

# Albatros

**WWP®**  
WINGS & WHEELS  
PUBLICATIONS

**in detail®**

**L-39 Albatros  
Variants C, V, ZA,  
MS/59, 59E/T, 139  
& L-159 Alca**



**František Kořán  
Jan Martinec**

**PHOTO MANUAL FOR MODELERS®**





# WWP®

WINGS & WHEELS  
PUBLICATIONS

PHOTO MANUAL FOR MODELERS®



**NEXT ISSUE  
IN BLUE LINE  
APRIL 2002**

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**Albatros in detail®**

© RAK, 1st edition, Prague, November 2001  
published by František Kořán RAK

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ISBN 80-86416-16-X

This publication would never have been completed without the help of the management and staff of the Air Force bases at Čáslav, Pardubice, Hradec Králové, Náměšť nad Oslavou and Air Force Museum at Vyškov. Editor would like to thank to Duncan Nicholson for their assistance with corrections of English version.

Front cover:

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Rear cover:

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First page:

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Reference and source material:

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Text © Jan Martinec & František Kořán 2001

English text © Karel Hellebrand & Jaroslav Špaček 2001

Graphic design and Litho © RAK, František Kořán, 2001 Prague, Czech Republic

Press by FINIDR s.r.o., Český Těšín, Czech Republic

Exclusive distribution in the North America:

4+ PUBLICATIONS N.A., Mr Ron Books

855 Bebout Road, Venetia, Pennsylvania, PA 15367 U.S.A.

Contacts: tel./fax: (724) 941-8755, E-mail: x4plus@fyt.net

Exclusive distribution in the Hong Kong & Taiwan:

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# L-39C

on pages 6 - 19

**History:** The trainer and light combat jet, the Aero L-39 Albatros represents a second generation jet aircraft designed and produced by Czechoslovak aviation industry during the last thirty years of the 20th century. The Aero L-29 Delfin - The Albatros's predecessor was a famous and successful light jet trainer designed by Jan Vlcek. Even when the production of the Delfin had only just started, it was felt that throughout the Warsaw Pact military pilots needed to train on a more advanced type of training jet. The only exception was in Poland, which elected to keep its own TS-11 Iskra jet trainer. The initial development of L-39 begun only three years after the production of L-29 started. The new type was designed in close cooperation with the Soviet Union - the likely future main user and client, which planned to use the L-39 as its Air forces basic jet trainer. The new type was designed to have more powerful engines than the Delfin, and because Czechoslovakia then did not have such an engine, a Soviet engine, the Ivchenko AI-25 with a thrust of 14,21 kN was selected. This engine was already in use in the Yak-40 jetliner. The AI-25 was modified and upgraded for training and light combat use by a Czech company Motorlet (Walter). The new version of the Ivchenko engine was designated the AI-25W (Walter). The thrust of 14,44 kN, was more than the original. An even more powerful version of engine, designated AI-25TL with a thrust of 16,85 kN, was developed, later supplied from the Soviet Union. All existing L-39 aircraft, including those already produced, were gradually re-engined with new AI-25TL. Prototype aircraft were designated L-39X-01 to L-39X-11. Two airframes, X-01 and X-04, were used for static tests. The first aircraft selected for flying test was the second prototype L-

39X-02. Taxi tests started on 25th October 1968, and these were soon followed by the aircraft's maiden flight on 04th November 1968. During flying tests was found that it was necessary to enlarge the engine air intakes to allow better air flow into the engine. Boundary layer control flaps and additional air intakes were tested and installed. Thus the final appearance of the air intakes was changed - they became larger bigger and were moved slightly forward. Company tests were concluded at the end of 1970. After ten more pre-production machines were built, the first aircraft were officially delivered to the Czechoslovak Air Force on 7th September 1971. The whole initial batch of aircraft were allocated to the Czech Air Force training School in Kosice on 28th March 1972. The prototype L-39X-07 was dispatched to the Soviet Union for Harsh Weather and other flight tests by Soviet Air Force in March 1973. As a result of these tests, the Soviet Union, as the largest potential customer asked for some changes to the design to be made. These changes were made on X-07 which then it served as a basis for design on which all production machines were made for the Soviet Union. The L-39ZC, in fact a modified L-39X-011 prototype, was demonstrated at the Paris Airshow in 1977. The Albatros made a good impression on the professional aviators at the show. L-39 has been further modified during its production life, and various new versions have entered series production. It was found in early 1980's that a more powerful variant of L-39 jet trainer was needed. The new L-39MS was the result of that thinking, which was later designated L-59. The L-39/L-59 family is definitely the World's most widespread jet trainer of its type. Almost 3,000 planes have been produced and in total they have logged more than 4,000,000 flying hours to date.



# L-39U

on pages 20 - 29



# L-39ZA

on pages 30 - 45

photo: by Petr Soukup



The L-39 Albatros is two-seat, single engined low-wing monoplane of all metal construction with tricycle undercarriage. The tapered wing is made as one piece with a pair of 100-litre wing-tip tanks. Wing mechanisation is with double-slotted flaps. Tail has a tapered horizontal elevator and slightly swept-back vertical fin. The pair of the air brakes is mounted under fuselage in place of the fuselage-wing connection. The fuselage is divided to three parts. In the front part blocks of avionics and communications are located. The center part is pressurized and includes the crew cockpit, followed by fuselage fuel tanks with total capacity of 1,100 litres and engine air intakes. The rear part with tail surfaces is detachable, what allows better access to the engine. The cockpit is accessible by two separate canopies opened to the right (L-39 only). The crew seat on two indigenous VS-1-BRI ejecting seats with parameters  $h=0$ ,  $v=150$  km/h. Seats can be ejected even through the closed canopy in case of its separation failure. Both cockpits are fully equipped with flying, engine and systems instruments and communication,

weapons and navigation control elements. The instrument equipment differs by aircraft versions according to specific client's requests and purpose of individual version. All versions and modifications are fully equipped for night and day flying including the bad weather conditions. The undercarriage is retractable, tri-cycle type with low-pressure tires. Main undercarriage legs are equipped with hydraulic brakes and are retracting to the centre of the fuselage. The powerplant is AI-25 (AI-25W or AI-25TL) jet engine with axial compressor with Saphir APU. All L-39 versions are equipped with two or four wing pylons, according to the version. A various weapons and special equipment can be attached on those underwing pylons, like drop tanks, bombs, unguided rocket pods, machine gun pods, reconnaissance pods, and Air-to-Air missiles. Together with L-39, the complete training and testing system was developed. It includes the complex pilot simulator TL-39, the ejection simulator NKTL-29/39, and mobile automatic testing system KL-39. The last serves for checking the correct function of all instruments, aggre-

# L-59/L-39MS

on pages 46 - 59





# L-139

on page 116



photo by Jan Kouba

gates and other aircraft's systems. L-129 - the original project of "upgraded" L-29 Delfin from 1963 was cancelled. It was also planned to develop supersonic version L-39M-1, which should succeed cancelled L-129. These projects were later reduced to L-39 only. Airframes from L-39X01 to L-39X11 were pre-production and test aircraft of L-39C, which is the basic and most numerous variant for elementary training, equipped with two underwing pylons for drop tanks or light weaponry. L39V is a special single seat version for towing KT-04 target. It was developed on Czechoslovak Air Force order. It had air pressure turbine powered winch case under the fuselage, which operated the towing cable. The necessary space for winch drum with the towing cable was provided in the rear cockpit. Production machines were built as part of L-39ZA batch. Two of eight produced machines were delivered to East German Air

Force. L39Z was the original designation of a new training and light combat aircraft, which was developed since 1973 with aim to boost up export of L-39. The modernisation project took two steps. The first one was the strengthening of wing construction with adding of two more underwing pylons. This resulted in L-39ZO version. The second step was devoted to more complex construction changes in the front part of fuselage, where a pod with 23-mm GSh-23L two-barreled gun with ammunition was attached. Many systems in the front part of the fuselage were repositioned or changed to provide enough space for the gun pod. The factory tests involved three prototypes and were conducted from 1973 to June 1976. The aircraft had strengthened undercarriage, bigger wheels and other structural changes. Finally, the variant received designation L-39ZA.

# L-159 Alca

on pages 118 - 120



photo by Jan Kouba





Continued from page 5: The Israeli company Elbit had been cooperating with Aero Vodochody in 1989-90 as a partner and a system integrator in development of new L-39 variant for Royal Thailand Air Force. RTAF requested a training aircraft that could be fully compatible with western Military Standards. It had to provide training of RTAF pilots, who could then easily continue on RTAF F-16s combat aircraft. Main changes were done in the instruments equipment, which was expanded by HUD. The capability to carry standard Western weapons like Mk.82 bombs and AIM-9 Sidewinder Air-to-Air IR missiles. The first flight happened in 1992. L-39 MS/L-59. Since the early 1980s was clear that is necessary to upgrade Albatros family for better support of pilot training for coming fourth generation of combat

planes. The development resulted in L-39MS, which was later designated L-59. The main change was installation of then new Lotarev DV-2 turbofan with thrust of 21,58 kN. The original Soviet engine was developed specially for L-39 and it was determined that it would be from the beginning license built in Povazske strojarne in Slovak part of the Czechoslovakia. The aircraft development resulted in much better performances, which allowed not only training but also light combat roles. The cockpits had new digital avionics with modern instruments, including HUD and new weapon and navigation systems. Also introduced were new indigenous "zero-zero" VS-2A ejection seats and a new single-piece cockpit canopy. The airplane structure was strengthened.





# L-39C



photo by Petr Soukup

The aircraft with its original registration OK-GXA in the Research and Development Air Institute at Prague-Kbely Airfield, today it serves in the Czech AF as "0742" (top). The L-39C s/n 332448 displaying a civilian registration N8125R in a new interesting camouflage, which is very similar to USAF schemes of the 1960's-1970's (bottom). This plane's civilian owner is Mr. Elmo Hahn from Michigan. It is one of two aircraft of the Jet Team group. The picture was taken on 23rd June 2001. Interestingly it has installed bigger wingtip fuel tanks from the L-59. (opposite page)



photo by Emil F. Knapp

The L-39C Number "5233" served in the Aero Vodochody factory for testing flying instruments. It was later sold to USA (top). Another L-39C sold to USA (middle). It had been flown by The Northern Lights Aerobatics aerobatic team until it was written-off in a crash near Pecan Island on 10th February 2001. Another picture of the L-39C in the colours of a private US owner from Reading, Pennsylvania was taken in August 1993 (bottom). This aircraft was the second L-39 sold to USA.



photo by Emil F. Knapp

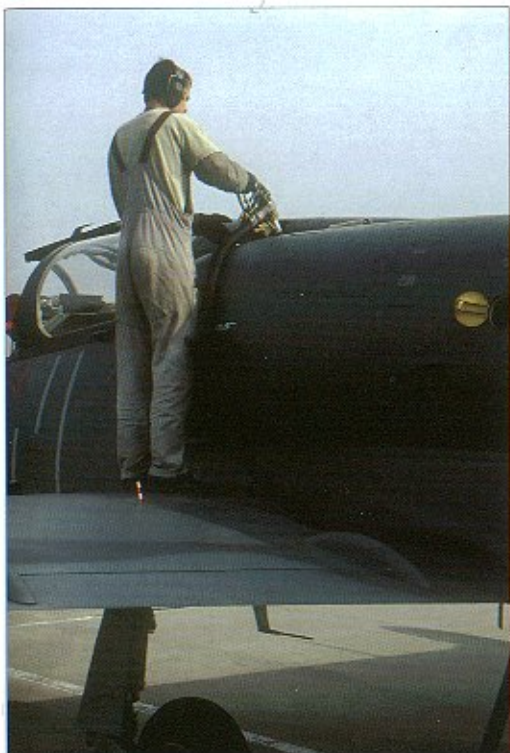




photo by Petr Soukup



# L-39C



A technician refuels the L-39's second fuselage tank from a special CAPL fuel truck.





# L-39C Walk Around





The front view on the L-39C with the new "NATO camouflage" applied. The horizontal tailplane has the row of vortex generators on the bottom side.



