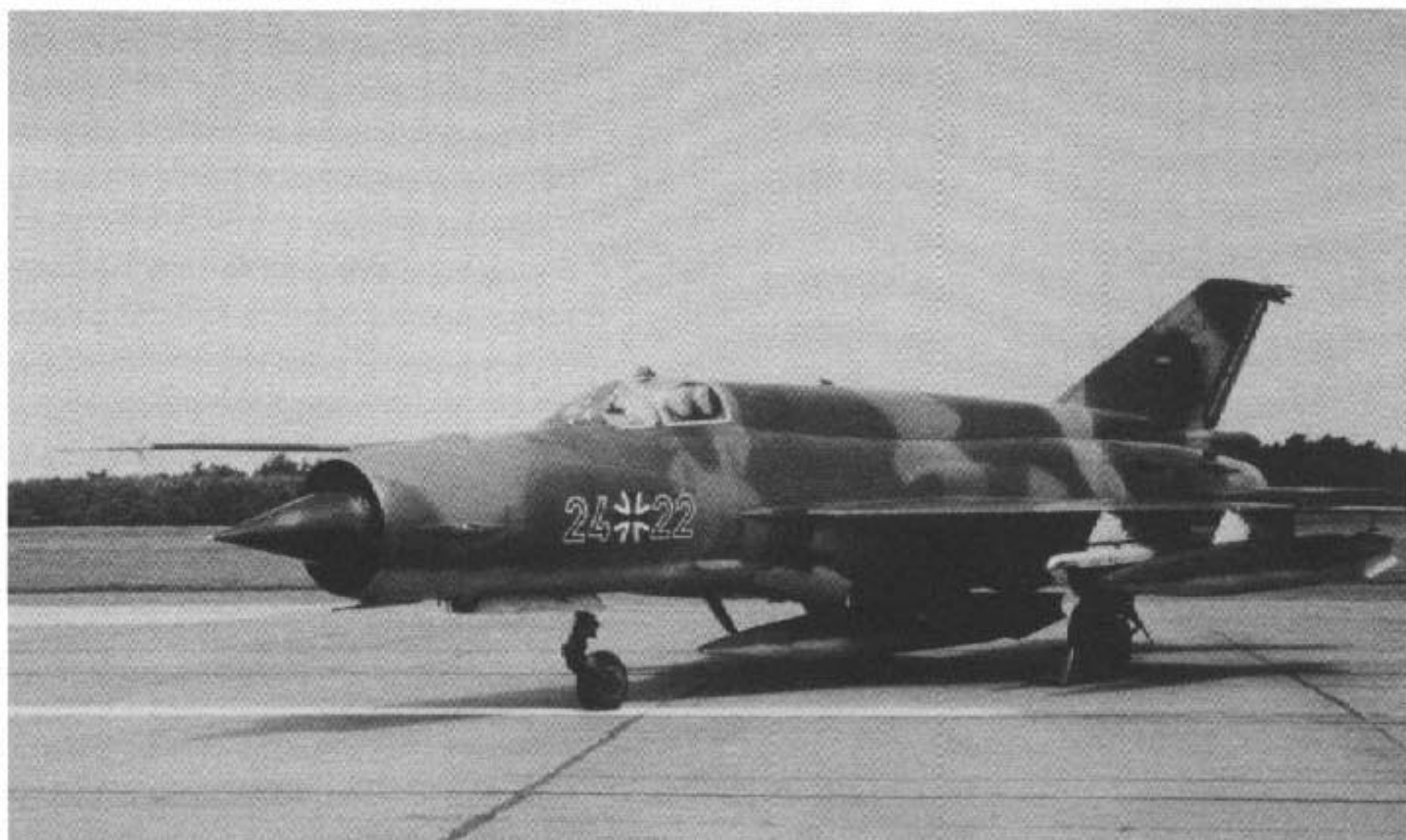


Ground crewmen detach the tow bar from a Polish MiG-21bis, Red 9811, while the pilot performs his preflight checks. There were only a few MiG-21bis Fishbed Ls delivered to Poland, the main variant in service being the MiG-21MF Fishbed J. (Wolfgang Tamme via Hans-Heiri Stapfer)



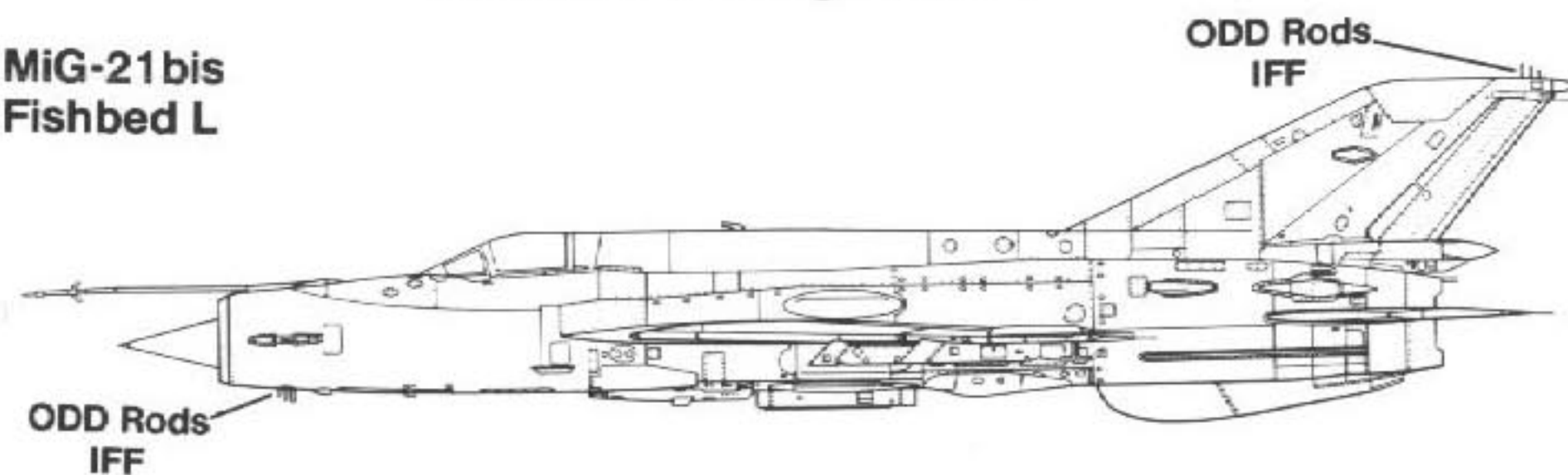
A MiG-21bis Fishbed L of the Afghanistan Air Force parked on the ramp at the Military Flying Academy in Kabul during 1987. This style of national marking was first introduced into service during 1982. (Wojciech Luczack)

This former East German MiG-21bis-SAU Fishbed N was absorbed into the German *Bundesluftwaffe* and registered 24+22. The aircraft retained its East German camouflage of Tan and Olive Drab over Light Blue undersurfaces. The Fishbed N differs from the Fishbed L in the ILS antennas on the nose and fin tip. (Marcus Fülber)

