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Details of Soviet MiG-31 Revealed In First Western Air Show Appearance

DONALD E. FINK/LE BOURGET

Mikoyan MiG-31 high-speed interceptor has separate cockpits for pilot and rear-seat weapons system operator. Aircraft carries a varied load of radar- and infrared-guided missiles, and also is fitted with a fuselage-mounted 23-mm. cannon.

The Soviet Union's Mikoyan MiG-31, making its first exhibition appearance in the West at this year's Paris air show, is a "brute force" long-range interceptor originally developed to counter the USAF/Lockheed SR-71 strategic reconnaissance aircraft and U. S. cruise-missile-carrying bombers.

The aircraft was designed around a large phased-array radar and an associated missile weapon system with a look-down/shoot-down capability and impressive supersonic performance, which resulted in a versatile interceptor that is now being adapted to newer missions.

While the aircraft was derived from the MiG-25 and bears a strong external similarity to it, the two-place MiG-31 is described by Edward K. Kostrubsky, Mikoyan deputy chief designer who led the development effort, as "a new design with different engines, a new weapon system, new missiles and a totally new mission."

"At the time we designed the MiG-31, the Soviet Union felt menaced from the north and west by high-altitude reconnaissance aircraft and bombers equipped with cruise missiles," Kostrubsky told AVIATION WEEK & SPACE TECHNOLOGY. "We needed an aircraft that could meet this threat and also intercept very small flying missiles and other targets capable of flying at very high speeds."

Development of the MiG-31 began in the early 1970s. The first prototype flew in 1975 and series production began in

MiG-31 was designed for high-speed interceptor mission, not close-in combat, as evidenced by restricted cockpit visibility. Note periscope over cockpit and pink thermetic window sealant.

Retractable probe on MiG-31 nose permits extended missions with aerial refueling.

Dual canopies hinge upward. Weapon system operator's radar unit has been removed from aft cockpit and rests atop wing.

Large vertical fin contains numerous communications antennas and tail warning devices. Fins also contain fuel tanks.

1979. The aircraft shown at Le Bourget was manufactured in 1983, Kostrubsky said, and had logged about 3,000 hr. prior to its flight to Le Bourget. It was not specially prepared for the show, other than to be given a new flight demonstration paint scheme. The MiG-31 still is in series production, but development work at the Mikoyan Design Bureau has shifted to an advanced aircraft, generally referred to in the West as the MiG-33.

As the aircraft matured in operational service, the mission for the MiG-31—known by its NATO code name as the Foxhound—was expanded to include countering the USAF/Rockwell B-1 bomber. And in a further operational enhancement, the aircraft currently are deployed in four-ship formations, with their radar systems interconnected by on-board data links, to sweep intercept areas 500-600 mi. across.

The same system combination enables the MiG-31 to function as an airborne warning and control system (AWACS) platform capable of directing the attacks of other aircraft such as the MiG-29 and the Sukhoi Su-27.

The evolution of the MiG-31 from the MiG-25 resulted in a huge aircraft that is 74.4 ft. long, with a wing span of 44.2 ft. and a height at the tail of 20.2 ft., according to specifications released by the Soviets at the show. The span of the horizontal tail is 28.7 ft. The aircraft has a maximum gross takeoff weight of 90,364 lb. with internal fuel and 101,824.8 lb. with full combat load and two external fuel tanks.

The primary internal fuel load of about 34,200 lb. is carried in a combination of two large fuselage tanks aft of the cockpit, tanks fitted around the forward inlet sections and integral wing tanks that extend out to the outer underwing stores station. An additional 1,350 lb. of fuel is carried in tanks fitted into the twin vertical fins. This internal fuel supply can be augmented by two large underwing drop tanks.

The MiG-31's range and combat endurance can be extended with aerial refueling. A retractable refueling probe is located on the left side of the nose section at the forward edge of the cockpit windshield frame.

Two Tumansky D-30F6 turbofan engines, each producing a maximum thrust of 34,162 lb. with afterburning, power the MiG-31. They give it a sustained supersonic speed of Mach 2.35 at 60,000 ft., with a maximum dash speed of Mach 2.83, and a Mach 1.6 capability in low-level flight.