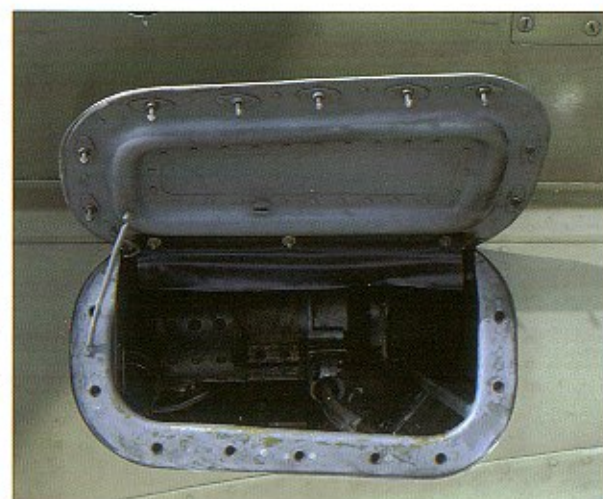
Continued from page 6: Among many other changes, the new wing had bigger wingtip tanks and control surfaces were hydraulic operated. The L-39MS/L-59 had four underwing pylons as standard as well as a GSh-23 gun pod. The first flight was on 1st October 1989. The Czechoslovak Air Force received its first aircraft in 1990. In the early nineties The Albatros was modernised with new instruments and other internal systems provided by US companies including AlliedSignal, Flight Visions, Litton, and others. This cooperation with US companies resulted in an export variant the L-59E for Egypt and the L-59T for Tunis. One of these aircraft was decorated in a livery incorporating with names of all the countries where Albatros family aircraft were exported and in these colours participated in a num-

ber of European airshows. Almost seventy L-59 were produced for Czechoslovak, Tunis and Egypt Air Forces. The L-139 was "westernized" version of L-39 and it was developed in cooperation with the Allied Signal company, which provided a new engine the TFE 731-4-1T with thrust of 18,15 kN. Some improvements developed for L-59E and L-59T were incorporated in the design. The first flight was conducted on 8th May 1993. Organizational changes in Czechoslovak Armed Forces, and a new focus on Western World aviation markets begun in early 1990's. Yet further modernisations resulted in the development of entirely new design the L-159 ALCA (Advanced Light Combat Aircraft), which has its origins in the original, almost forty years old L-39 design concept.

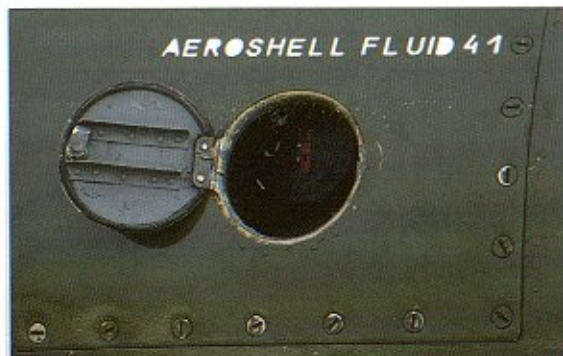




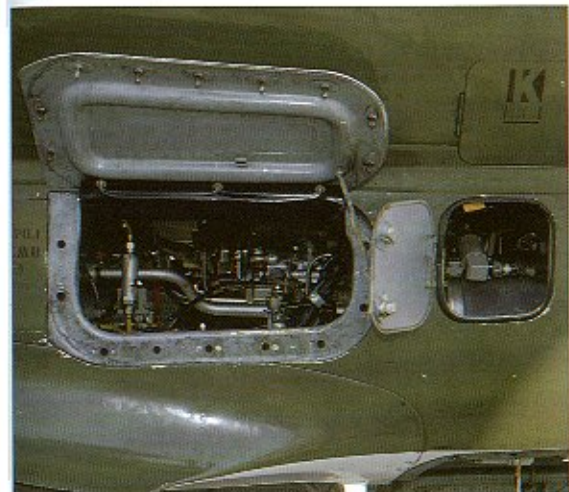
The engine oil filler cap (above). The engine and other service inspection covers (left and below).







A hydraulic fluid reservoir, with its filler cap above. Inspection covers on the port side of the engine area. The external power supply cable is connected (right centre) and inspection covers around the Saphir-5 APU (bottom).





# L-39C Interior Details

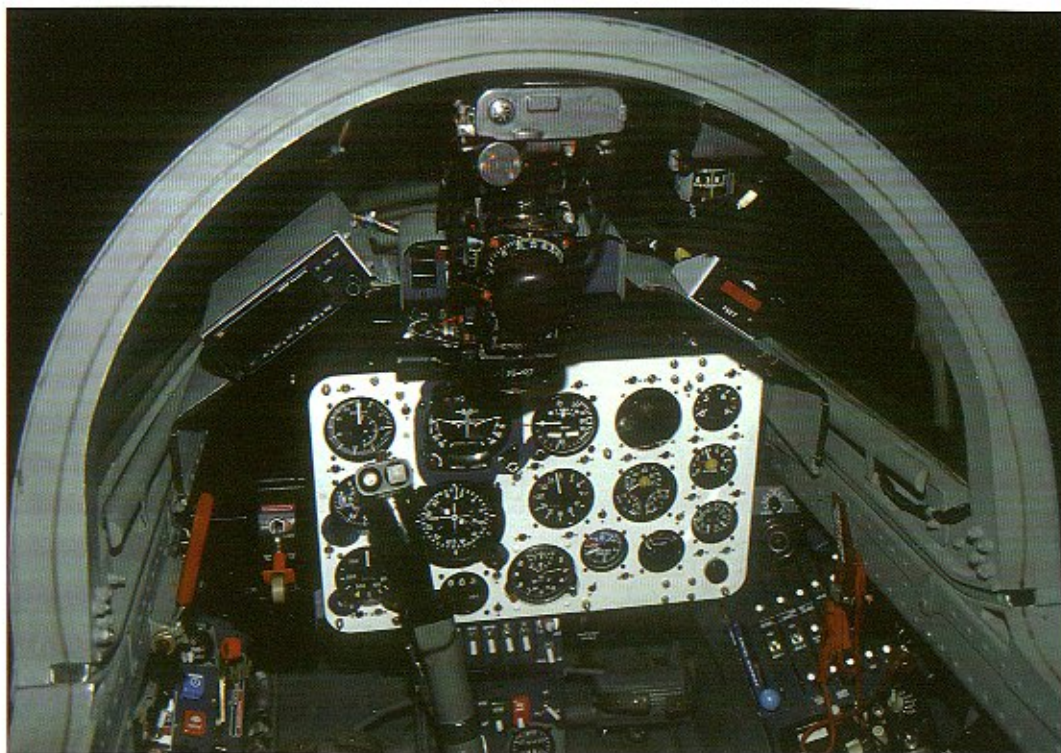
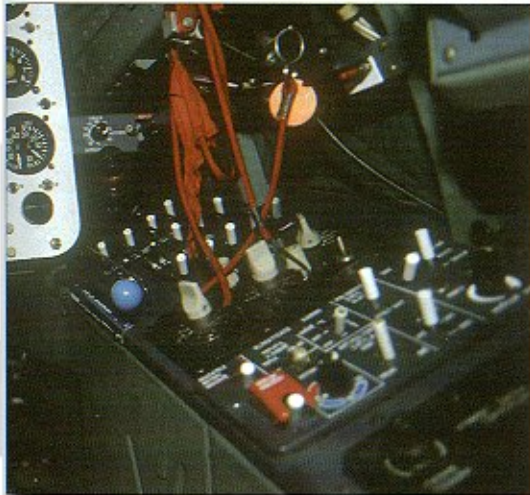


photo by Antonín Klavíra

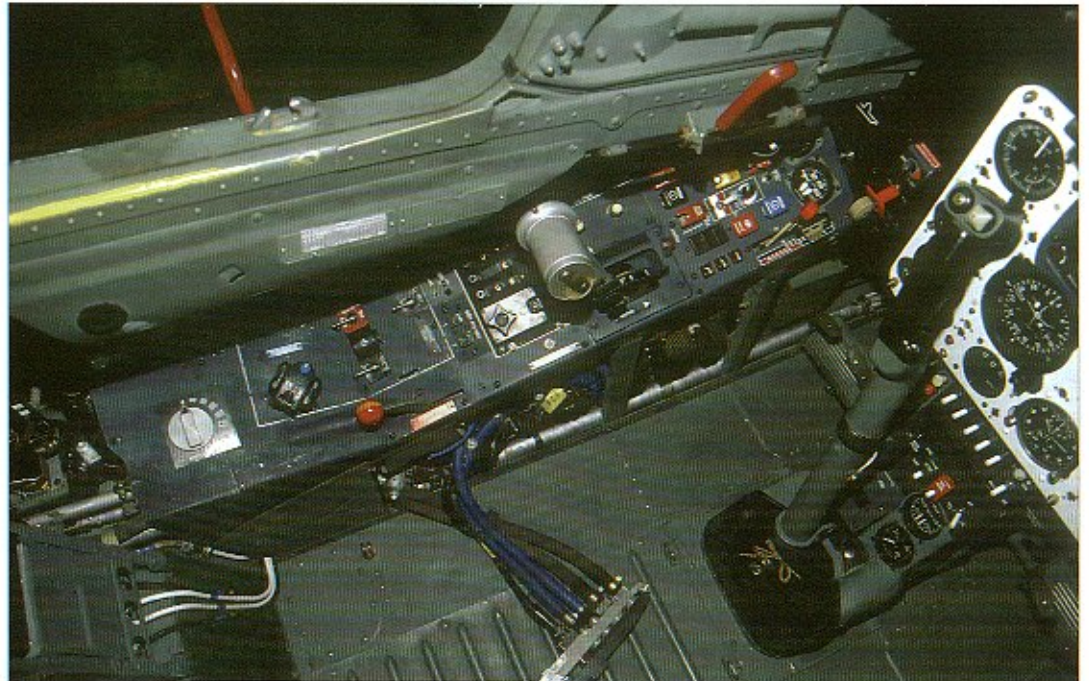
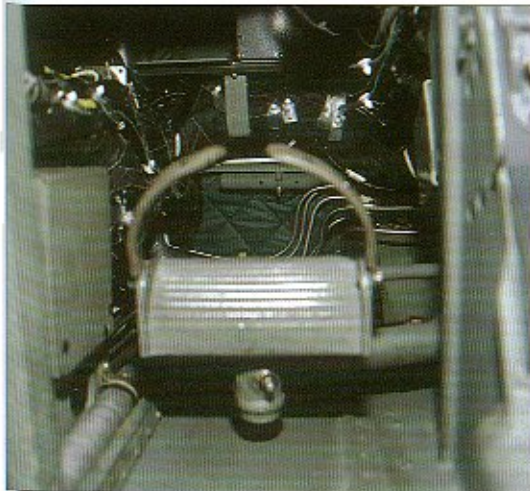
The front cockpit instrument panel - on the left with the metal covering sheets removed. A GPS installation can be seen over it (left) and the altimeter is calibrated in feet (right). These altimeters were installed in Czech L-39s in the nineties. The detail of the gunsight, used for the aiming of unguided weapons (bottom).







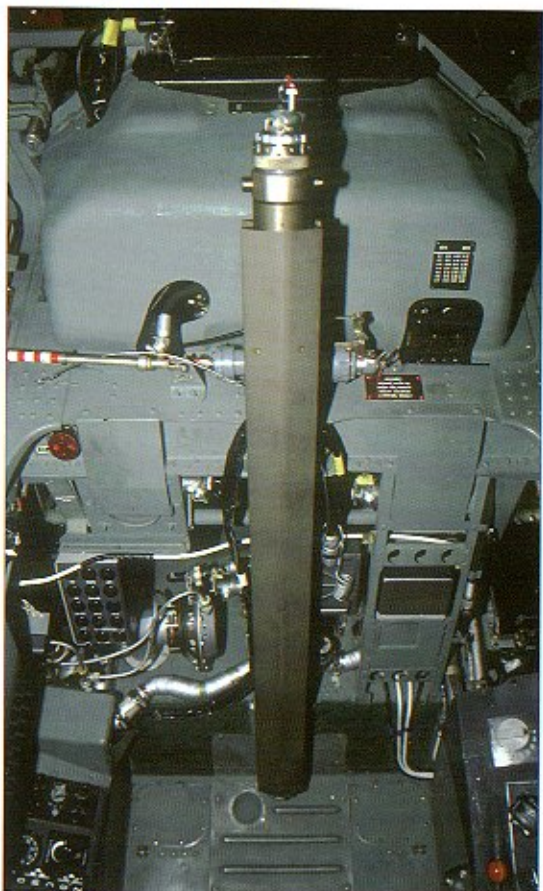
The port cockpit side panel with the dominant throttle and locking safety device in the closed position (on the canopy frame). The starboard cockpit side panel with emergency systems and control switches. The red handle below the canopy frame serves for emergency jettisoning of the canopy. Detail of the pedals (below left).