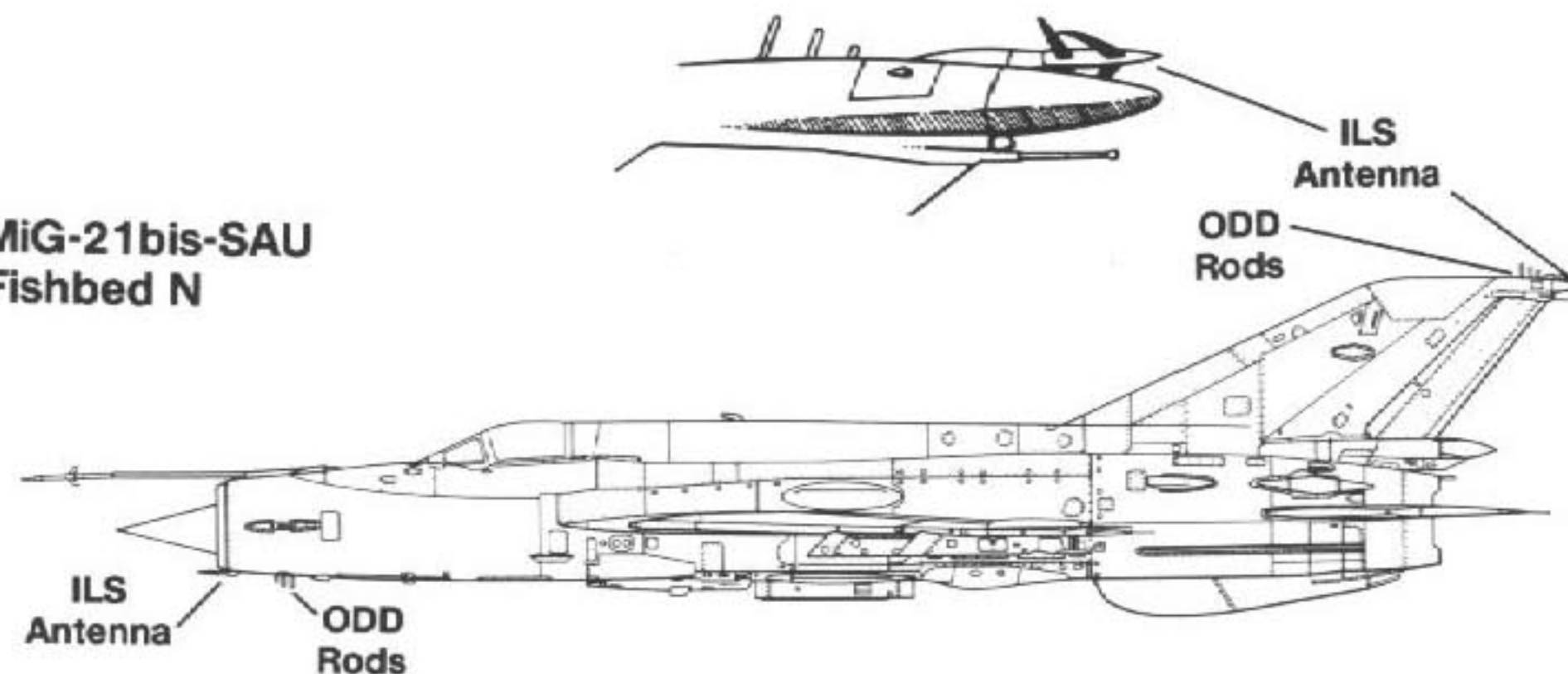


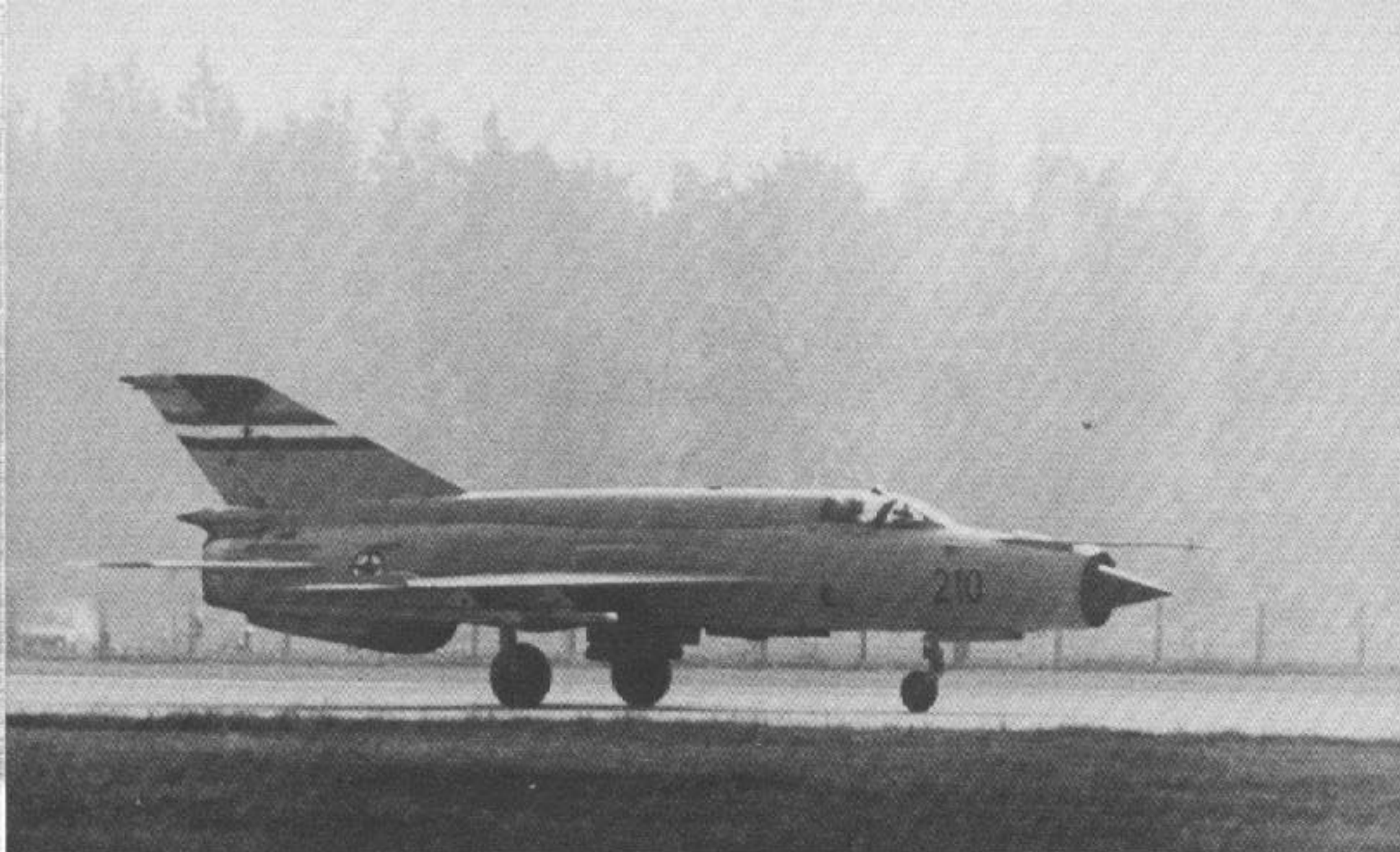
## Antenna Configuration

MiG-21bis Fishbed L

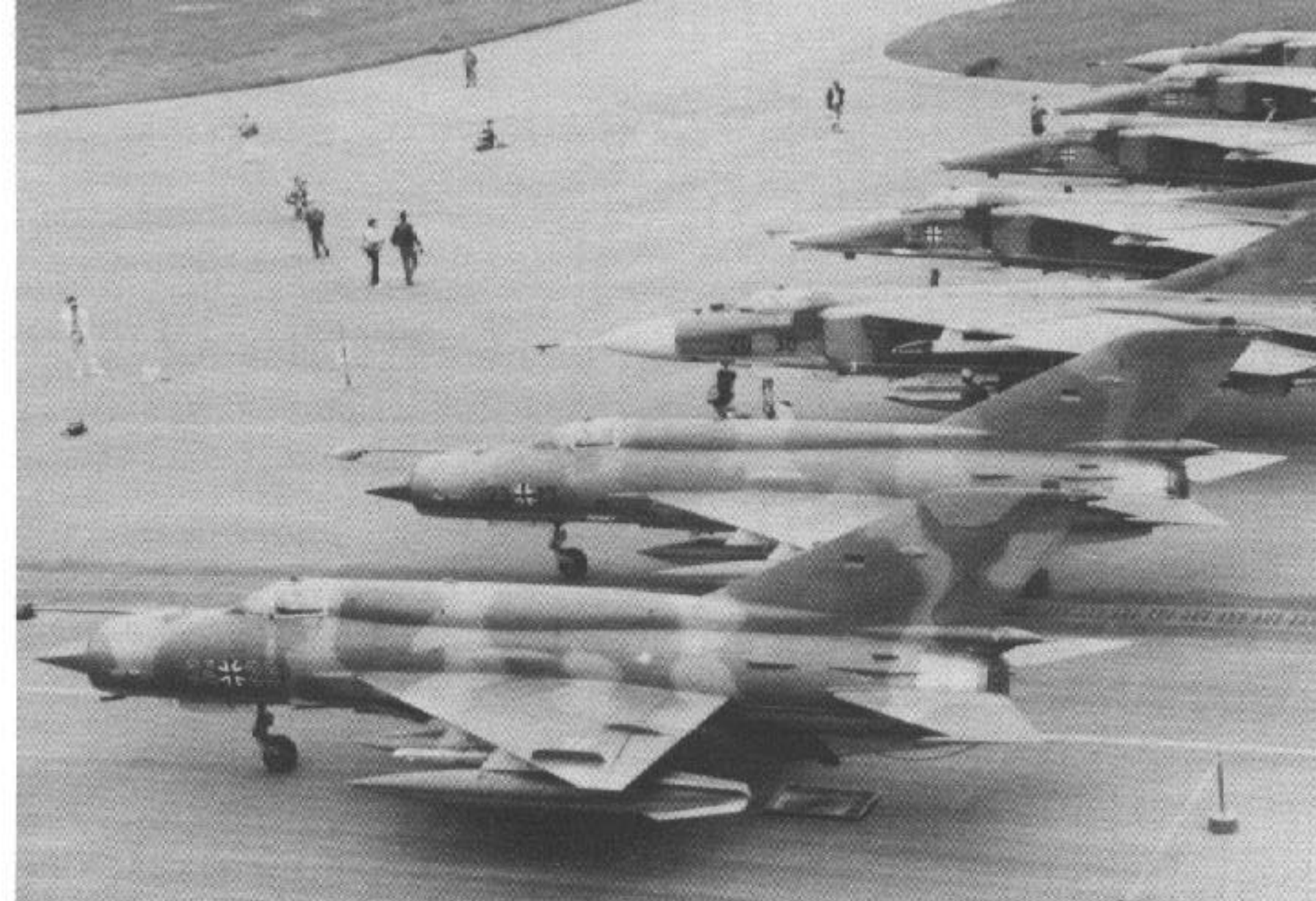


MiG-21bis-SAU Fishbed N





A Yugoslav Republic MiG-21bis (Black 210) taxis out for an early morning training mission. Although the high command of the air force was dominated by Serbians, nearly half of all MiG-21 pilots were in fact Croatian and several have defected to Croatia with their aircraft. (Emil Pozar)

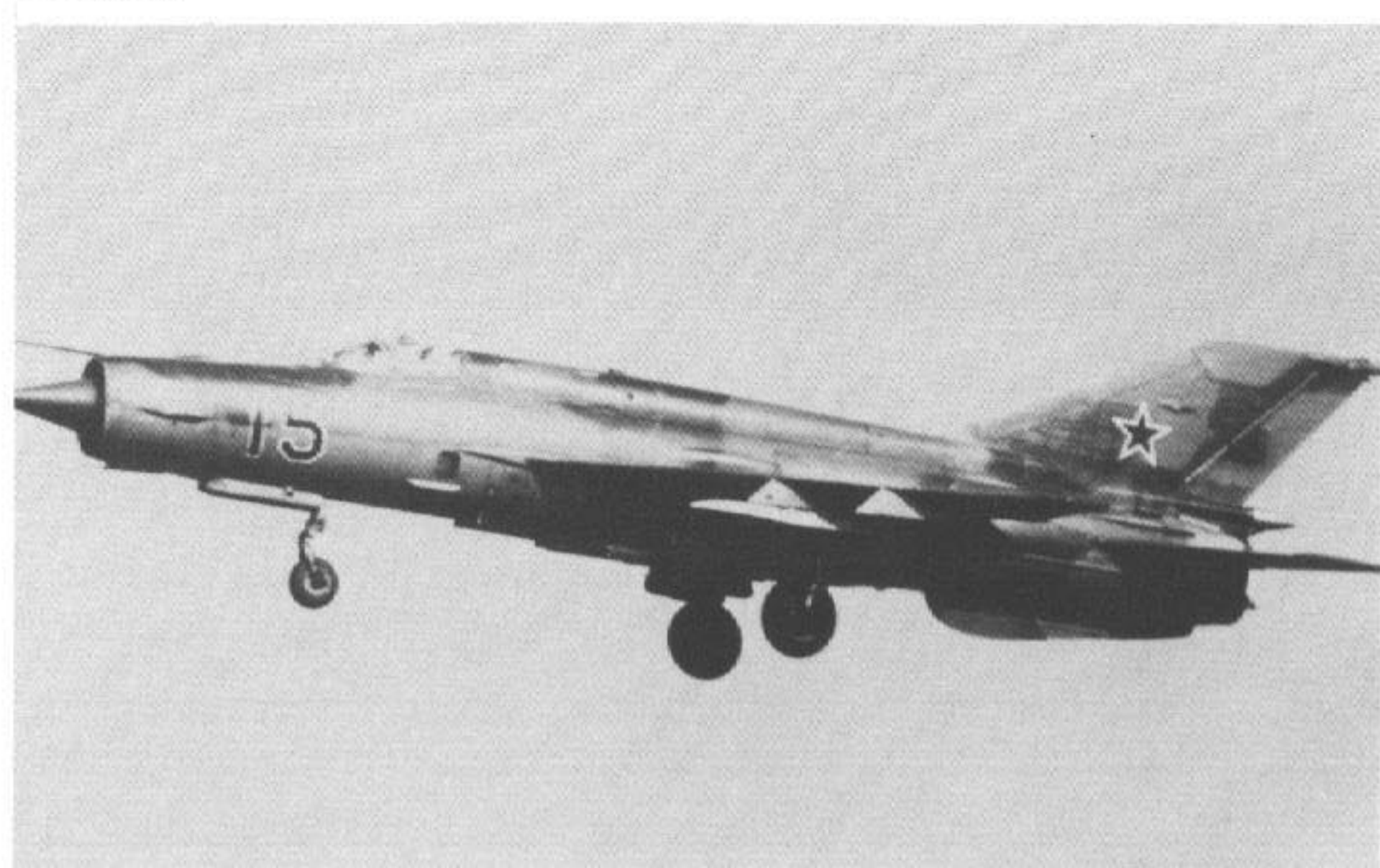


These MiG-21s and MiG-23s are assigned to the Test and Evaluation Center of the German Air Force (WTD-61) at Manching in Bavaria. The aircraft in the foreground is a MiG-21bis-SAU (24+20), behind it is a MiG-21MF (23+17). The difference between the dorsal spines of the two aircraft is very noticeable when they are together. (Harald Ziewe)

This overall Air Superiority Gray Yugoslav Republic Air Force MiG-21bis-SAU Fishbed N, Black 125, carries a K-13A (AA-2 Atoll) missile on the outboard wing pylon. Since the partitioning of Yugoslavia into separate republics, the national markings have been changed and the Red star is no longer carried. (Don Sperry)

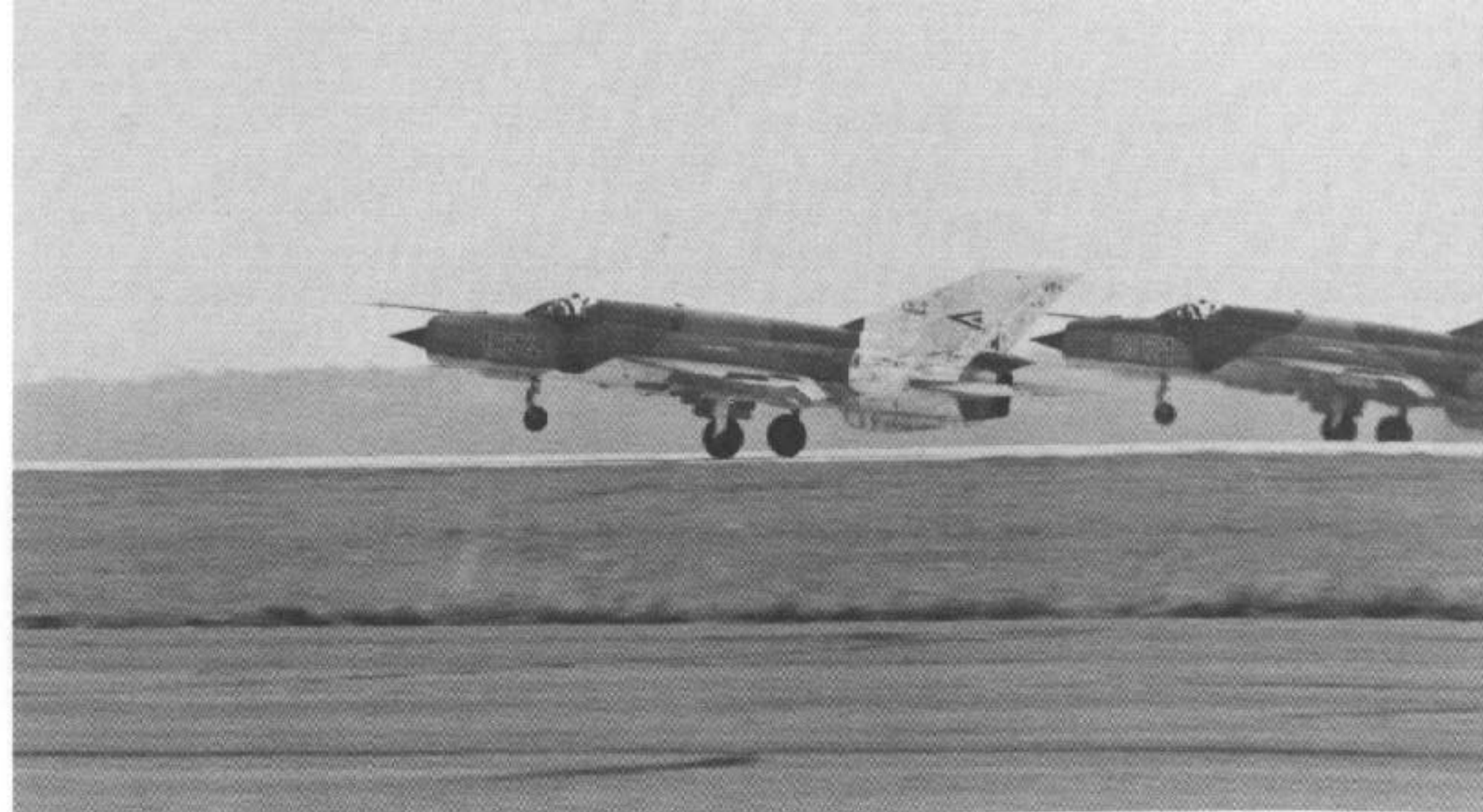


A Soviet Air Force MiG-21bis on final approach for landing at its home base. The aircraft carries a tactical camouflage scheme of Brown and Dark Green uppersurfaces over Light Gray undersurfaces, which was applied to most VVS MiG-21s during mid-1970. (Hans-Heiri Stapfer Collection)





A MiG-21bis, MG-116, of the Finnish Air Force on the ramp at Kubinka Air Base, USSR during August of 1991. The MiG-21 detachment was supported on their goodwill trip by the Fokker F-27 Friendship in the background. (Yefim Gordon)



Two Hungarian MiG-21bis Fishbed Ls, Red 1874 and Red 2021, of the Kapos Regiment take off from Taszar for an air combat training mission carrying the new national markings. For ACM training purposes the entire tail of the lead Fishbed was painted White. (George Punka)