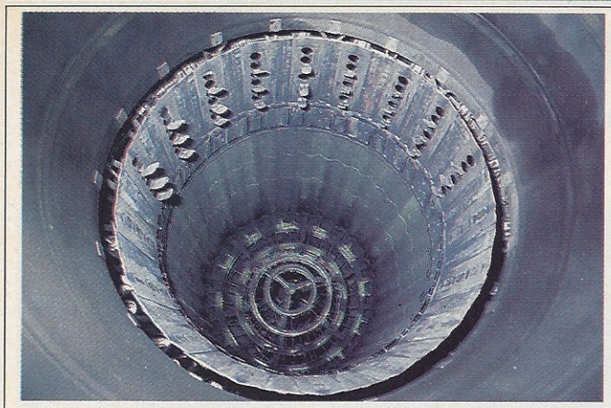
"The MiG-31 is an interceptor designed to carry a varied load of defensive missiles," Kostrubsky said. A typical armament load includes four AA-9 "Amos" long-range radar-guided missiles carried in semi-buried stores stations on the underside of the fuselage, and two AA-8 "Aphid" infrared-guided medium-range missiles or two short-range missiles that are carried on the inner wing pylons. This weapons complement is augmented by a six-barrel 23-mm. cannon mounted in a conformal fuselage pod located above the right main landing gear bay. The cannon, which has a 6,000-round-per-minute rate of fire, is fed by a drum containing 260 rounds.

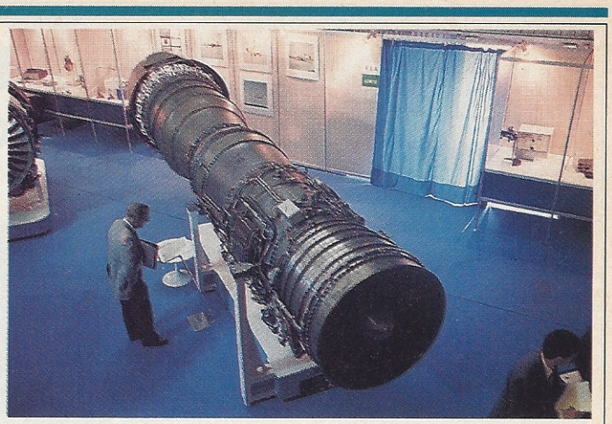
The radar has the capability to scan ±70 deg. vertically and 60 deg. right and left in the horizontal, Kostrubsky said. Search range is about 160 naut. mi. The aircraft is capable of tracking up to 10 targets and attacking four simultaneously.

The data link system transmits via an array of antennas that includes three on each side of the MiG-31's nose and two on each side of the aft fuselage. Conformal antennas associated with communications links to the Soviet air force's ground control system are located in the leading edges of the two aft-mounted ventral fins.

The MiG-31 also has an infrared search and tracking system with the receiver mounted under the fuselage in a hinged sensor head that rotates downward to the deployed position. The IRST sensor has a viewing arc of ±60 deg. hori-

Electronics spine atop fuselage also contains drag chute. End cap may house tail radar.





zontally and a vertical arc of +6 deg. and –13 deg., according to Kostrubsky.

Most of the MiG-31 airframe is constructed from advanced aluminum alloy material, which can be used in areas where aerodynamic surface temperatures do not exceed 150C, he said. Titanium and stainless steel are used in critical areas where surface temperatures can reach 300C at high Mach numbers.

The MiG-31 is stable in all speed regimes, and there are no pitch changes during transition from subsonic to supersonic flight, Kostrubsky said. The fuel in the tail is not used for center-of-gravity trim.

Engine inlets on the MiG-31 are larger and considerably more complex than those on the MiG-25 and are designed to eliminate airflow problems that adversely affected the earlier aircraft's specific fuel consumption in the subsonic regime, he said. The MiG-31 inlets include hinged lower lips and movable upper ramps for shockwave control.