The telescopic guide rod for the ejection seat in the rear part of the cockpit.





# L39C Cockpits Details

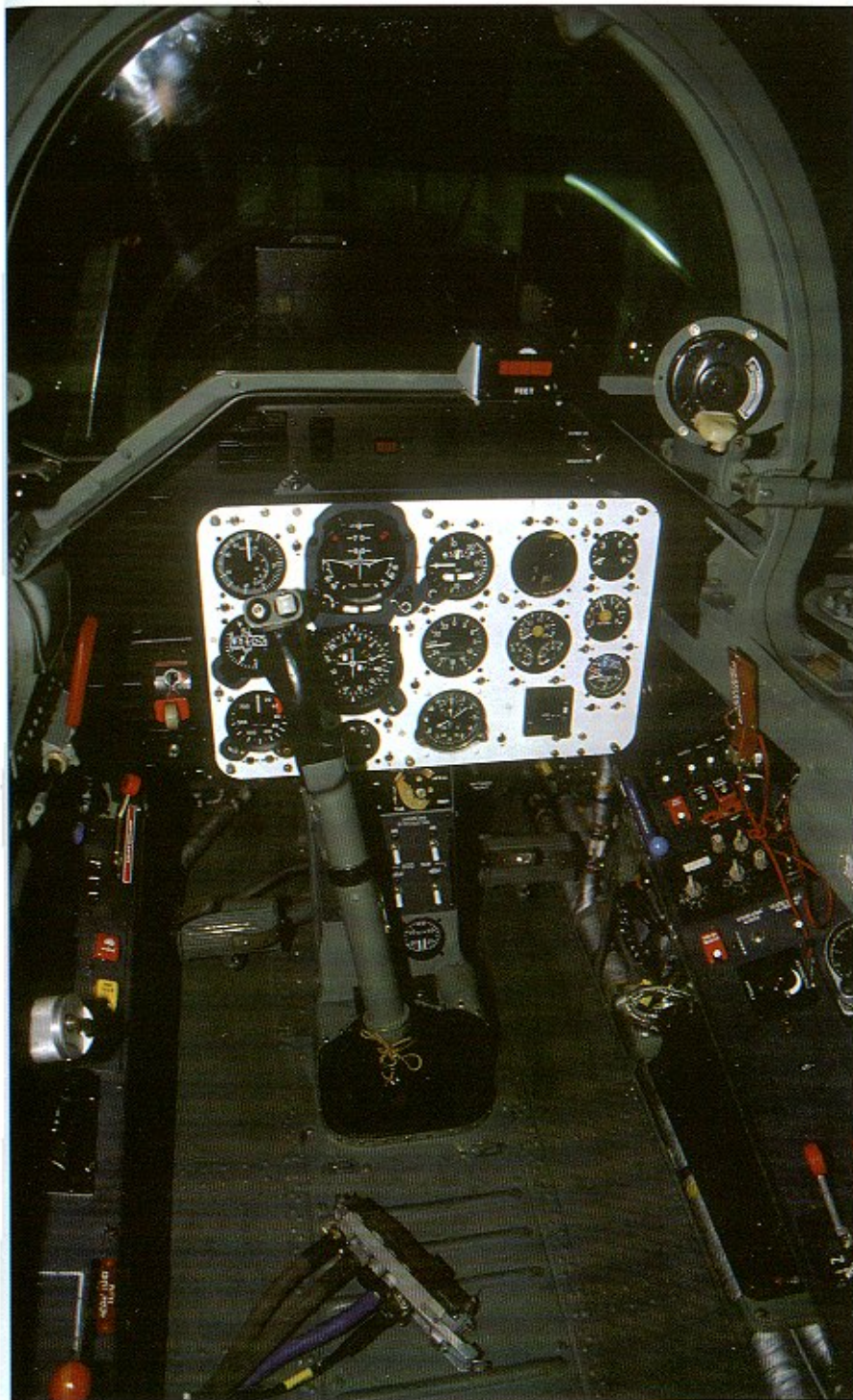


photo by Arlanin Kovzo

The rear cockpit is equipped with similar instruments as the front. The cockpits are separated by a transparent bulkhead. Control stick detail (below right).



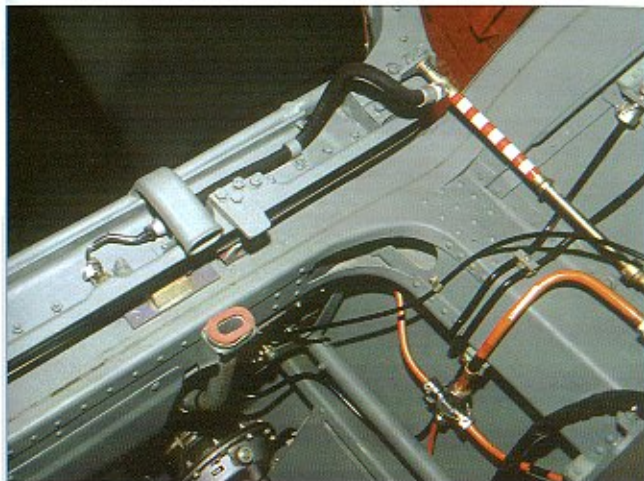
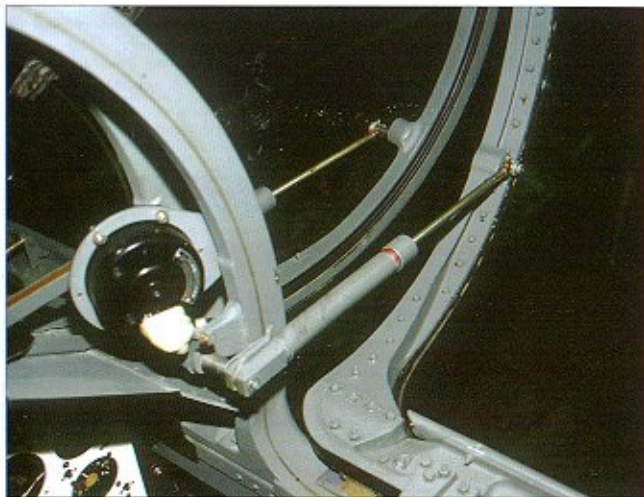




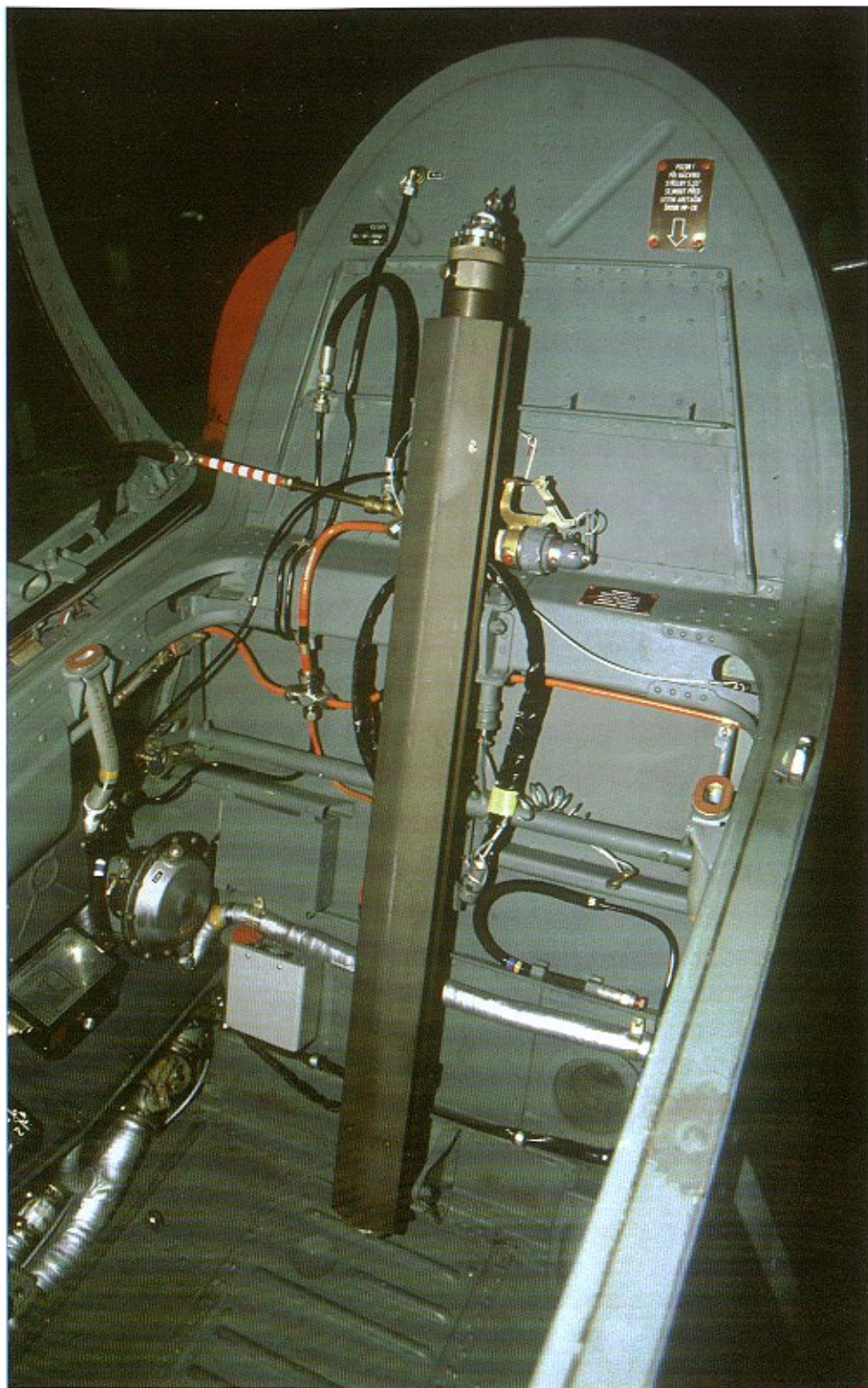
The layout of the rear cockpit side panels instruments, switches and control elements is similar to the front cockpit.



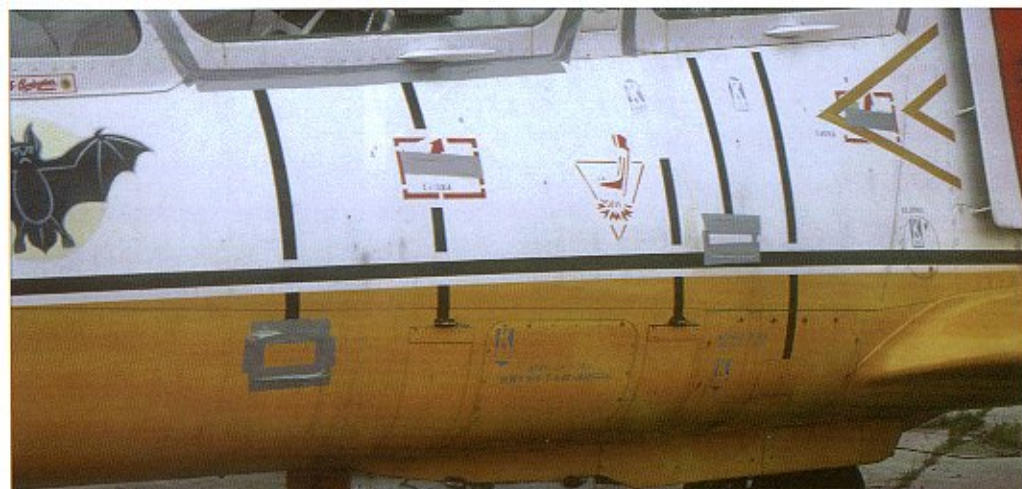




The canopy opening is limited by two struts. The canopy is secured in closed and locked in position by four catches, which are connected to the emergency ejection system. Both cockpits are similar.