These Finnish Air Force MiG-21bis Fishbed Ls visited the Soviet Air Force base Kubinka near Moscow during early August of 1991. They carry reduced size roundels and the White background for the Black Lynx unit marking on the fin was deleted. (Yefim Gordon)





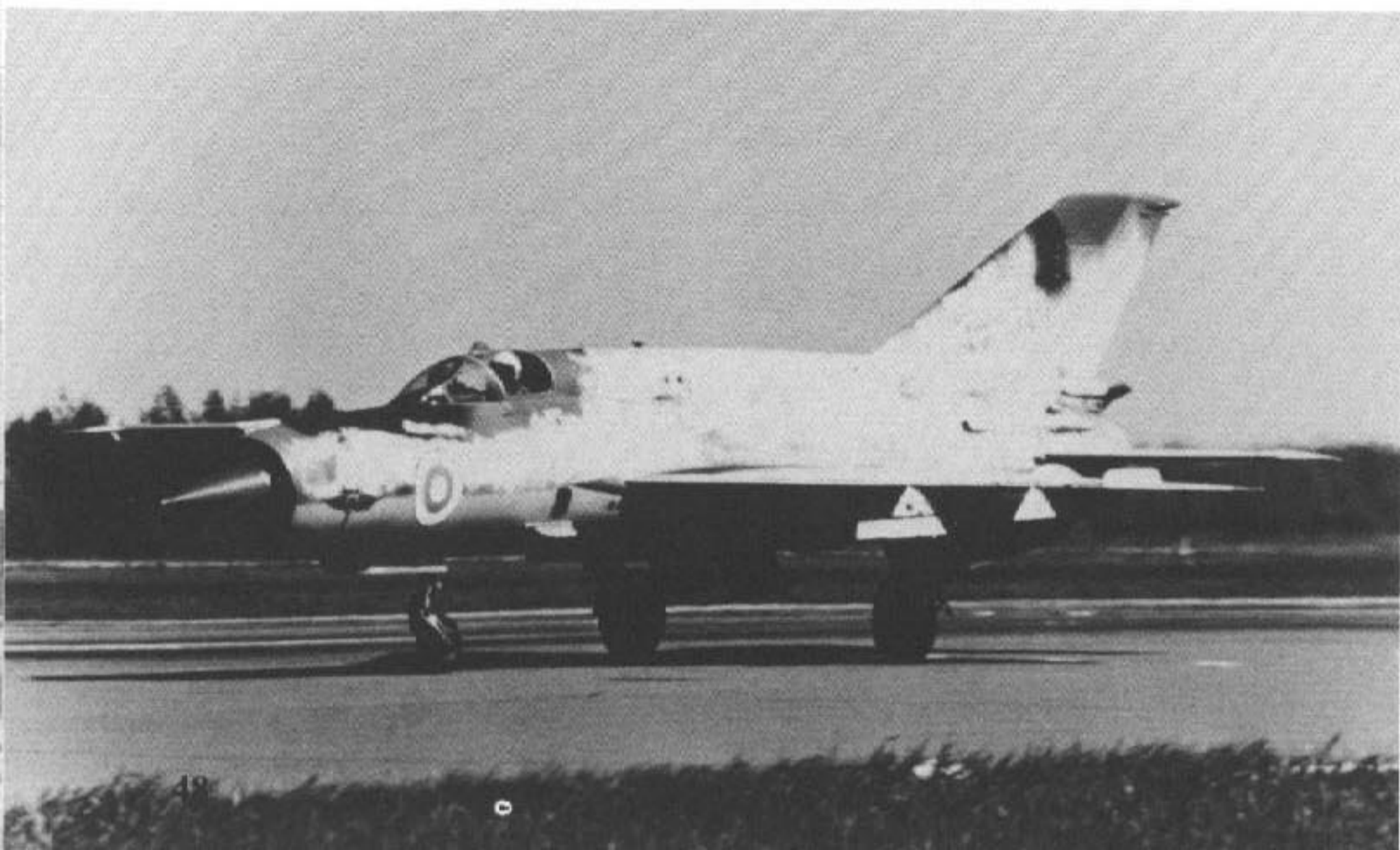


Three Finnish MiG-21bis Fishbed Ls on the ramp at Oulu Air Base during June of 1987 being prepared for a training sortie. Each MiG has three drop tanks, two 290 liter (76.6 gallon) tanks on the outer wing pylons and a 800 liter (211 gallon) tank on the centerline. (Jyrki Laukkanen)



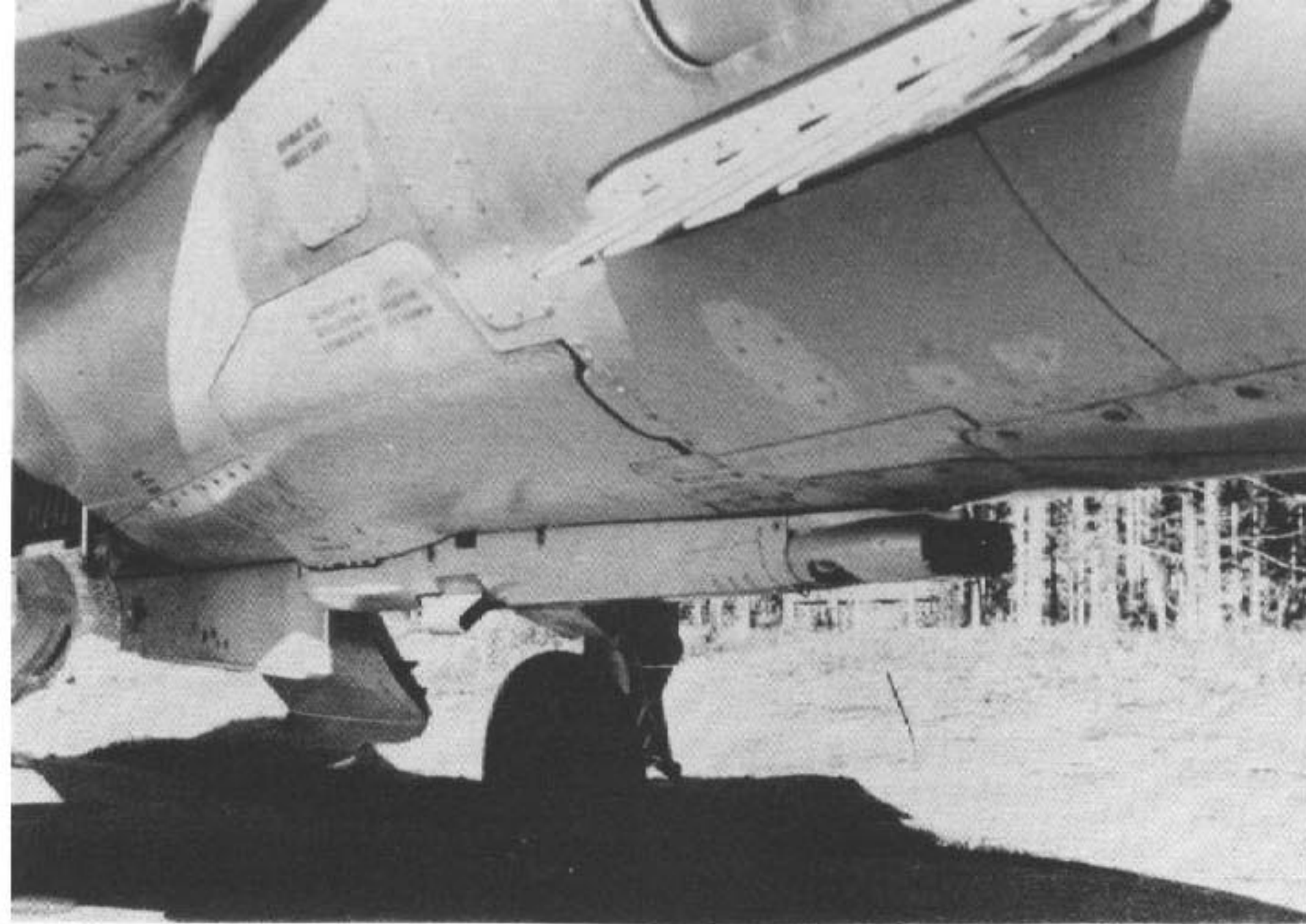
A Finnish Air Force MiG-21bis Fishbed L taxis along the taxiway of its home base. The MiG-21bis Fishbed L has a completely re-engineered fuselage that is lighter, stronger and has more space for internal fuel in the larger fuselage spine. (Jyrki Laukkanen)

This Finnish Air Force MiG-21bis Fishbed L was painted with a temporary snow camouflage for an exercise. The MiG-21bis has improved weapons capability, including radar guided K-13A (AA-2-2 Advanced Atoll) missiles. (Jyrki Laukkanen)

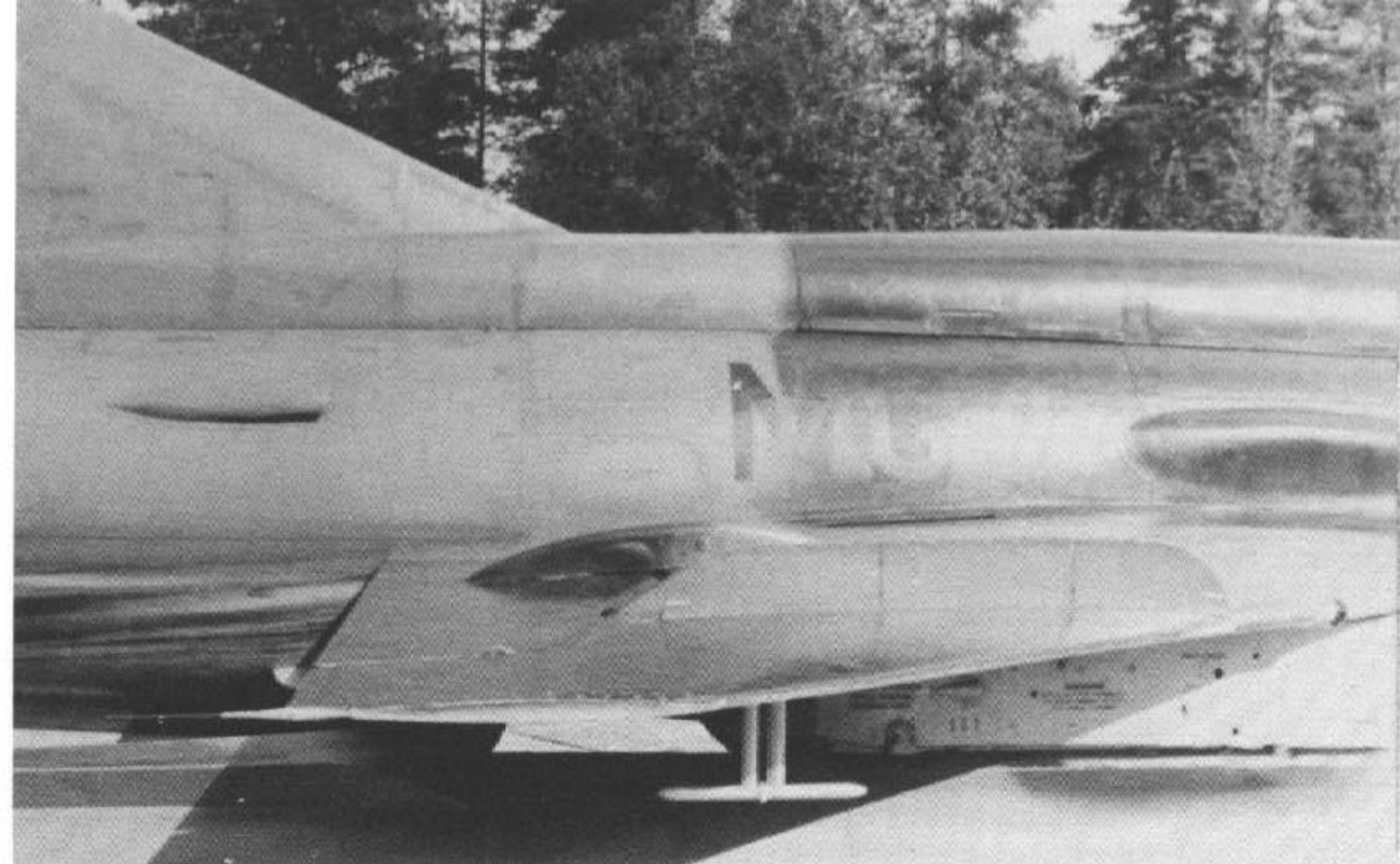


Assisted by the ground crew, a Finnish pilot boards his Fishbed L for a training mission. The MiG-21bis Fishbed L entered operational service with the 31st Fighter Squadron (HavLLu 31) of the Finnish Air Force during 1981, replacing the MiG-21F-12 Fishbed C. (Jyrki Laukkanen)