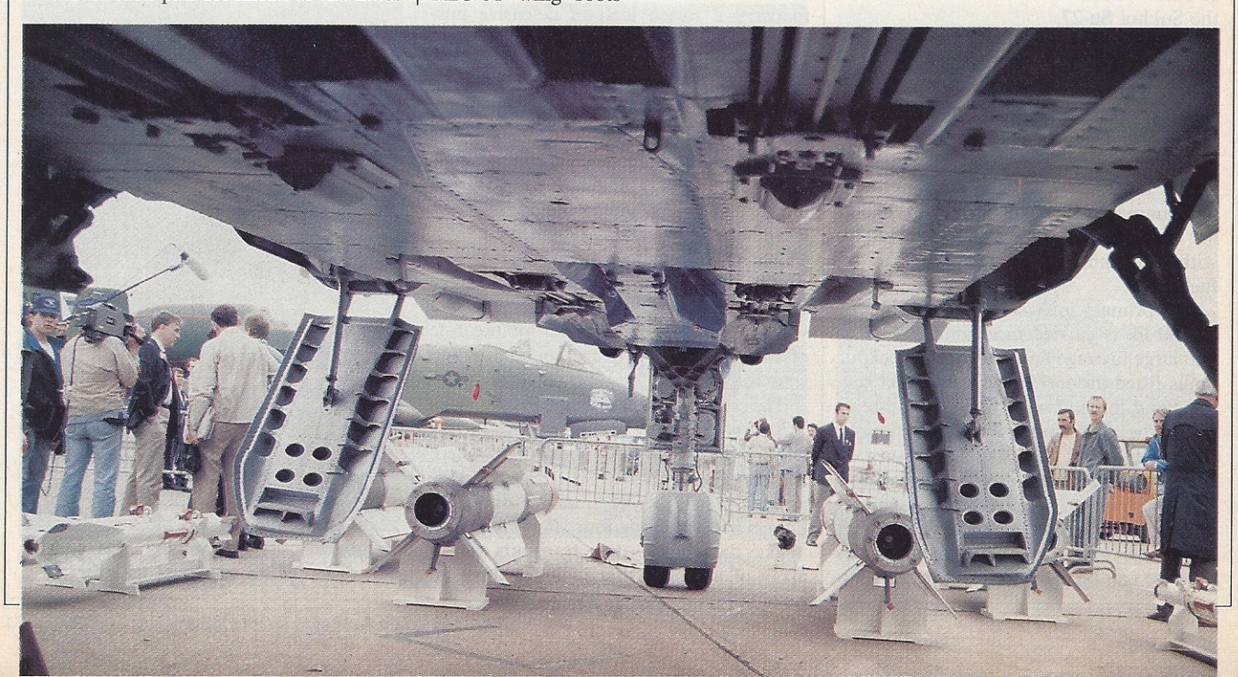
The landing gear includes a twin nosewheel unit with a mudguard and unique main mount bogies that have the outer wheels in each pair set ahead of the inner wheels, instead of side-by-side on a common axle. This arrangement makes it possible to rotate the main wheel units as the gear retracts to facilitate stowing the wheels in the fuselage wells.

It also spreads the main wheel footprint, during takeoffs and landings, which makes it possible to operate the MiG-31 from grass or semi-prepared runways. On landings, the rear wheels touch down first and the aircraft pivots forward on the main gear units until the front wheels make contact.

The MiG-31 wing has the same basic planform as that on the MiG-25, but the wingtip end plates used on the earlier aircraft have been eliminated. Sweep angle of the main airfoil is 41 deg. Leading edge extensions, with a sweep angle of approximately 70 deg., have been added to the MiG-31 wing roots to enhance maneuverability at high angles of attack.

Each wing leading edge is divided into four hydraulically actuated flap sections that deploy to a maximum of 10 deg. for low-speed lift enhancement, Kostrubsky said. They also function in an automatic mode as maneuvering flaps. The wing trailing edges have large inboard flap sections that deploy to a maximum of 30 deg. and outboard ailerons with a ±20-deg. arc of travel.

Long afterburner chamber is shown in nozzle view of MiG-31's Tumansky D-30F6 turbofan engine (upper left). Fuel manifold can be seen in the forward end of the chamber, as can flame holders and pressure relief tabs around the periphery of the nozzle. Size of D-30F6 is evident from engine on display stand (upper right). Engine has 3:1 bypass ratio and produces 34,162 lb. of thrust. Under-fuselage view shows semi-buried missile stations and speed brake panels ahead of main gear. Numerous access panels are provided along the outer side and bottom of each nacelle to facilitate engine servicing. For removal, the engines are slid rearward through the aft end of each nacelle.