The detail of the port engine inlet. Its semi-circular leading edge is made from stainless steel and can be heated during flight to prevent freezing. Detail of anti-static dischargers on the horizontal tailplane.



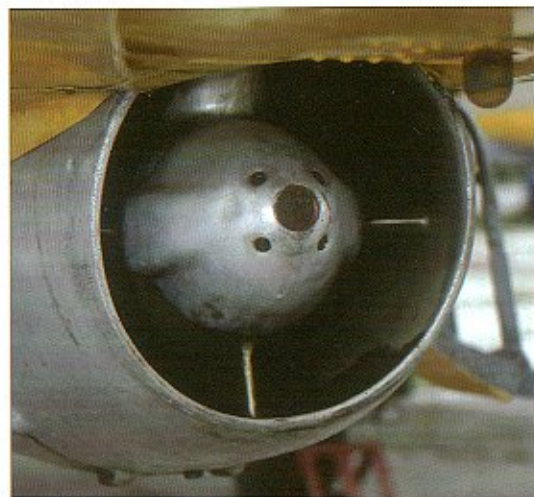
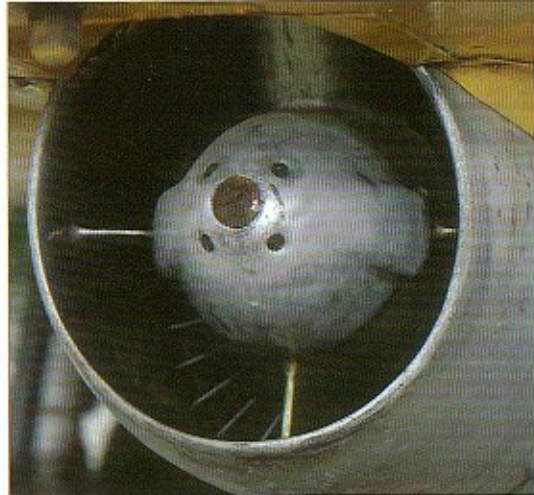




A L-39V in the Air Force Museum at Vyskov. The L-39V was similar to the other versions with the exception of the ram air turbine mounted under the fuselage and non-standard yellow-white colours. The antenna of R-832M radio on the top of the fin is standard equipment for all L-39s.



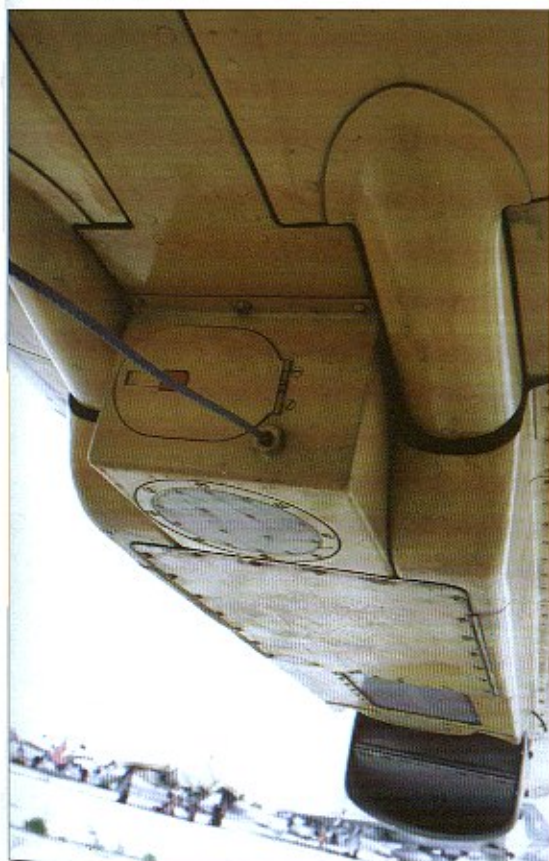








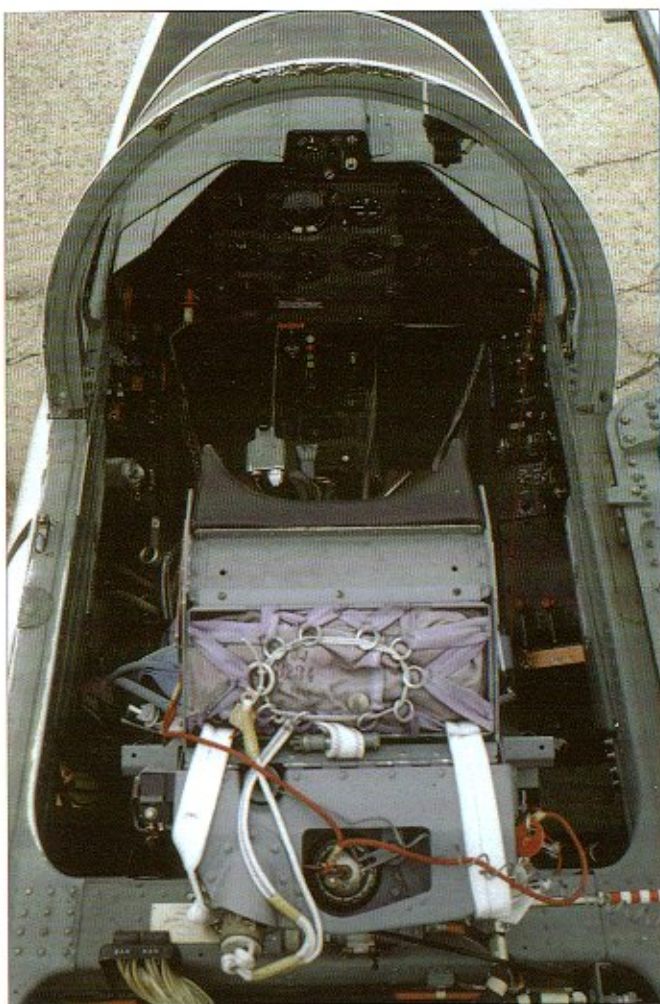
## L-39U Exterior Details



Detail of the ram air turbine L-03 and the emergency hydraulic cable cutting mechanism. Details of the towing cable with its emergency cutting mechanism. Details of the ram air turbine fairing, by which the towing cable is led from its drum to the cutting mechanism. Because of this fairing, some equipment had to be repositioned from inside the fuselage to its bottom surface. Instruments moved included the radar altimeter RV-5 and automatic radio-compass model RKL-41.



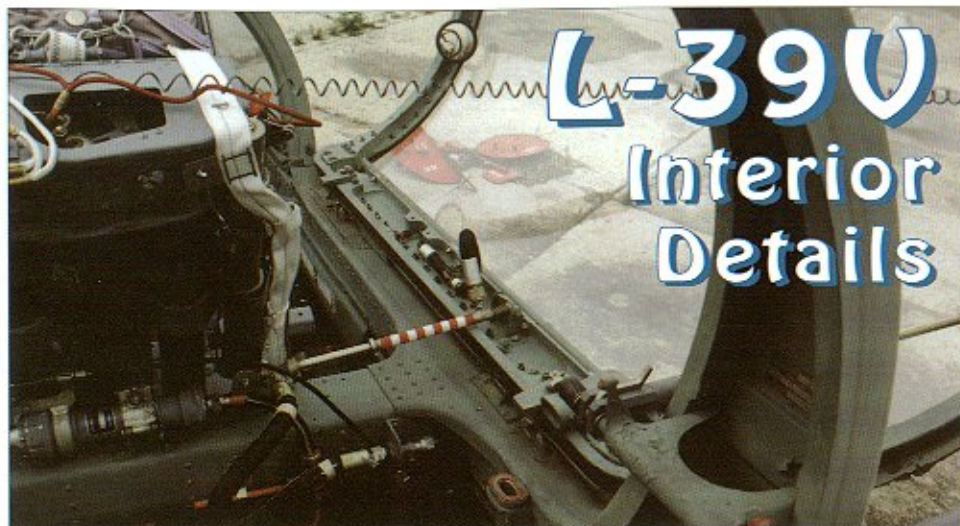




The pilot's cockpit differed in the L-39C from the ZA version by having a significantly reduced number of instruments on both the front and side panels. Controls for deploying the towing cable together with an indicator showing the length of cable deployed were added above the front instrument panel. The L-39V cockpit was not pressurised.

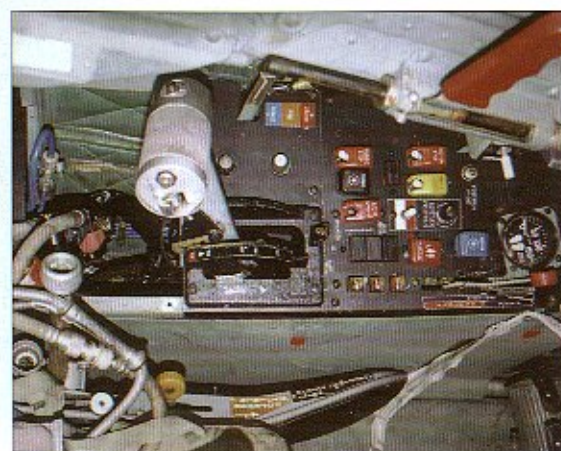
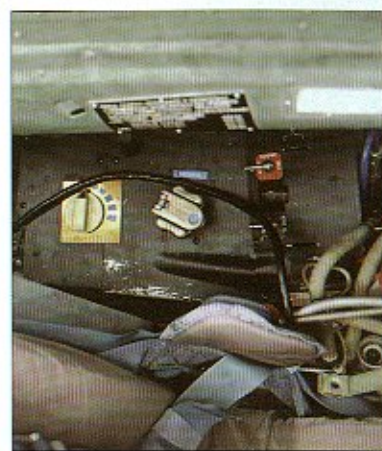
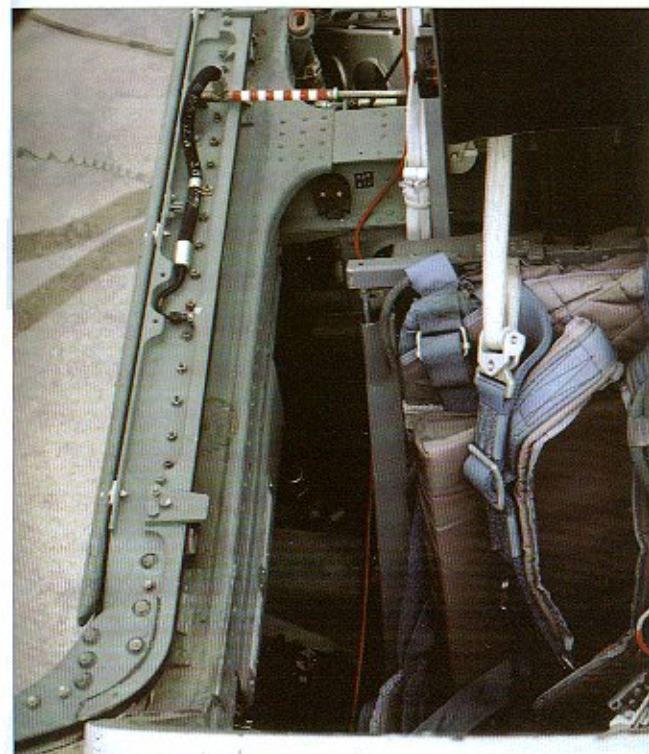