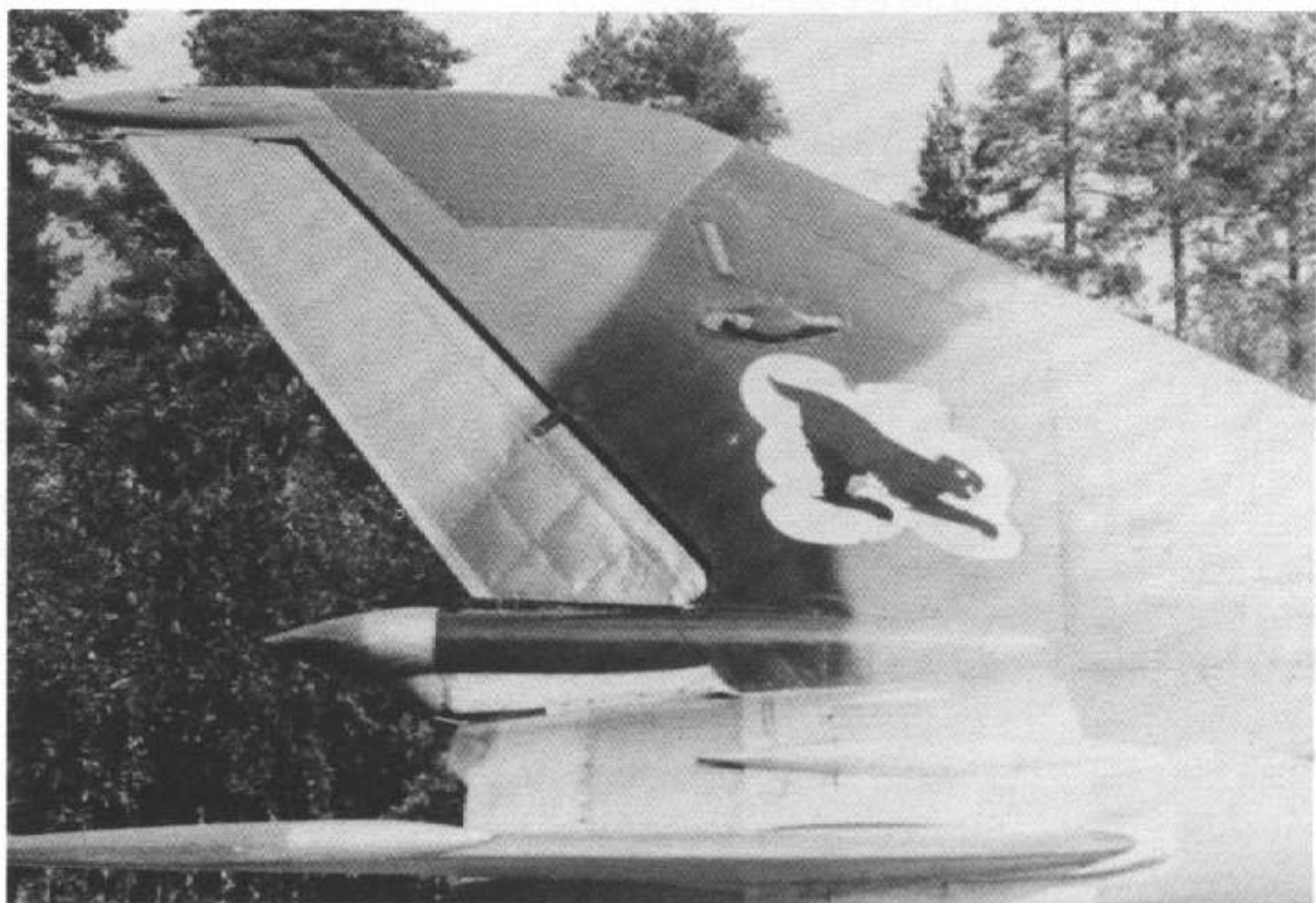


The auxiliary air inlet on the fuselage side is protected from gun gasses by the fence directly below the door, The GSh-23L twin barrellled 23mm cannon has two ram air intakes on the gun housing to allow cooling and purging air into the gun bay. (Jyrki Laukkanen)

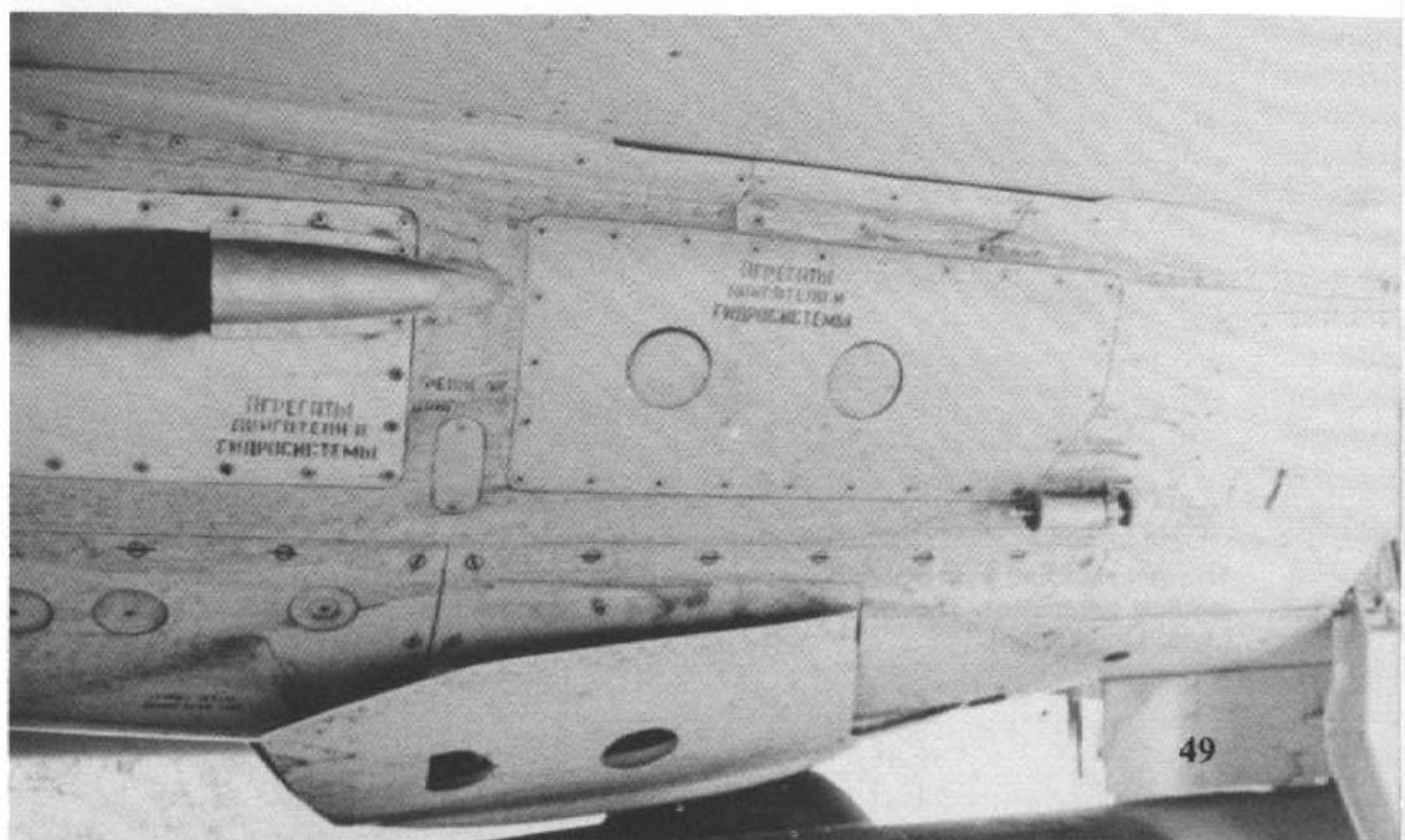


The air flow fence on the upper wing forces the airflow back across the aileron, improving maneuverability and control. The small inverted T antenna under the wing is one of two such antennas carried as part of the radio altimeter system. (Jyrki Laukkanen)

The dielectric cap at the top of the fin is made of fiberglass and usually painted a Medium Green. The bullet fairing at the base of the rudder is the braking parachute housing. (Jyrki Laukkanen)

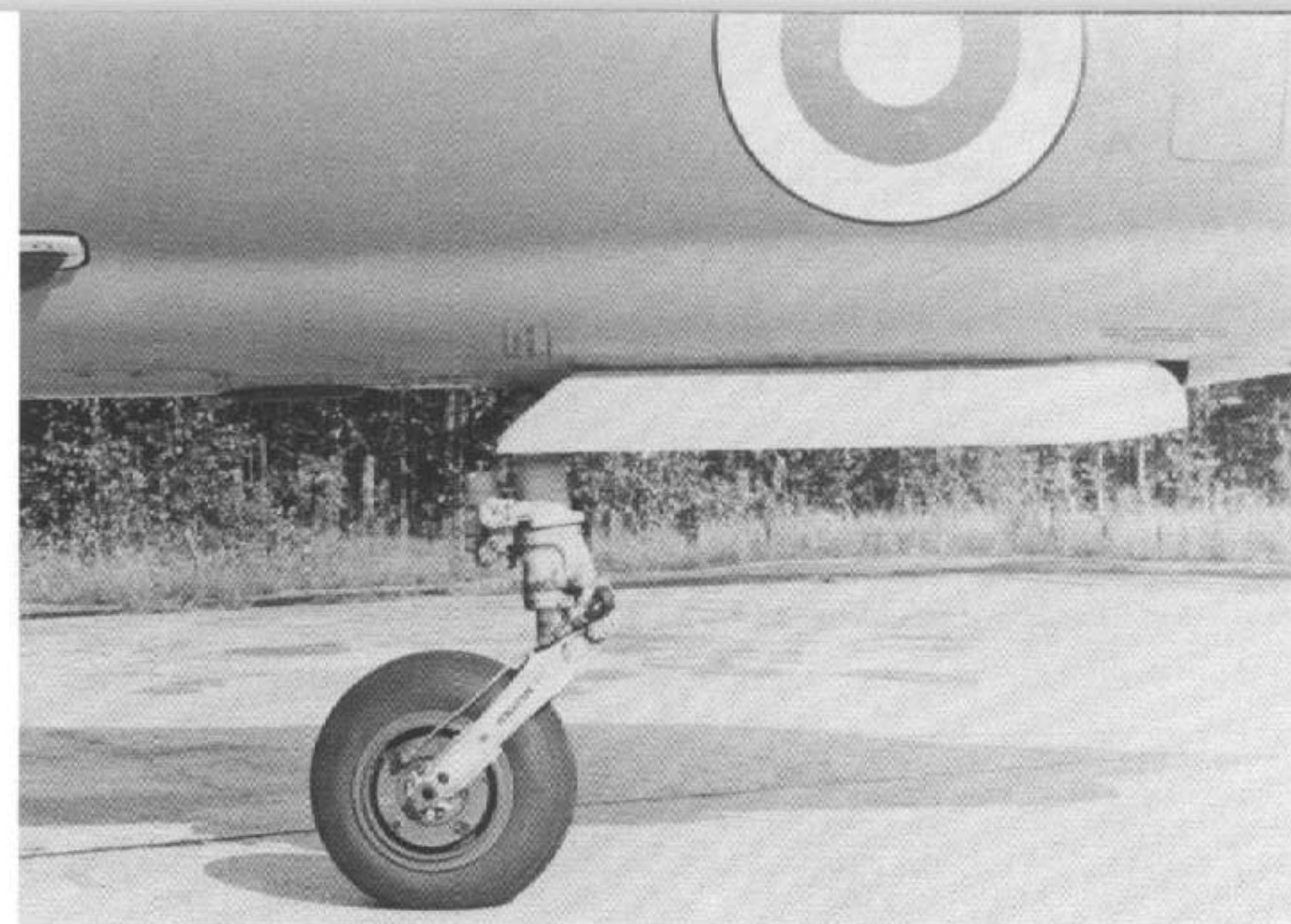


The rear fuselage speed brake is a single piece bulged and perforated hydraulically operated unit. The use of the speed brakes reportedly causes no change in aircraft trim. (Jyrki Laukkanen)



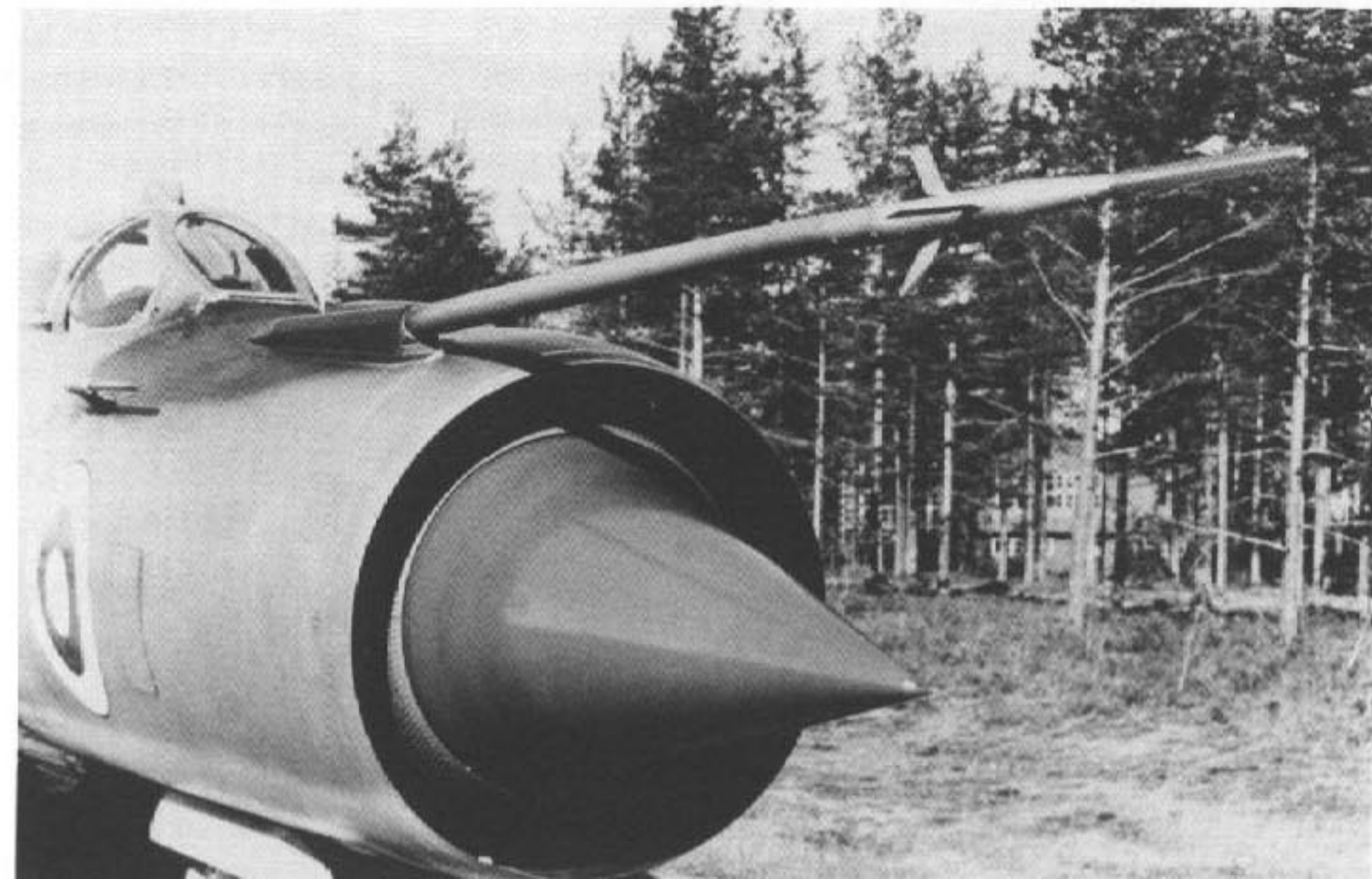


The main landing gear doors are a two part door, with the lower section attached to the main landing gear strut. The door closing piston is mounted in front of the main gear strut. (Jyrki Laukkanen)