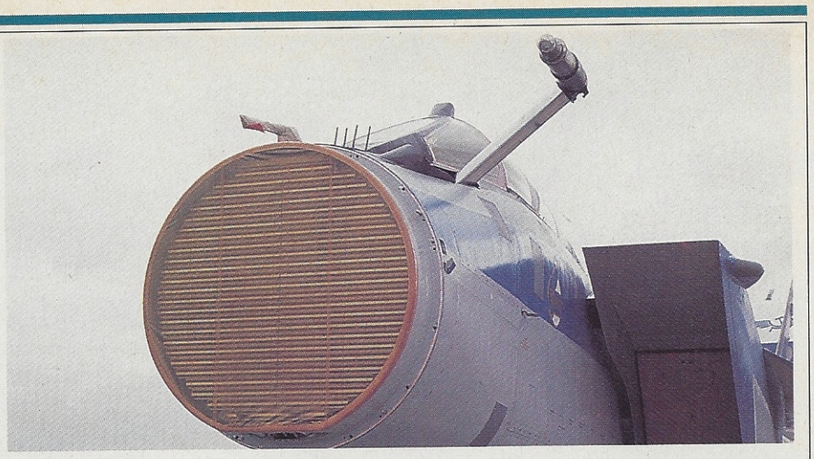


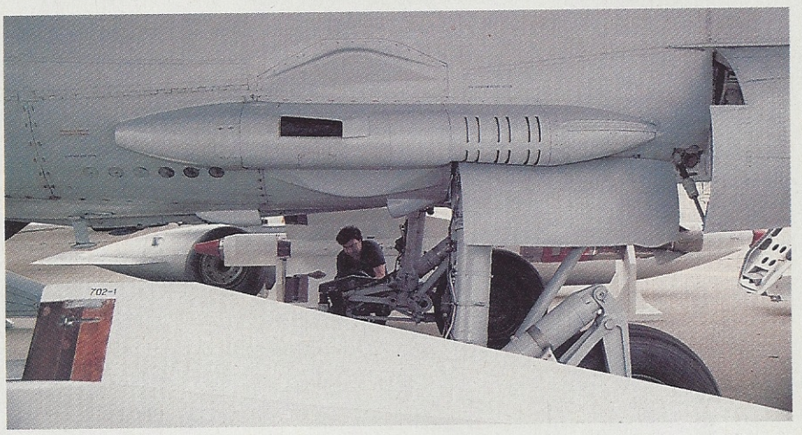
Six circular blow-in ports about 2 in. in diameter have been located midway back on the MiG-31's extremely long inlet ducts to provide cooling bleed air to the engine compartments, according to Kostrubsky. These help counteract the thermal effects on the engine bays from slipstream air heated by surface friction during very high speed flight, he said.

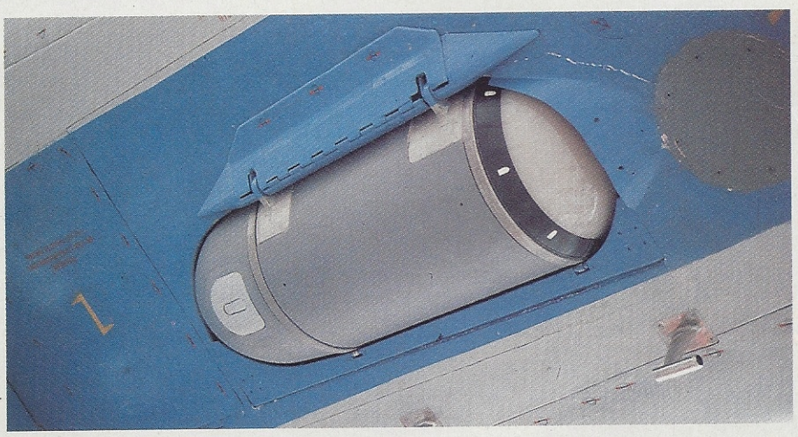
The MiG-31's large twin vertical fins have a slight outward cant and are festooned with a variety of antennas and tail warning devices. The horizontal tail planes are all-flying stabulators.

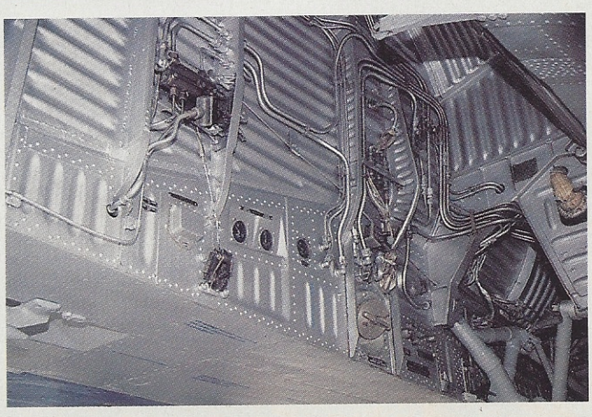
An aerodynamic fairing stretches along the top of the fuselage from the two-place cockpit to a landing drag chute container between the engine nozzles. The fairing functions as a tunnel for electrical wires, radio connections and hydraulic and fuel lines, Kostrubsky said. Similar channels are aerodynamically faired into the bottom fuselage and along the lower wing roots.

Twin speed brake panels, hinged at the forward edge, are mounted on the lower fuselage ahead of each wheel well. They deploy downward into the slipstream and can be extended at all speeds up to high supersonic cruise, Kostrubsky said. In low-level supersonic flight, the limiting factor is aerodynamic pressure, which at maximum level overpowers the hydraulic actuators and either prevents their extension or automatically retracts them.









MiG-31's phased array radar, designated "Flashdance" by NATO, shown with radome removed (top), is based on late 1960s technology, according to Western radar specialists. Six-barrel 23-mm. Gatling gun cannon is mounted in fuselage side fairing over the right gear well (second from top). The cannon has a rate of fire of 6,000 rounds per minute and is drum-fed. Infrared search and tracking system receiver (right) rotates downward from semi-buried fuselage station. Unique main gear bogie (below left) has outer wheel ahead of inner one. Left main gear bay (below, right) shows plumbing, wiring and aft well into which front wheel fits as bogies rotate on retraction.