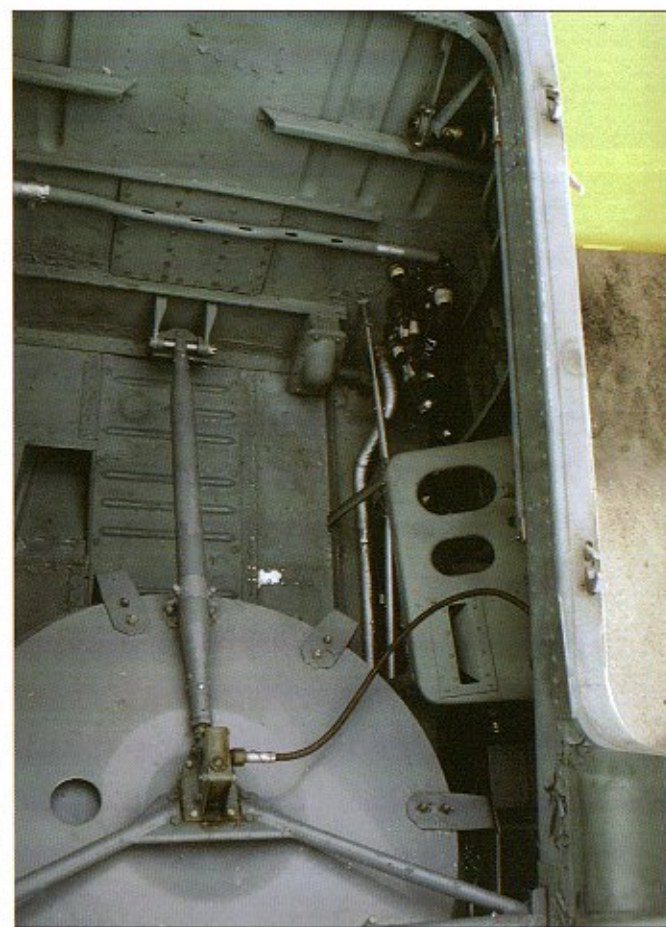
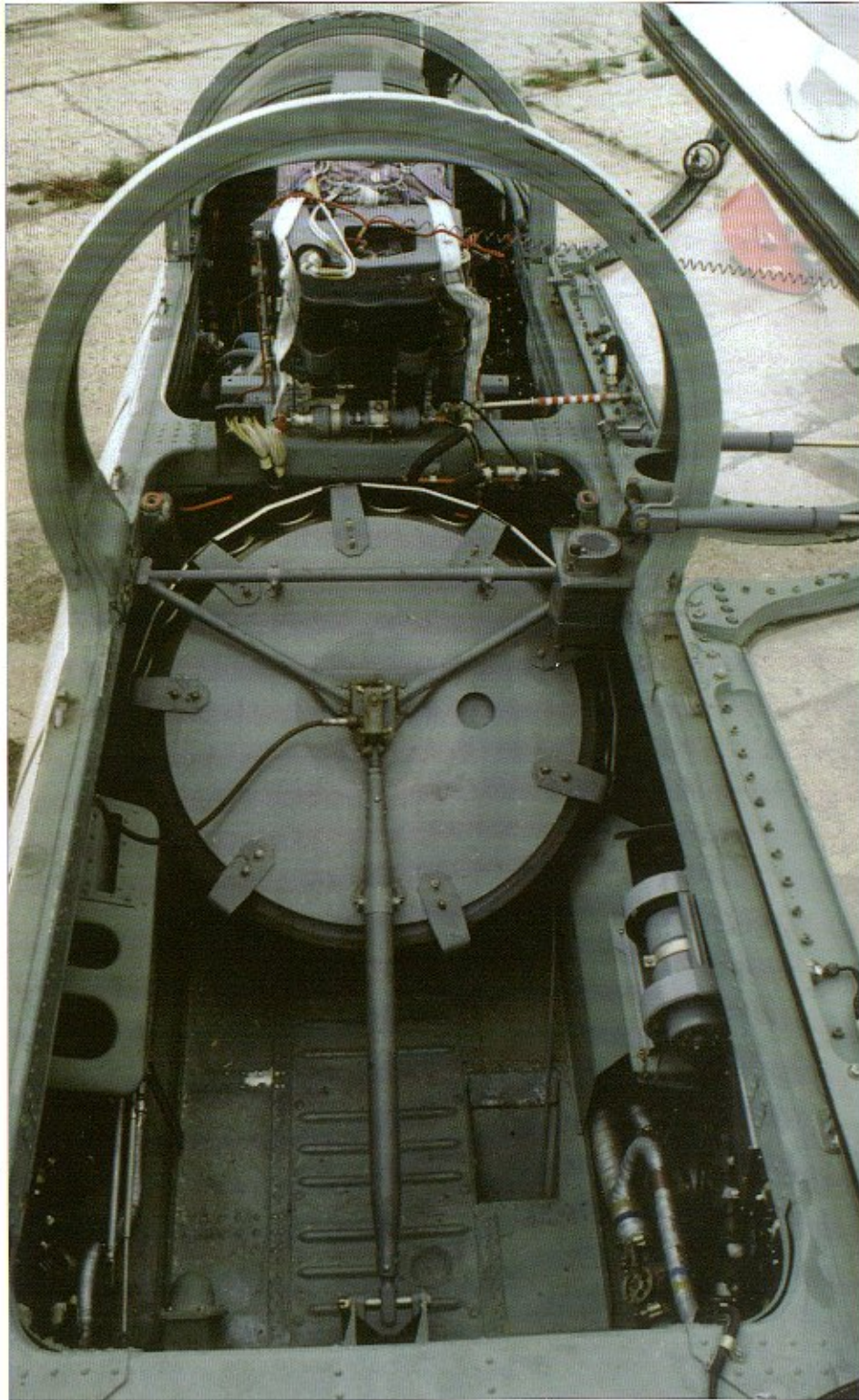


# L-39V

## Interior Details



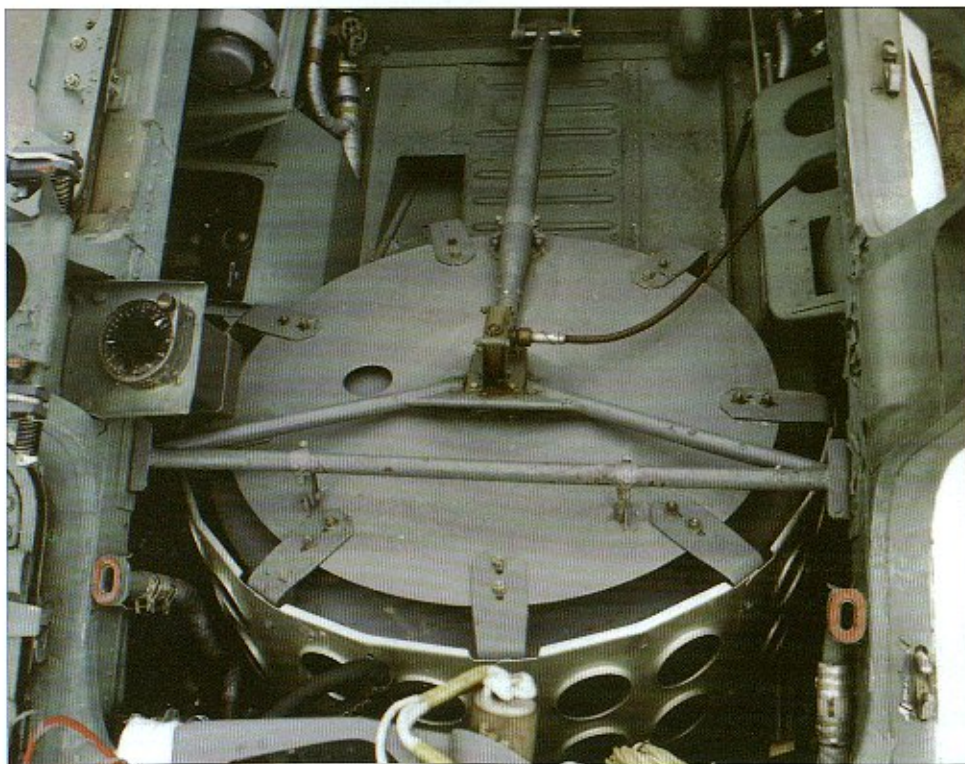






# L-39V Winch Drum Details

The rear cockpit was completely redesigned, the seat and all instruments were removed and the towing cable winch drum was installed at an angle of 30°.





# Target Drone Details







Target Drone designation KT-04 positioned on its launch trolley (on the left page) and on its transportation trailer (this page top and right). The details show the air pressure gauge of the inflating landing cushion under the fuselage, the stowage bay for main landing parachute and the towing cable lock.





photo by Jan Kouba



photo by Jan Kouba



photo by Petr Soukup





# L-39ZA



The L-39ZA destined for Nigeria with practice bombs CCP-100-70 on the inner and UB-16-57 rocket pods on the outer wing pylons (top).

The L-39ZA is seen in RTAF camouflage (middle). The L-39ZA in Algerian colours with drop tanks on the inner and UB-16-57 rocket pods on the outer wing pylons (bottom).



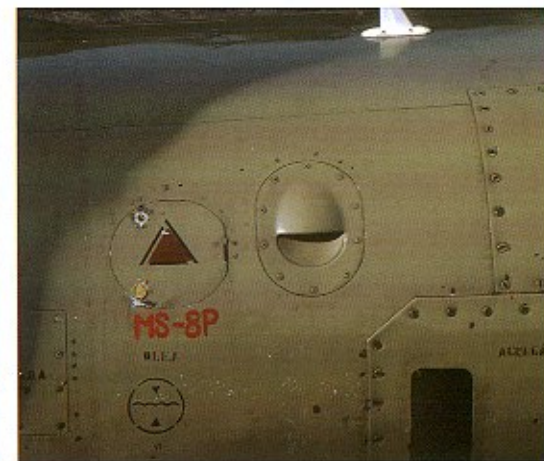
Opposite page - the L-39ZA number '5240' was the test-bed for RTAF aircraft (opposite page). A L-39ZA in the Aero Vodochody factory production line (middle left). The L-39ZA with "tiger stripe" livery carries two UB-16-57 rocket pods and two drop tanks (right). Note number '5015' with left drop tank in non-standard colours (bottom).