The nosewheel of the MiG-21 retracts forward into the landing gear bay. Just behind the gear bay is a small Black e electronics antenna and an intake air flow dump is located just forward of the gear doors. (Jyrki Laukkanen)

The shock cone also serves as the radome for the Jay Bird Improved search and track radar. The air data probe is offset to starboard and has vanes to detect both roll and yaw. This information is fed directly into the fire control system. (Jyrki Laukkanen)



# MiG-21 Trainers

Since the MiG-21 was to be built in large numbers it was anticipated that a conversion trainer would be needed to train pilots on the new aircraft. The MiG OKB had produced only one other trainer variant of a MiG fighter, the MiG-15UTI Midget two seat variant of the MiG-15 Fagot fighter. The MiG-21 trainer project would be only the second such project handled by the MiG OKB, since there were no training versions of the MiG-17 and MiG-19. In November of 1959, it was decided that the trainer variant would be based on the MiG-21F-13 airframe.

## MiG-21U Mongol A

The prototype trainer was given the company designation Ye-6U and flew for the first time on 17 October 1960 with P.M. Ostapyenko at the controls. The trainer retained the overall dimensions of the MiG-21F-13 with the second cockpit occupying space in the fuselage previously used for fuel (internal fuel was reduced to 2,350 liters 620 gallons). The two cockpits were covered by separate side opening canopy sections and the internal cannons and their ammunition were deleted as was the ranging radar.

After successfully completing its State Acceptance Trials, the aircraft was cleared for production and given the designation MiG-21U. Production began at Tbilissi in Georgia during 1962 and lasted until 1966 (for the Soviet Air Force). Export aircraft were built at the *Znamya Truda* facility in Moscow beginning in 1964 and ending in 1968.

When the training version of the MiG-21F-13 was detected by the West, NATO assigned the aircraft the reporting name Mongol. Early MiG-21Us had the braking parachute container housed in the port side of the fuselage underside in front of the ventral fin, while late production MiG-21Us had the parachute housed in a container at the base of the rudder. The forward speed brakes differed from the MiG-21F-13, with the two piece speed brakes being replaced by a single piece speed brake mounted on the fuselage centerline.

## MiG-21US Mongol B

With the introduction of the second generation MiG-21PF and MiG-21PFM, it was decided to produce a training variant which would be internally similar to these second generation Fishbeds.

The trainer, designed the MiG-21US, was configured with blown flaps, a R-11F2S-300 power plant and cockpit instrumentation similar to the MiG-21PF/PFM. The RP-21 Sapphire radar was deemed to be unnecessary and was not installed on the MiG-21US and for this reason, the smaller diameter nose of the earlier MiG-21U was retained. The rear cockpit was modified with the canopy having a periscope for the instructor installed in the solid upper canopy framing. When the type entered service, NATO assigned it the reporting name Mongol B.

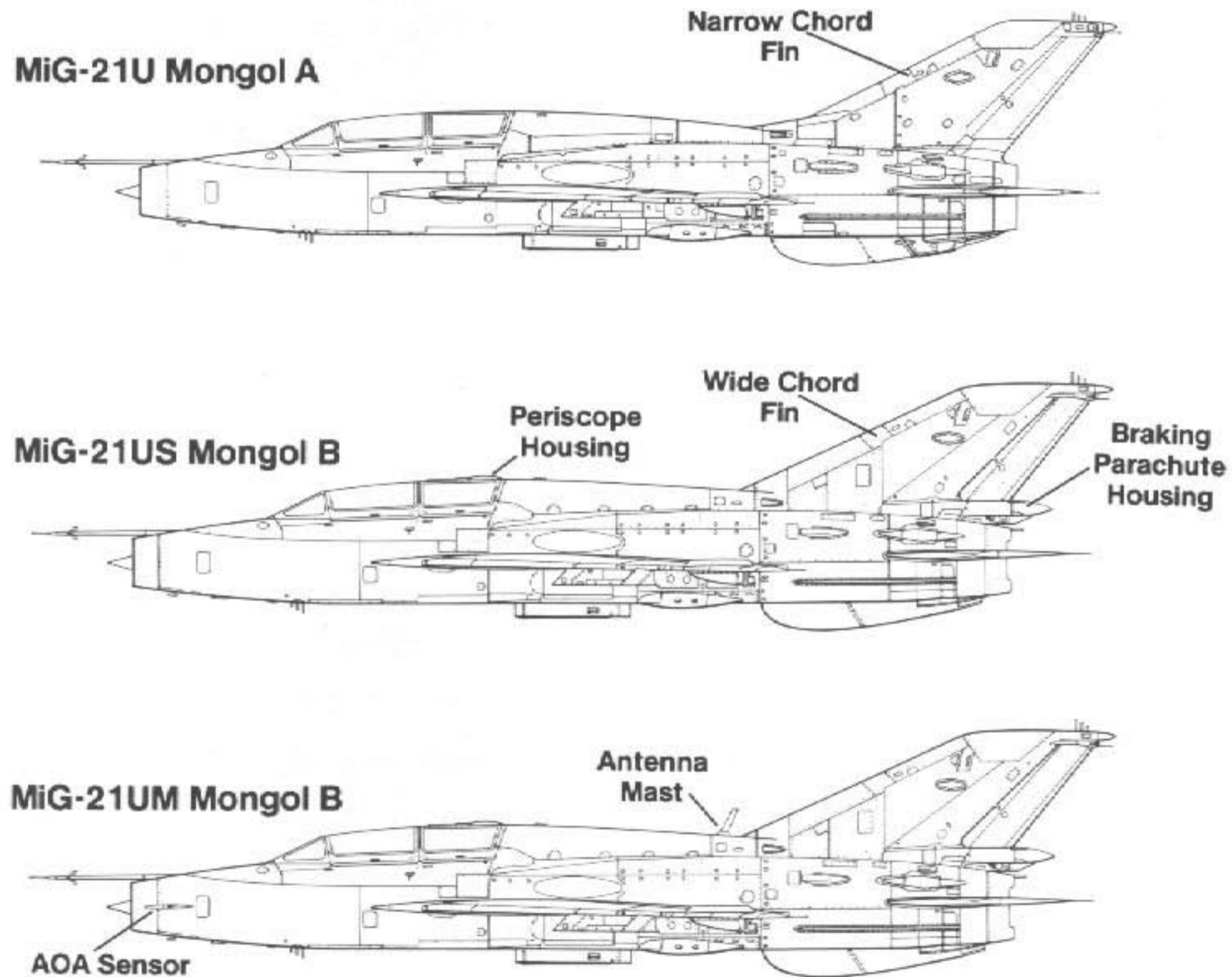
All production MiG-21US Mongol Bs had the braking parachute housed in a container at the base of the rudder and all featured the wide chord fin and rudder adopted from the late production MiG-21PF. The SK ejection seat, used on the MiG-21F-13, MiG-21U and MiG-21PF was replaced by an improved KM-1M ejection seat.

Production of the MiG-21US began during 1966 at Tbilissi for both Soviet Air Force and export customers and lasted until 1970.



A two seat trainer variant of the MiG-21 was also produced with production beginning at Tbilissi during 1962. This Finnish Air Force MiG-21U Mongol A was built at the *Znamya Truda* facility in Moscow, as were all export Mongol As. (Jyrki Laukkanen)

### Mongol Development



# MiG-21UM

The MiG-21UM was the training variant for the third generation Fishbed family (MiG-21SM/M/MF/R) and was modified in equipment and avionics to represent these aircraft.

The KAP-2 autopilot was replaced by an AP-155 unit, an angle of attack sensor was added to the port side of the nose and a blade antenna was added to the rear portion of the fuselage spine. The pitot tube on the starboard side of the nose was larger than the pitot tube used on the MiG-21U/US. Early production MiG-21UMs were powered by a 13,668 lbst R-11F2S-300 turbojet while late production aircraft were fitted with the 14,550 lbst R-13-300 power plant used on the MiG-21MF.

Since no training version of the MiG-21bis was produced, the MiG-21UM became the ultimate Soviet-built training version of the Fishbed.

China has also developed a trainer variant under the designation JJ-7 (export designation FT-7). These aircraft are quite similar to the late MiG-21UM, although the single ventral fin of the Mongol B was replaced by two larger underfuselage fins. The TF-7 can carry a pair of PL-5 missiles (Chinese AIM-9L Sidewinder copies) and can be fitted with an underfuselage 23MM cannon pod in front of the centerline pylon. Pakistan has taken delivery of at least fifteen FT-7s, giving them the designation F-7TP.

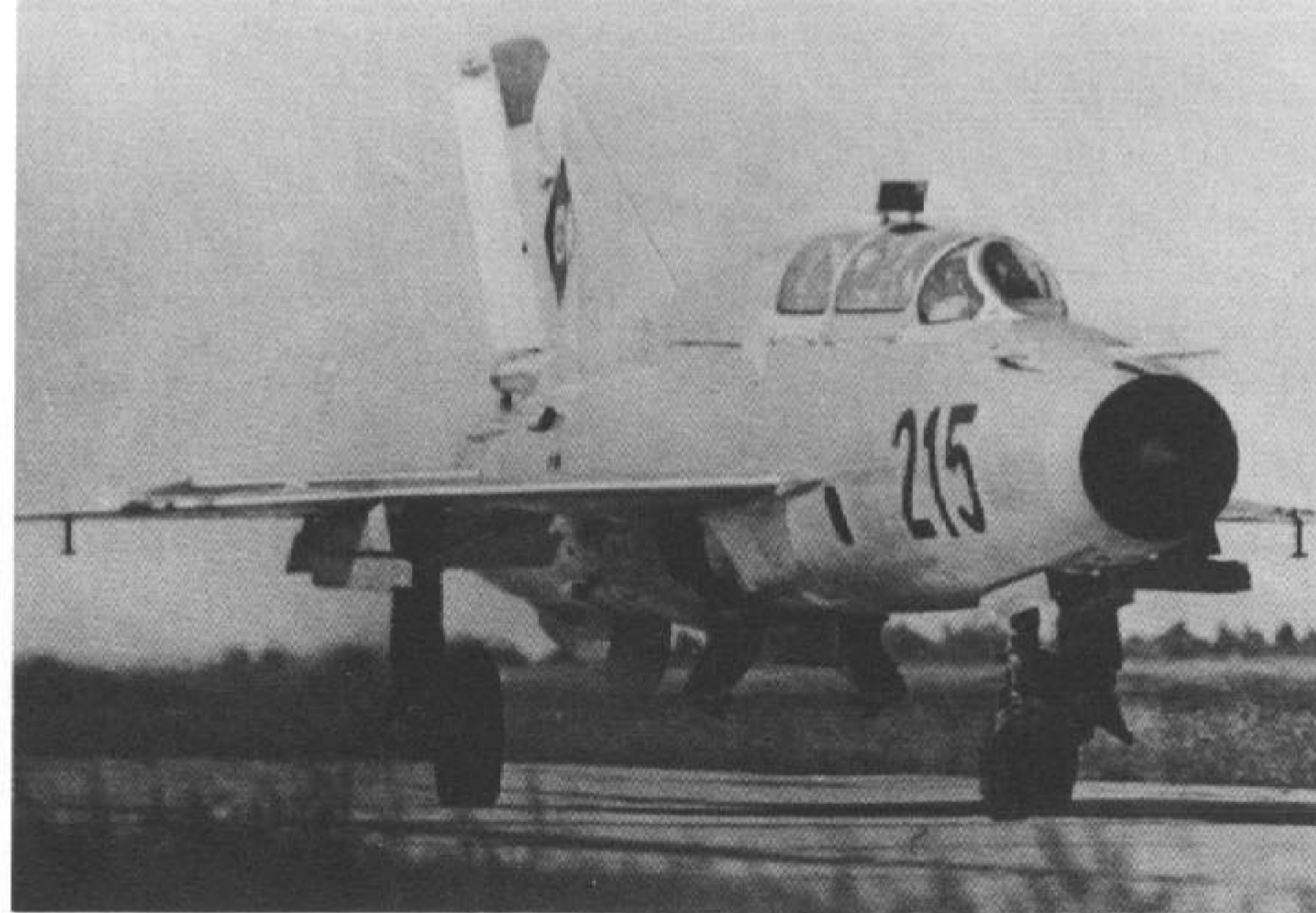
The canopy on the MiG-21U Mongol A was a two piece side hinged unit with a wind screen separating the two cockpits. The Mongol A carried no internal armament but could carry a K-13 (AA-2 Atoll) missile under each wing. (Jyrki Laukkanen)



A ground crewman preforms maintenance in the cockpit of a Finnish Air Force MiG-21U Mongol A at Halli Air Base during 1976. The Mongol shares the ramp with a MiG-21F-12 Fishbed C and a pair of French-built CM-170 Magister trainers. (Jyrki Laukkanen)

An East German MiG-21U Mongol A, Black 275, during a training flight over Germany during the 1960s. The first MiG-21Us arrived in East Germany during early 1965. The MiG-21U Mongol A has many of the same features as the MiG-21F-13 Fishbed C. (Hans-Heiri Stapfer Collection)





A Natural Metal East German Air Force MiG-21US Mongol B on the taxiway of its home base. At least one of these trainers was assigned to every fishbed fighter unit within the East German Air Force. (Hans-Heiri Stapfer Collection)



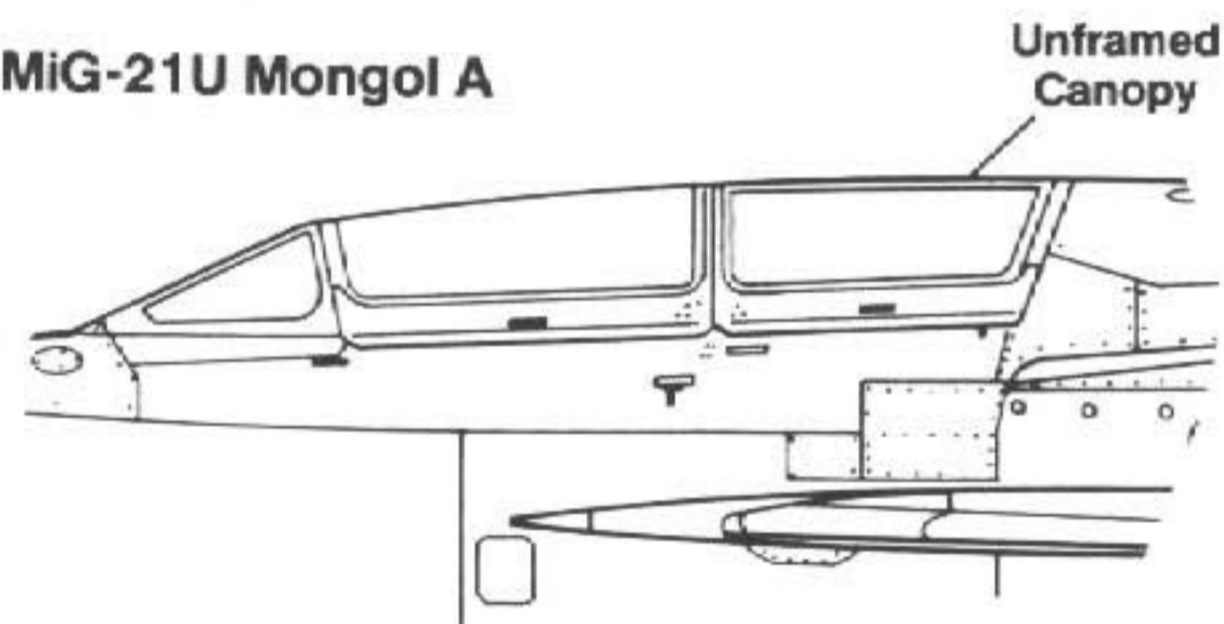
A Sudanese Air Force MiG-21US Mongol B is examined by USAF pilots during the Bright Star exercise held in January of 1979. The Black tactical number is in both Arabic and English numbers. (USAF)

This former East German Air Force MiG-21US Mongol B carries the Federal German registration code 24-12 but lacks full German insignia. The MiG-21US Mongol Bs used by East Germany were delivered in Natural Metal and camouflaged during the mid-1970 in East Germany. (Jens Schymura)

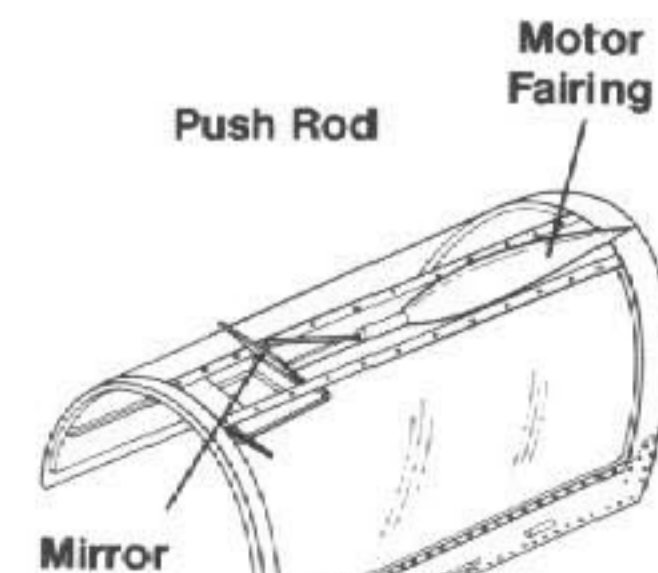
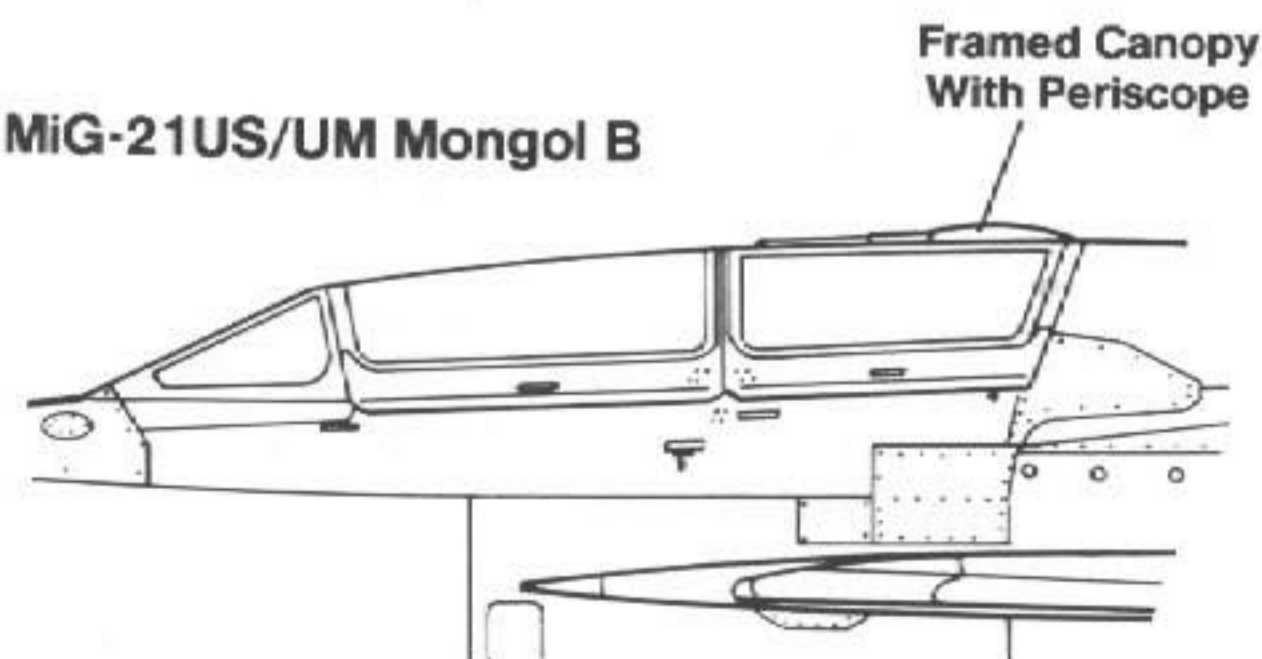