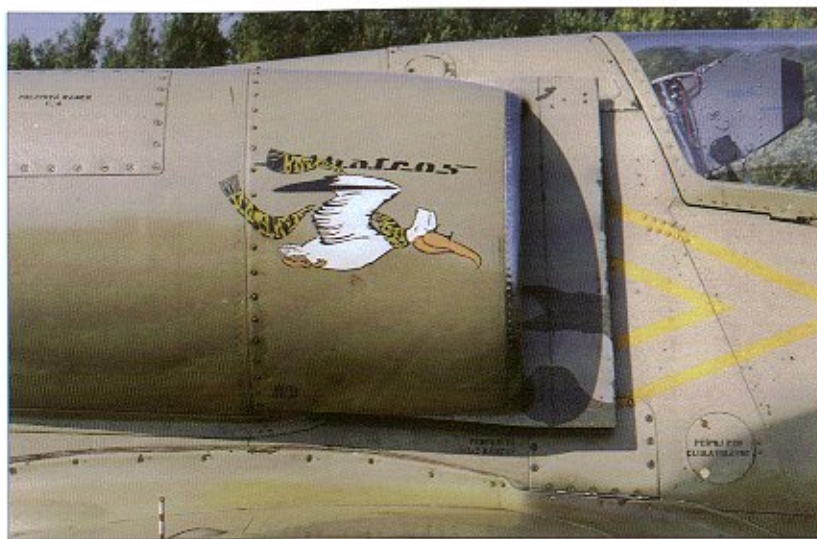




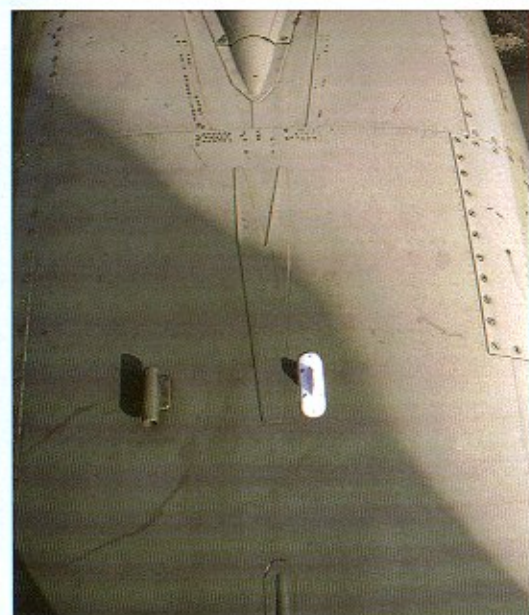
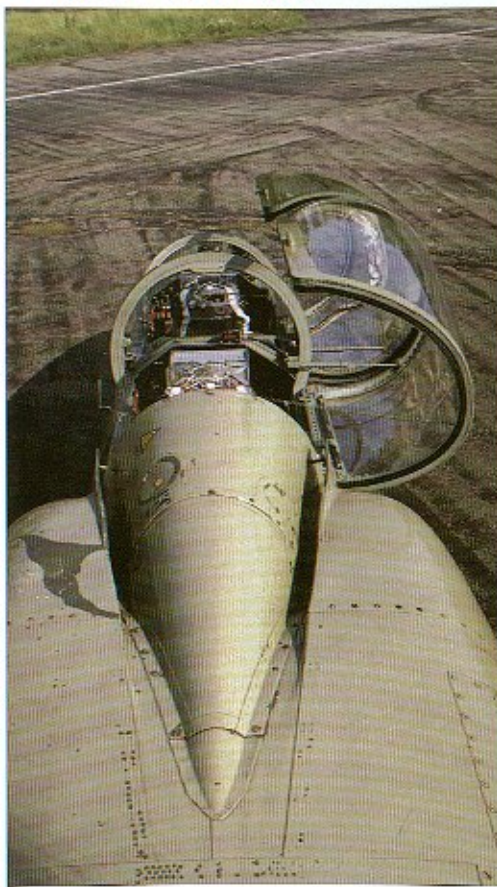
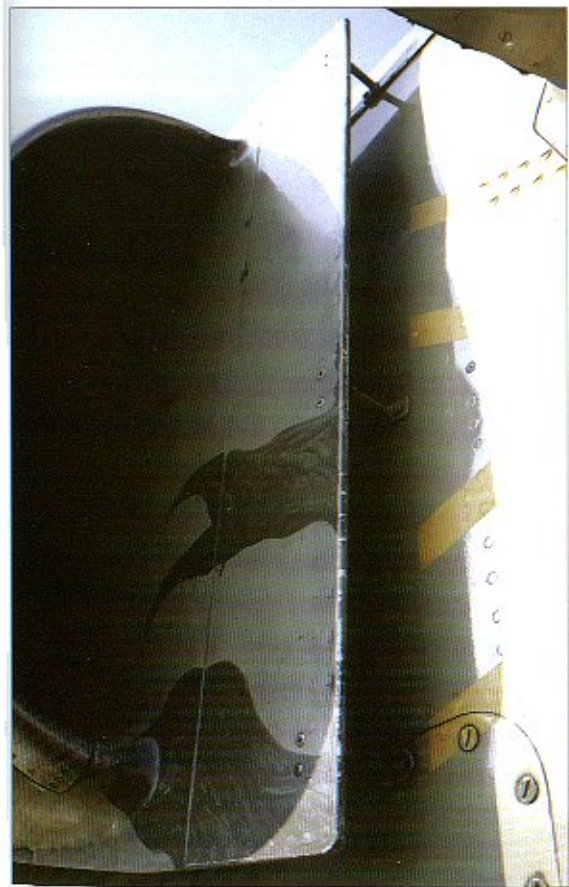
# L-39ZA Walk Around







Opposite page - the L-39ZA was a further development of the L-39C trainer. Despite many structural changes, its external appearance is similar to the L-39C. The wing root area was altered mainly in the area above the main undercarriage wells. Detail of the canopy opening levers (top).



## L-39ZA Walk Around

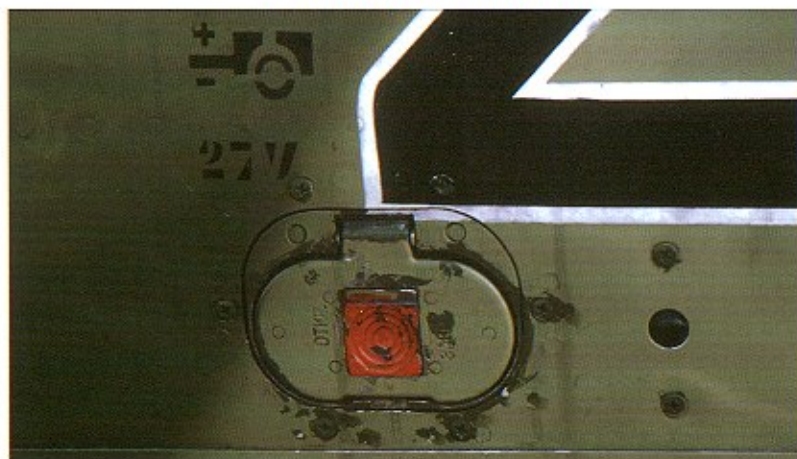
The shape of the engine inlets was left unchanged note the fixed splitter plates to disrupt the sluggish boundary layer airflow. The white aerial is part of the GPS system, which was installed during the nineties.



# L-39ZA

## Walk Around

Many hazard signs and warnings were stencilled on the L-39ZA. Such signs can be seen on the fuel and oil filters, the covers of the external electric power supply, the hydraulic accumulators and the signal rockets. Details of the underside of the fuselage and the wing roots can be seen on opposite page. The antenna between the air brakes was also added during nineties. The exhaust of Saphir-5 APU remains is the same as on the other versions, but the surface of the rear underside of the engine nacelles was strengthened. The sensitive radio-compass was repositioned from its original position in the centre part of the fuselage below the engines, to prevent its damage during the gunfire.

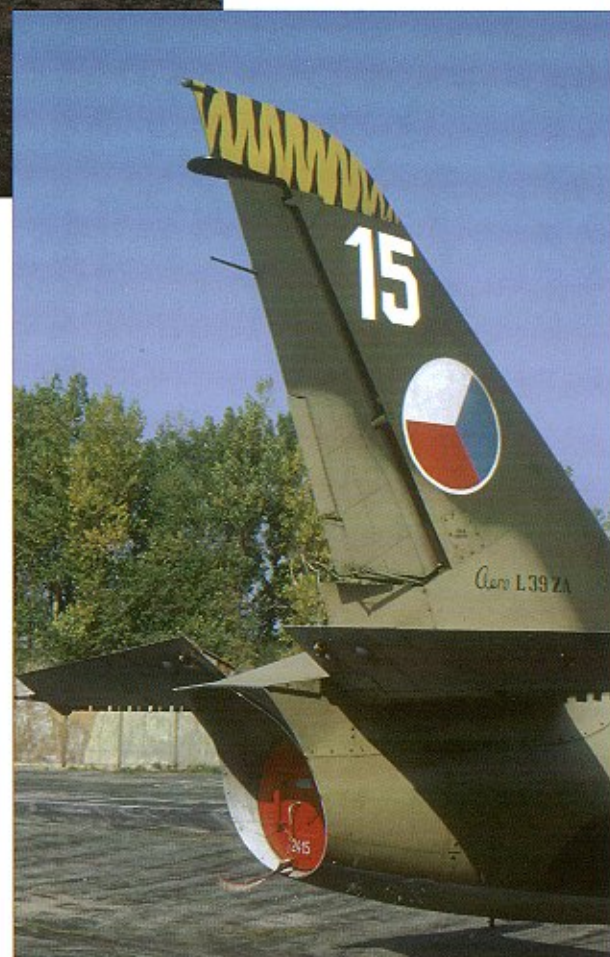




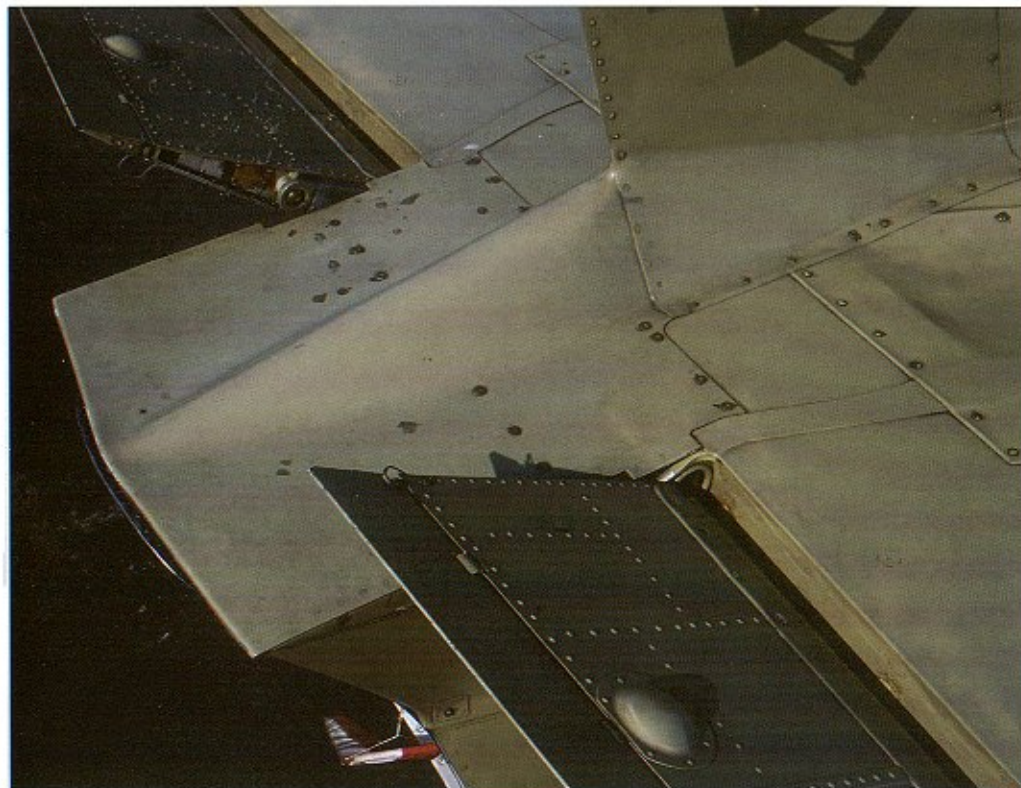




# L-39ZA Wing and Tail Details







The right wing root and its junction with the fuselage and the wingtip tank (opposite page). Tail surfaces are similar to L-39C/V/ZO even with the anti-static dischargers. Details of elevators and its electrically actuated trimmers.