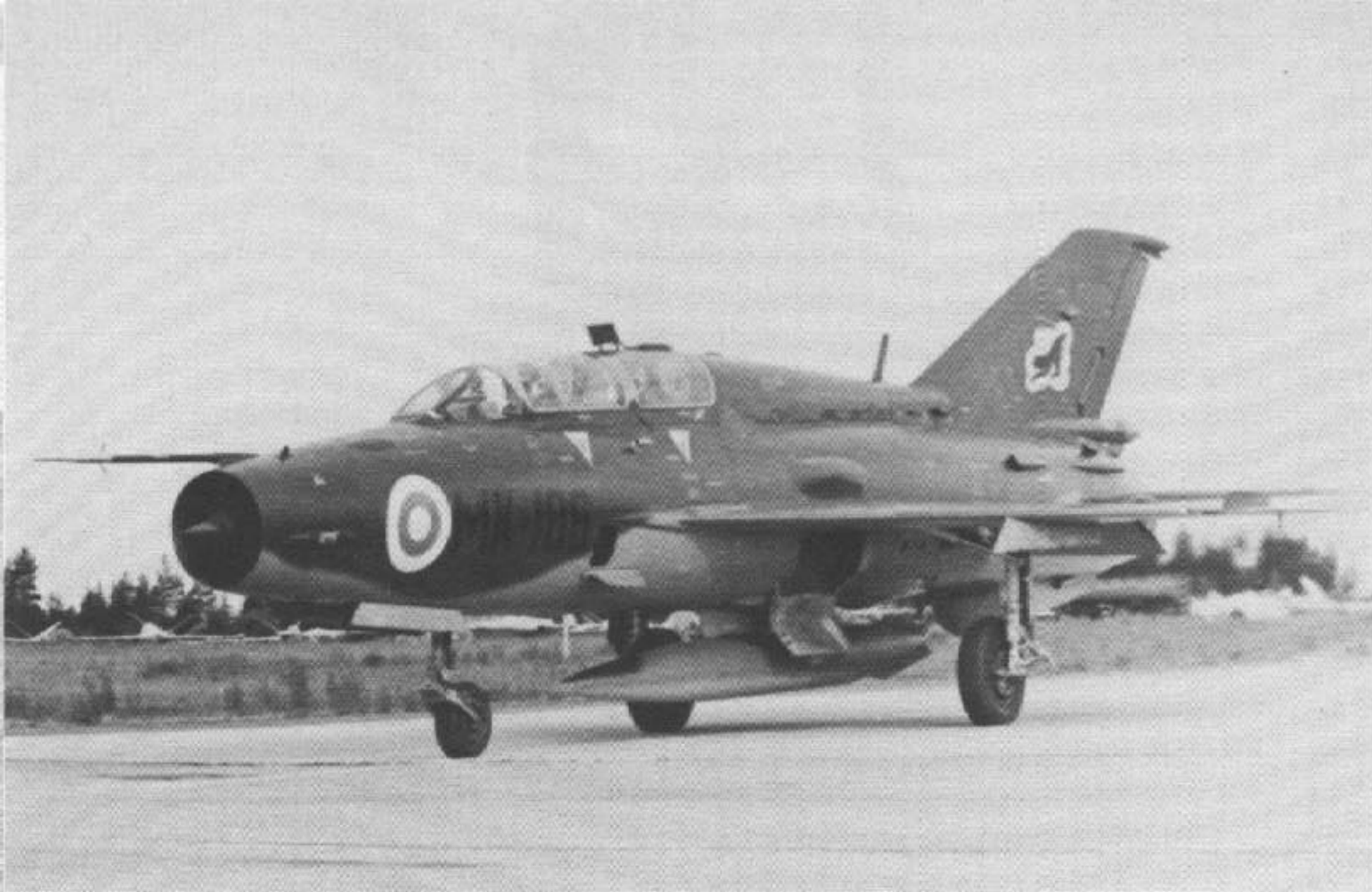
### Instructor's Canopy

MiG-21U Mongol A



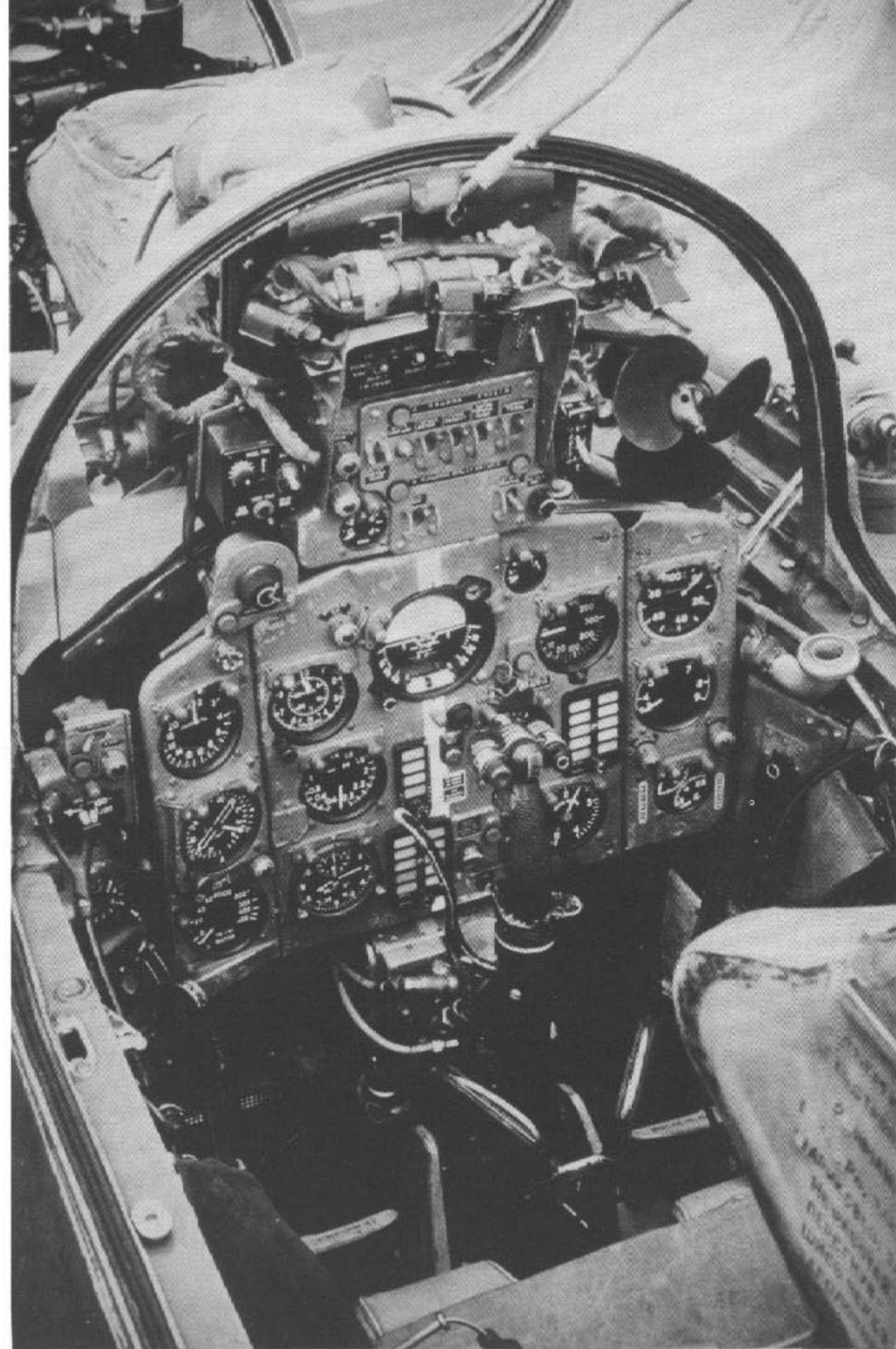
MiG-21US/UM Mongol B



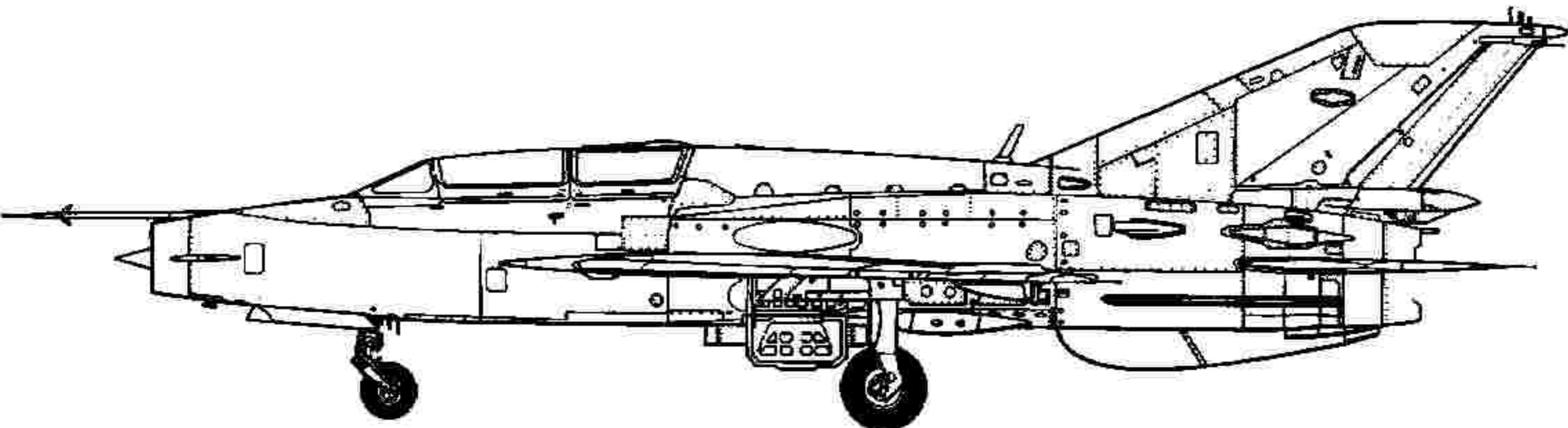


The instructor pilot in the rear cockpit is provided with a retractable periscope on the MiG-21US and MiG-21UM Mongol B for use during landings and take offs. The periscope is mounted in the upper canopy framing. (Jyrki Laukkanen)

The crew of a Finnish Air Force Mig-21UM Mongol B conducts preflight checks on the runway of a Finnish Air Force base. The rear cockpit of the MiG-21U series was not raised making it necessary to provide the instructor with a periscope to allow him to see anything in front of the aircraft. (Jyrki Laukkanen)



The rear (instructor's) cockpit of an East German MiG-21UM Mongol B. All instrumentation and legends are in Cyrillic not German. The small fan on the upper instrument panel is the same type used on Soviet transports and helicopters. (Marcus Fülber)



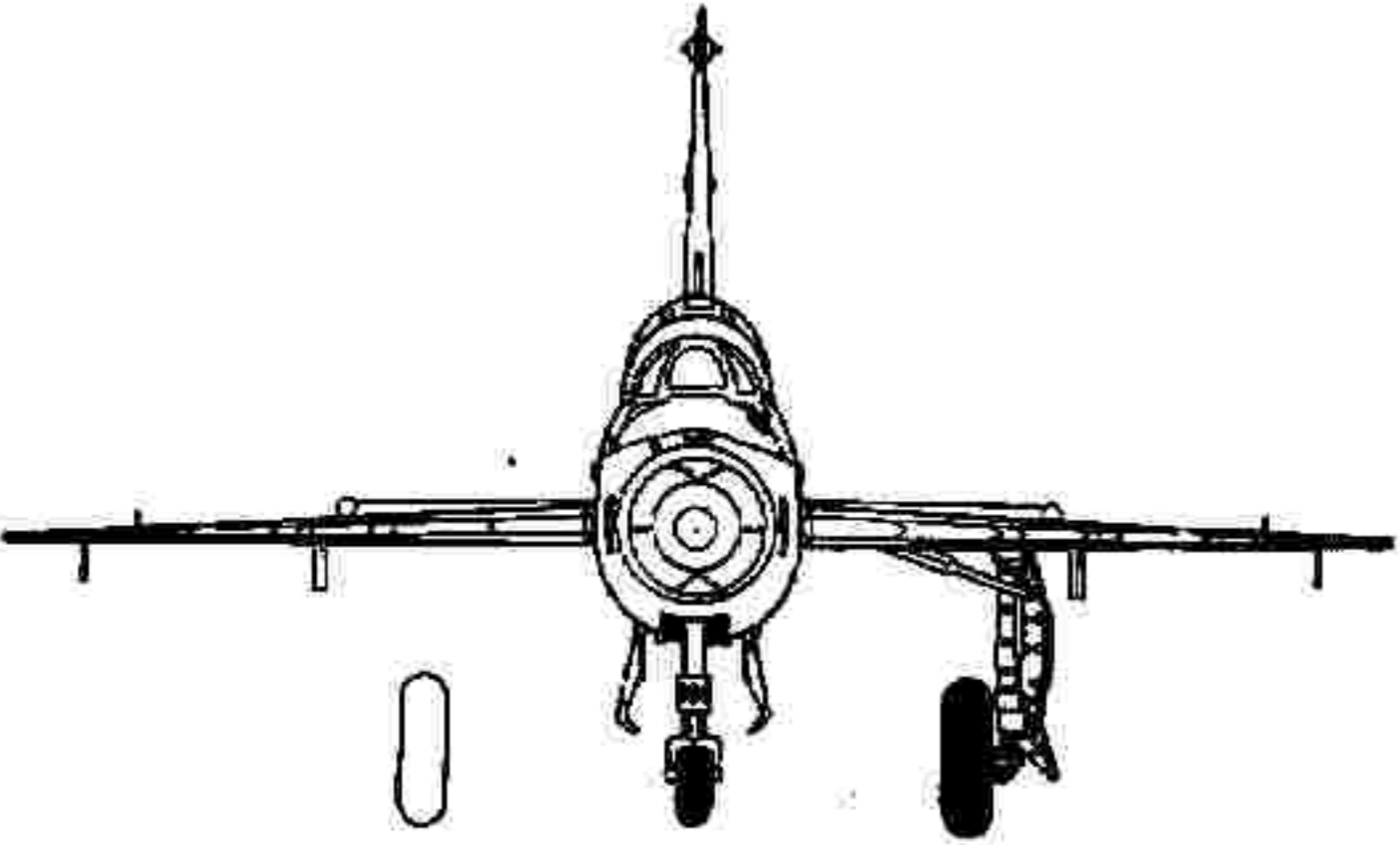
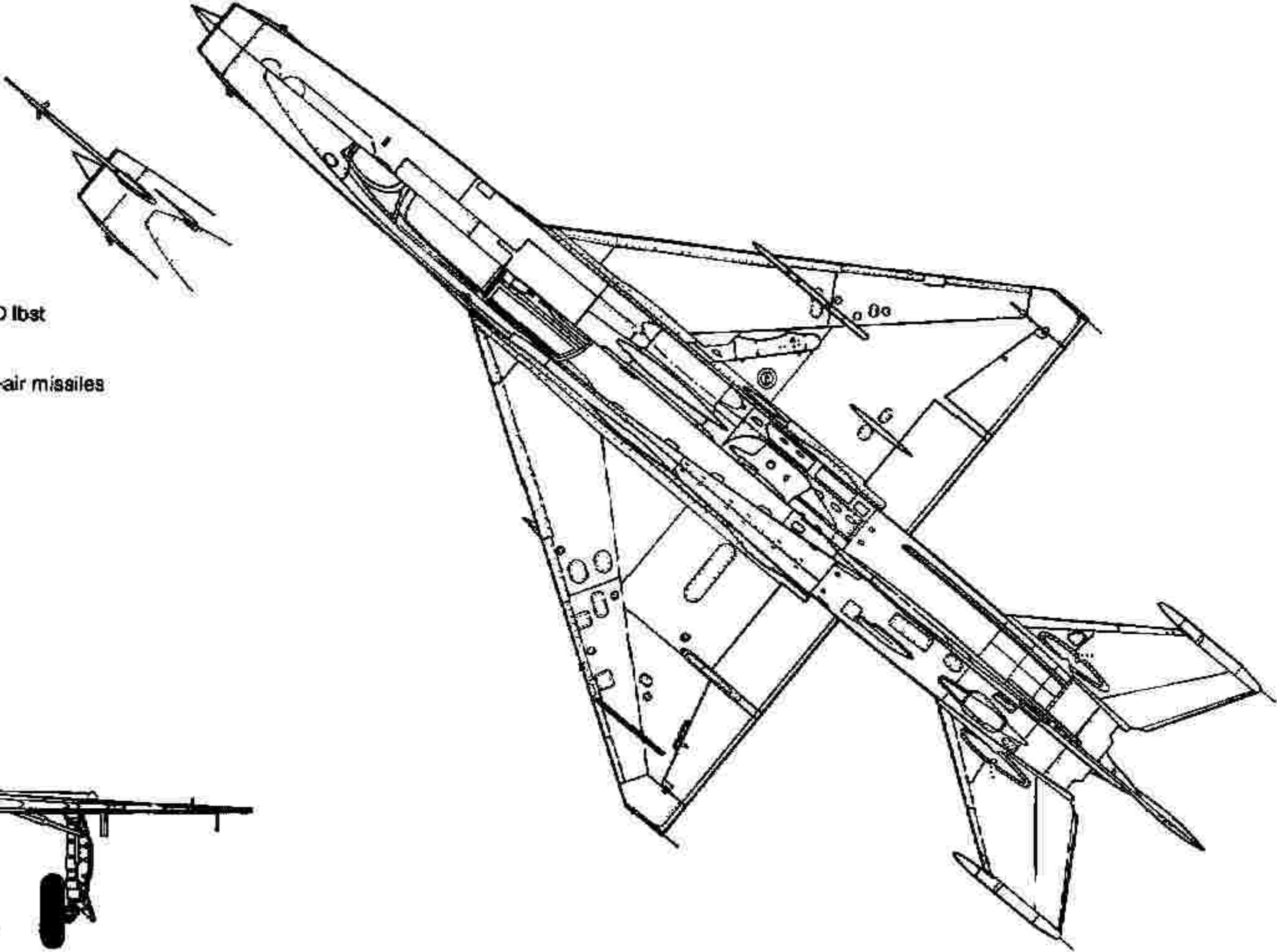
### Specifications