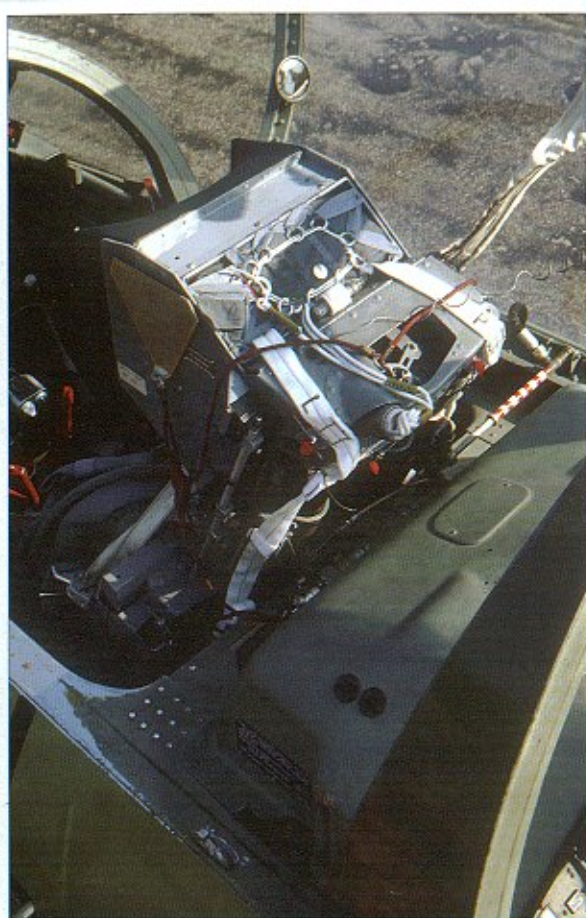
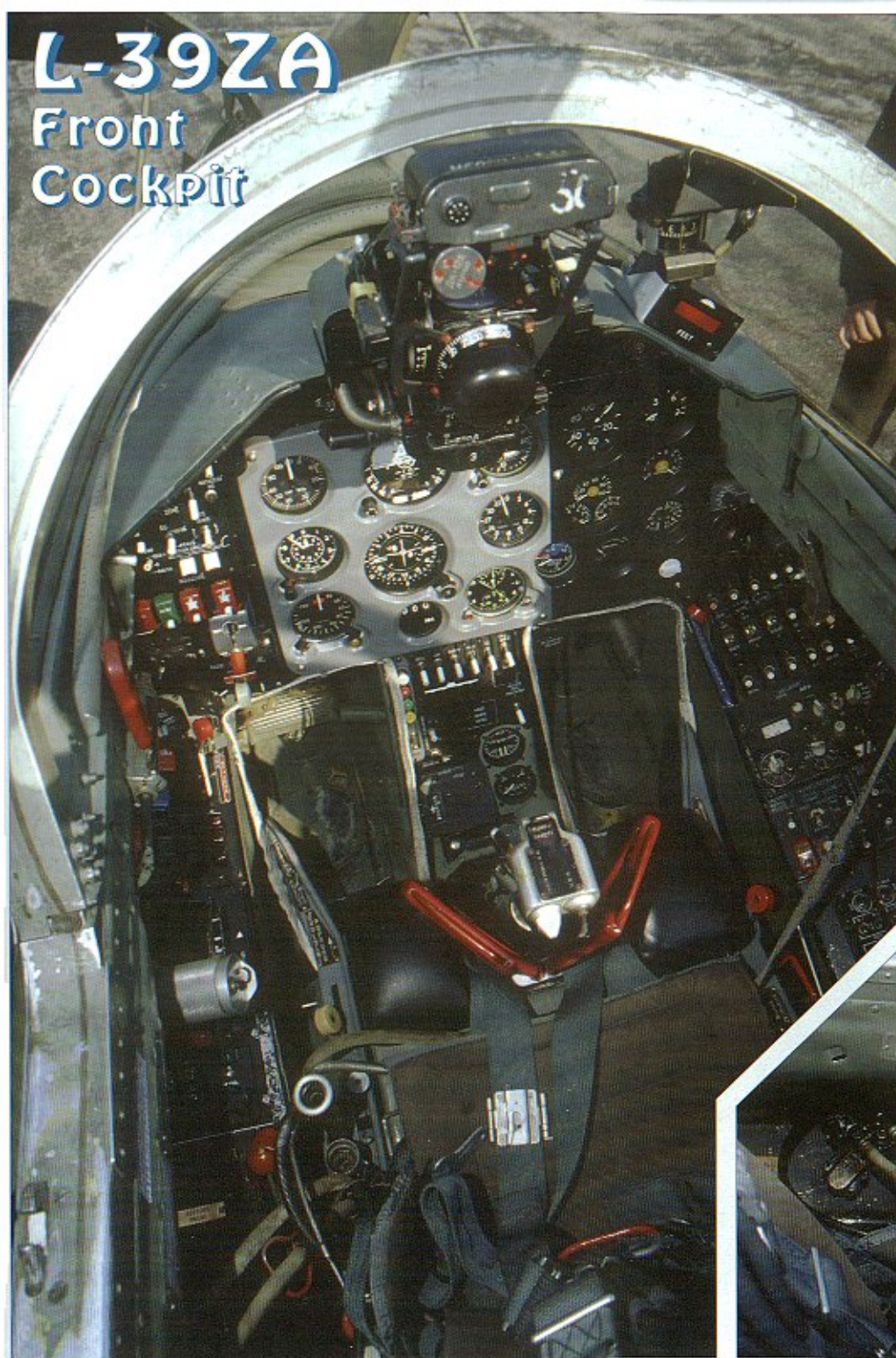




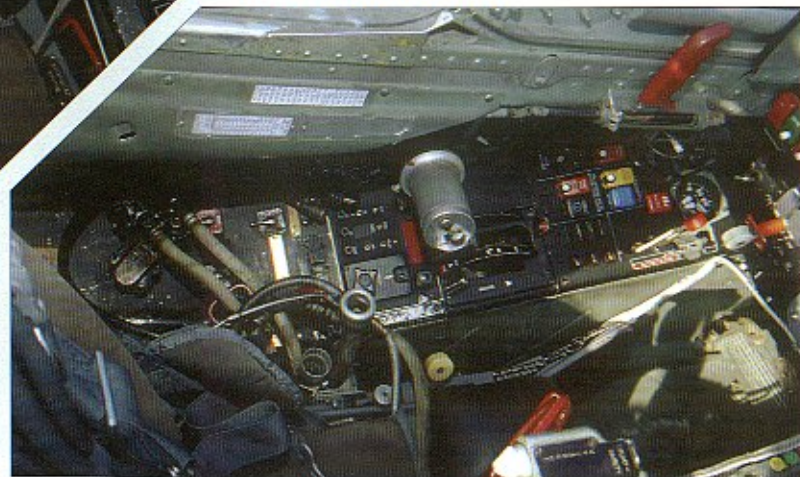


# L-39ZA

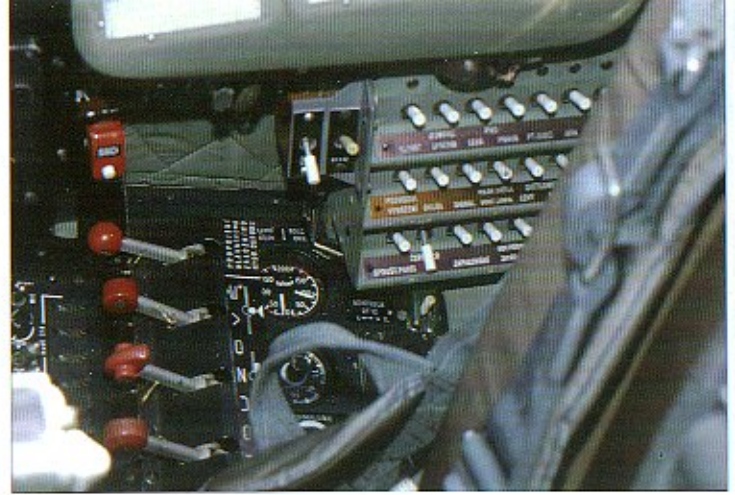
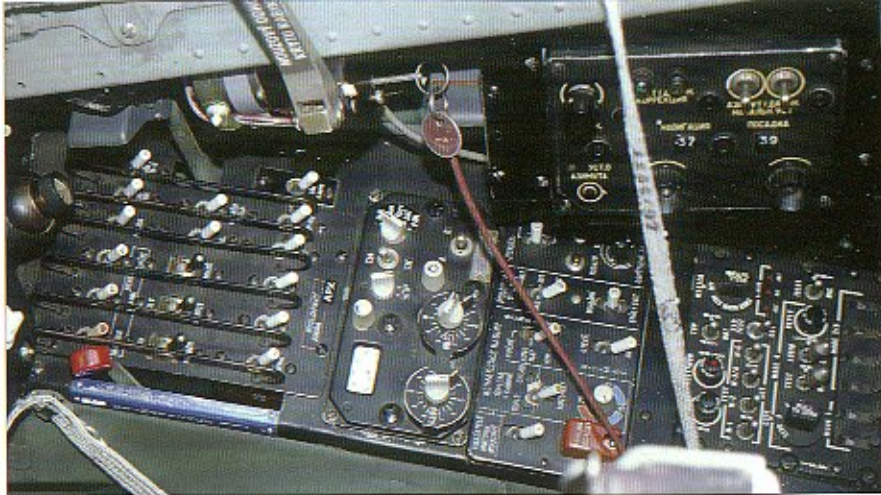
## Front Cockpit



The front cockpit of the L-39ZA had a different instruments and switches layout. The gunsight above the instrument panel is purely for the aiming of fixed and unguided weapons.

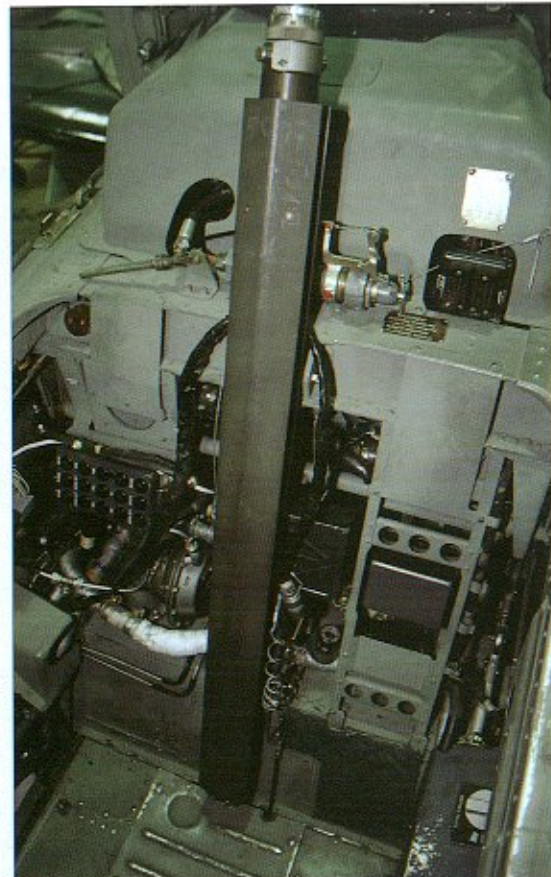
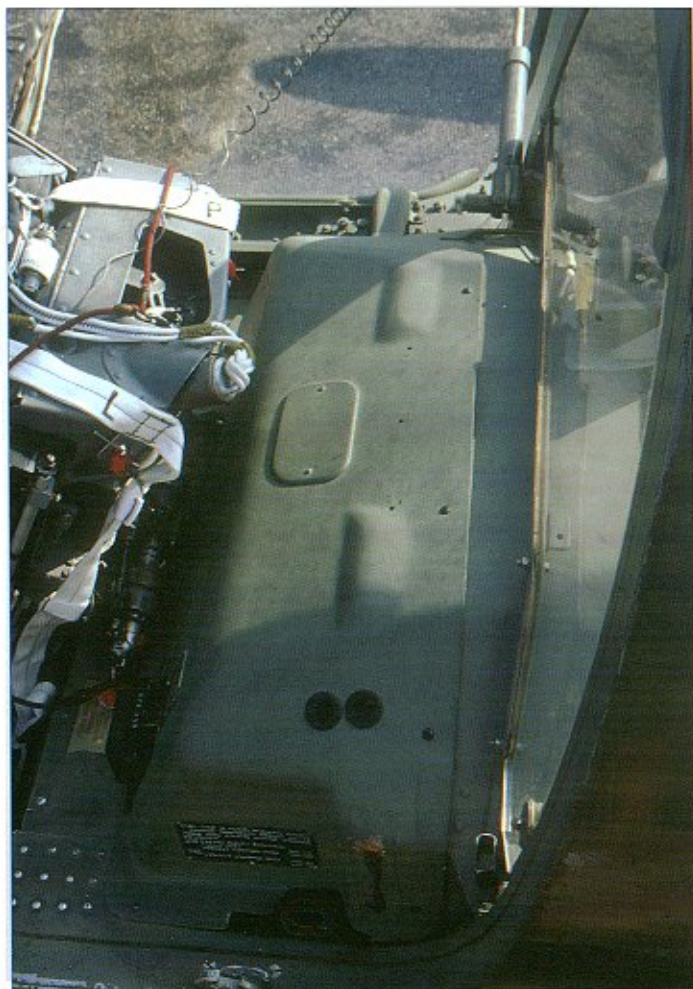






**L-39ZA Front  
Cockpit**



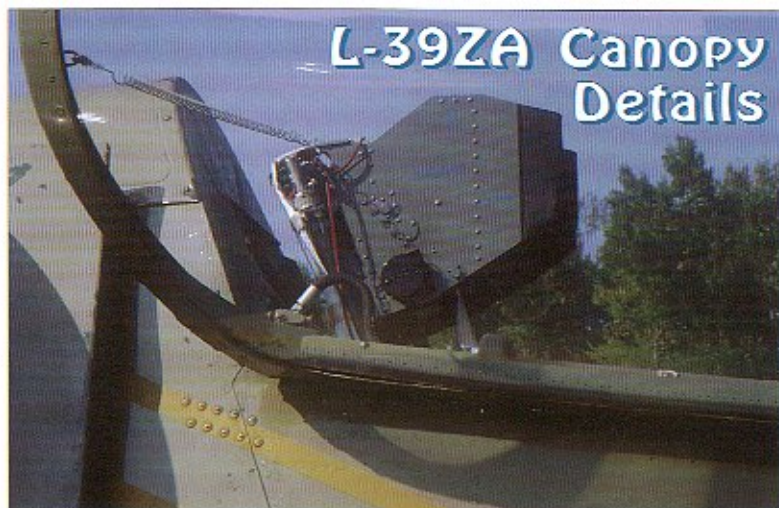


The cover of the rear cockpit instrument panel and the other details of the ejecting system (top). Detail of the handles activating the ejection seat (bottom left). Detail of the seat headrest with its folded stabilising parachute (bottom right).