## MiG-21UM Mongol B

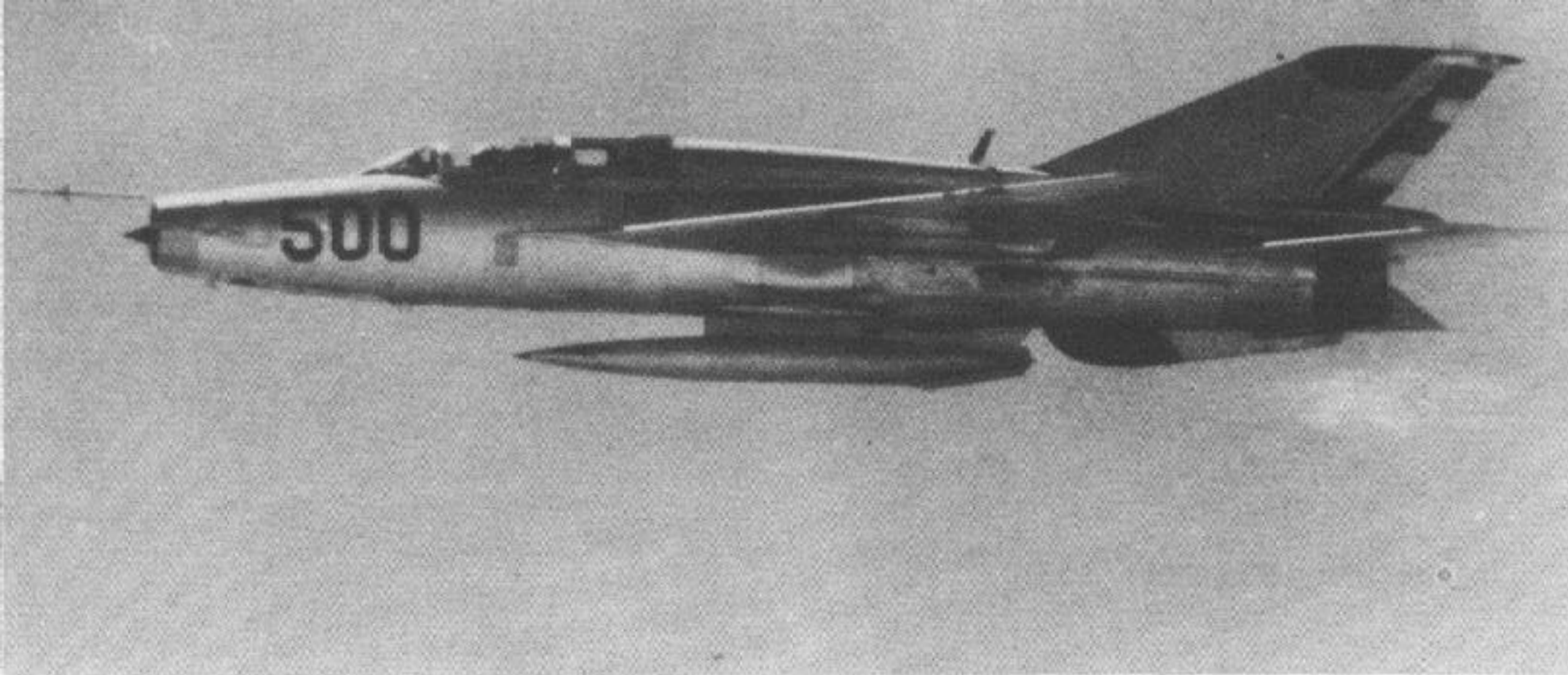
Wingspan .....23 feet  
Length .....46 feet 2 inches  
Height .....13 feet 2 inches  
Empty Weight .....11,750 pounds  
Maximum Weight .....18,430 pounds  
Powerplant .....One Tumansky 14,550 lbt  
R-13-300 turbojet

Armament.....Two K-13 (AA-2) air-to-air missiles

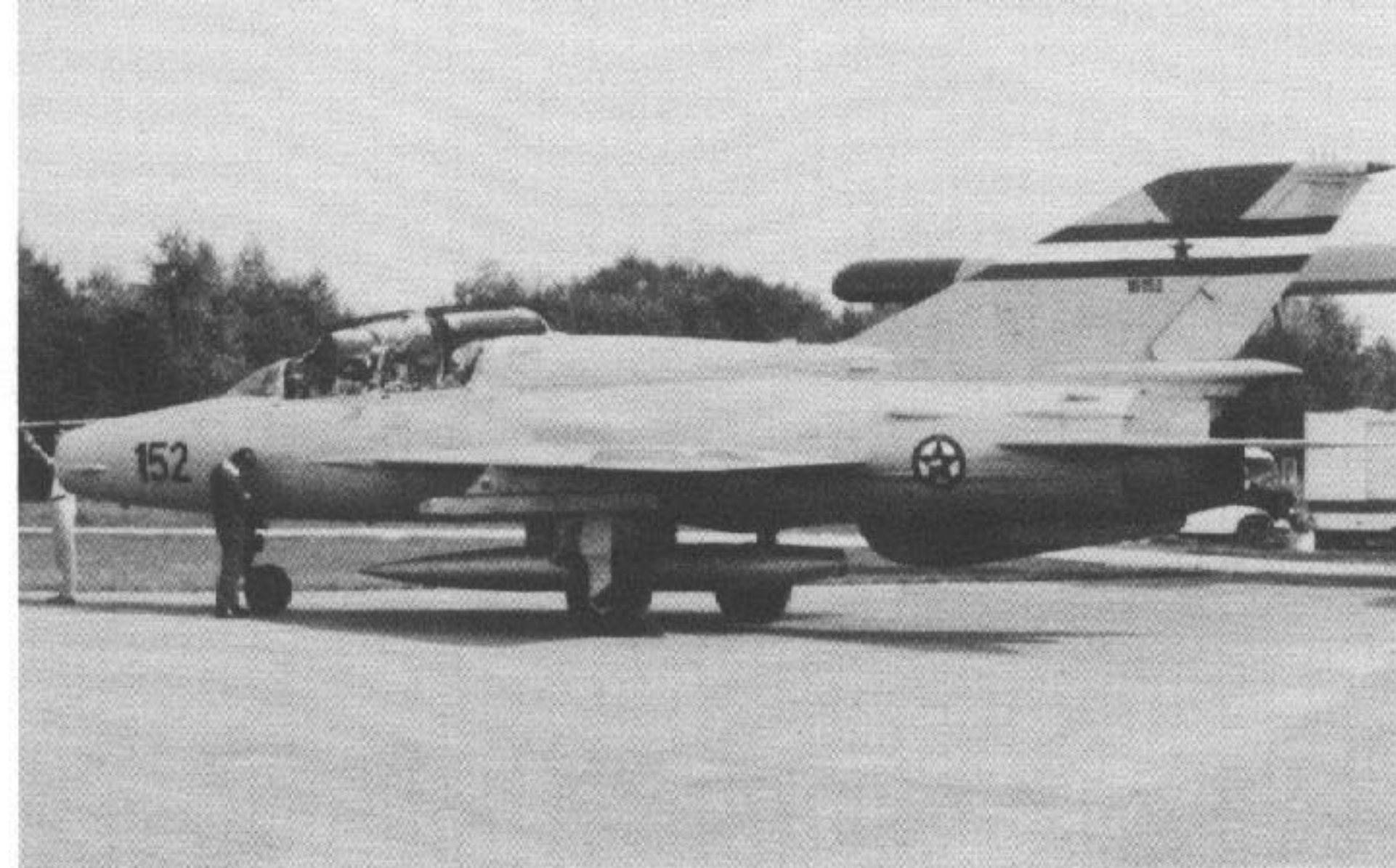
Performance  
Maximum Speed .....1,351 mph  
Service ceiling .....57,750 feet  
Range .....826 miles  
Crew .....Two





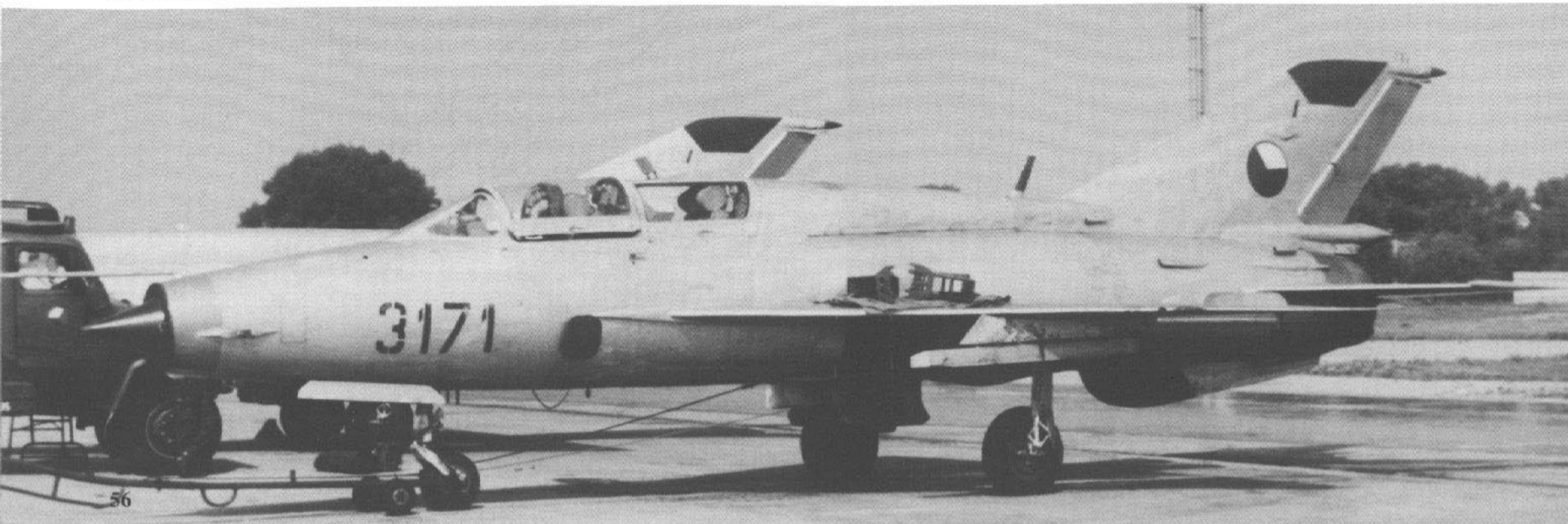


Red 500 was a MiG-21UM Mongol B flown by the Cuban Air Force. The rudder markings consisted of a Red triangle with Blue and White bars and a White star in the center of the triangle. (Robert J. Mills Collection)



An overall Air Superiority Gray Yugoslav Republic Air Force MiG-21US (Black 152) in pre civil war markings. The aircraft carries its full serial number (15152) on the fin in small Black numbers. (Emil Pozar)

A Czech Air Force MiG-21UM Mongol B, Black 3171, parked on the ramp of its home base with a tow bar in place. The MiG-21UM was identical to third generation MiG-21 fighters in internal equipment and instrumentation. (SIGN via Roman Sekyrka)



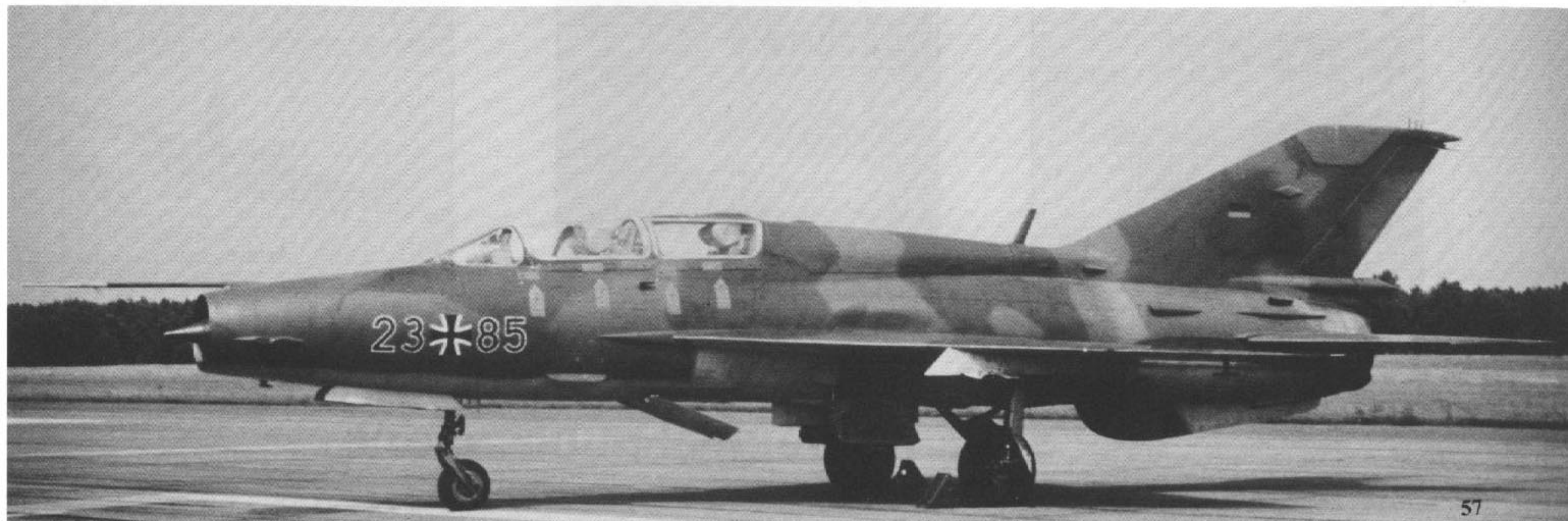


With the disbandment of the Warsaw Pact, the Hungarian Air Force changed its national markings several times. The markings finally adopted was nearly the same as their WW II markings, a chevron in Red, White and Green. This MiG-21UM, Red 19, carries a non-standard three tone camouflage of Olive Drab and Earth Brown and Tan. (George Punka via Hans-Heiri Stapfer)



Three Finnish Air Force trainers on the ramp at the Finnish Flight Test Center during May of 1979. The aircraft in the foreground is a MiG-21UM Mongol B, alongside it is a Saab J-35CS Draken, and to the left is a Valmet Vinka primary trainer. (Jyrki Laukkanen)

This former East German Air Force MiG-21UM Mongol B was taken on strength by the *Bundesluftwaffe* and given the registration 23+85. The vertical arrow markings on the fuselage sides are Yellow rescue instructions. (Jens Schymura)



# Soviet Aircraft from squadron/signal



1101



1108



1112



1116



1125



1129



squadron/signal publications

This MiG-21bis Fishbed L of No 4 Squadron Indian Air Force carries one style of high visibility markings carried on Indian Fishbeds for air combat maneuvering (ACM) training.



This JJ-7 (FT-7) Mongol of the Pakistani Air Force is a Chinese-built two seat trainer variant of the J-7 (F-7/MiG-21F-13) Fishbed C.