# L-39ZA Canopy Details



Details of the front cockpit canopy frame with curtain for instrument only flight training.



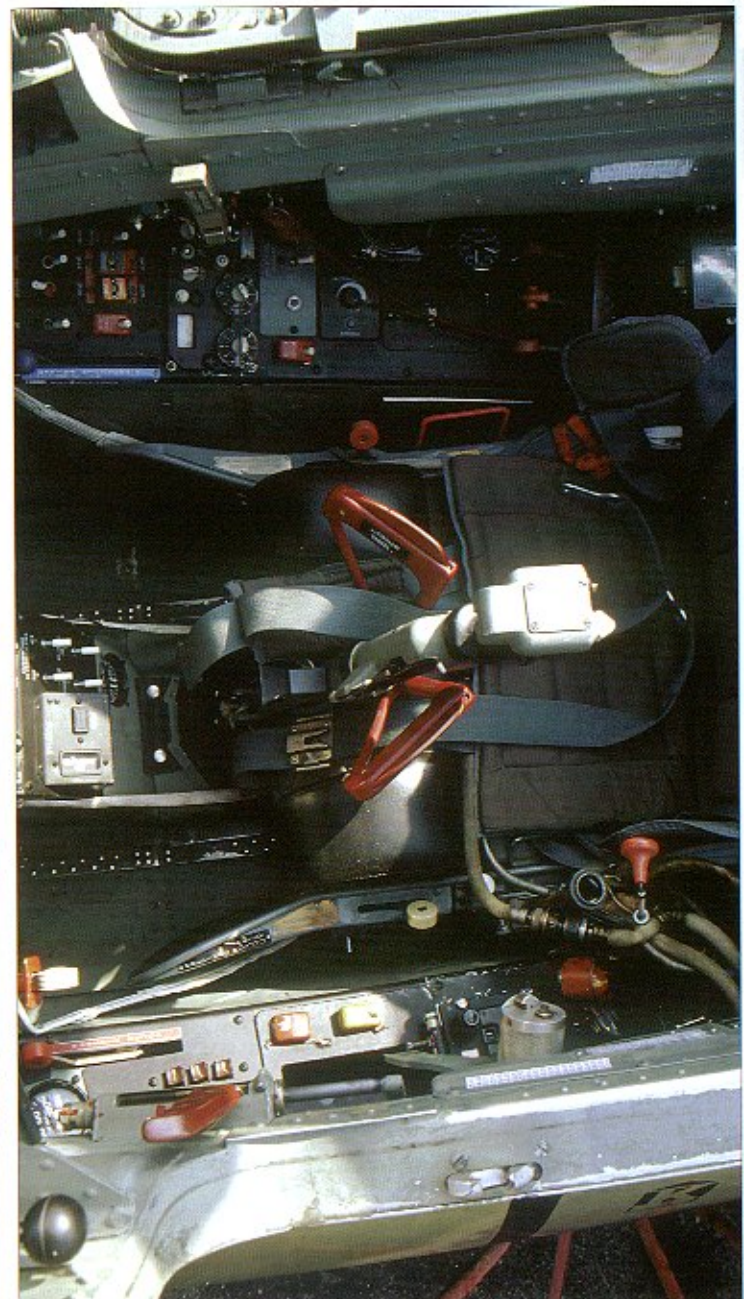
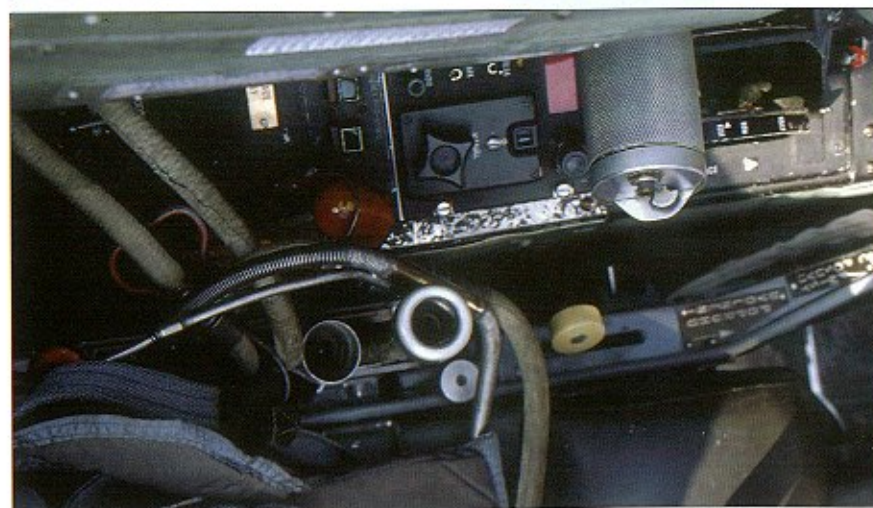
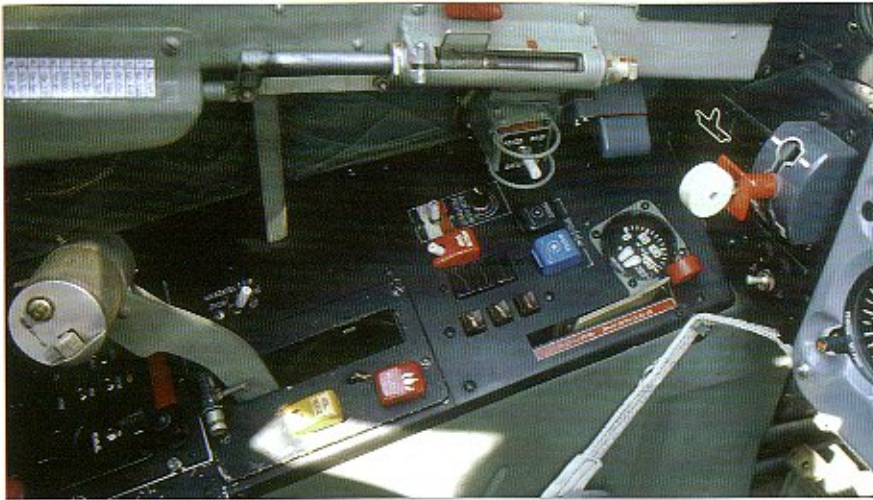


L-39ZA Rear  
Cockpit  
Details



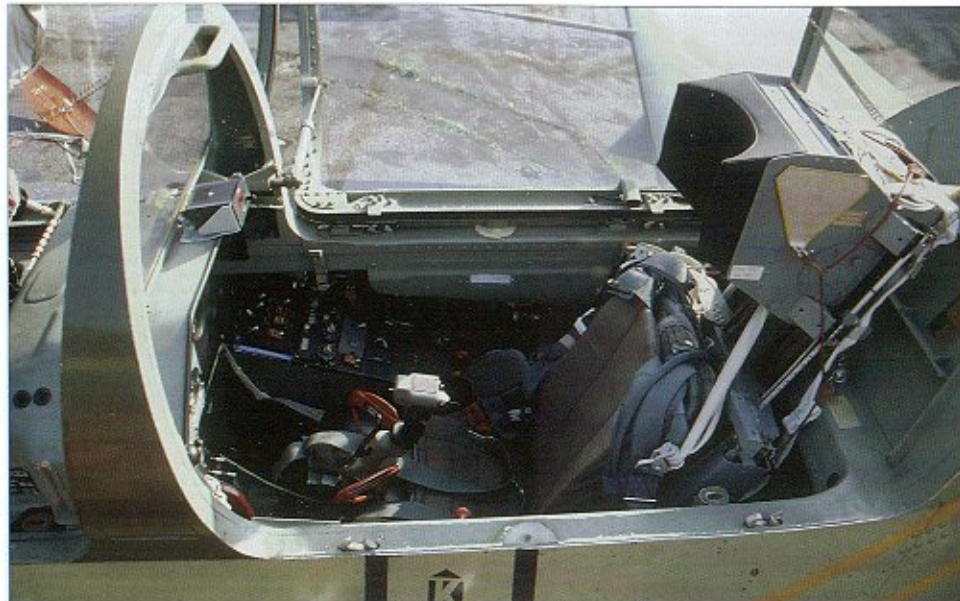


# L-39ZA Rear Cockpit Details



The rear cockpit is similar to the front one in all versions of the L-39 family.





General views into the rear cockpit. The barometric altimeter calibrated in feet is installed above the instrument panel. The ejection seat is the same for all versions.





# L-39MS/L-59

photo by Jan Kouba



photo by Petr Soukup

A Damaged L-59E after an unsuccessful landing on the Aero factory airfield (top right).

photo by Petr Soukup



Top left picture shows L-59E number "0101" in the air (the prototype aircraft for Egypt), the same aircraft can be seen on the two pictures in the middle.



photo by Petr Soukup

photo by Petr Soukup



The Two bottom pictures show L-39MS "0022", which was used by the Aero factory for weapon systems tests.



photo by Petr Soukup





photo by Petr Soukup

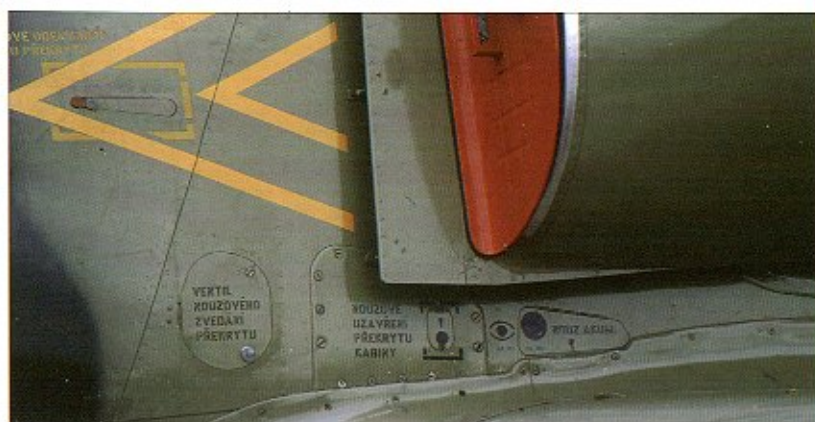


Two pictures of L-59T "0101" (the prototype for Tunisia) are seen at the top of the page. A flying formation with an F-18 (left). The first L-39MS/L-59 number "0001" (middle). The L-39 MS "0004" in a flight formation with a MIG-29 (left). The L-39 MS "0006" at Ceské Budejovice Air Force Base in September 1997 (right).



photo by Petr Soukup





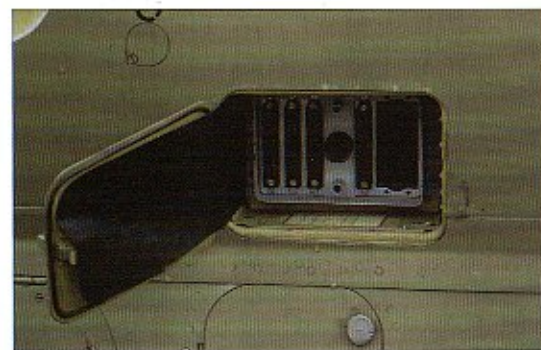
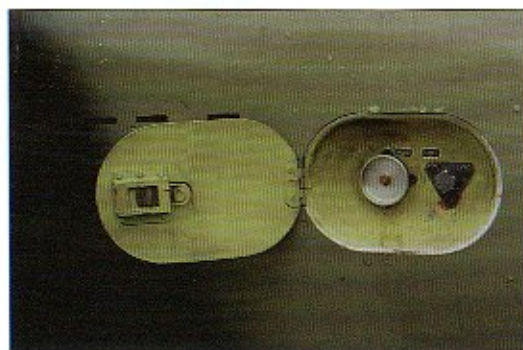
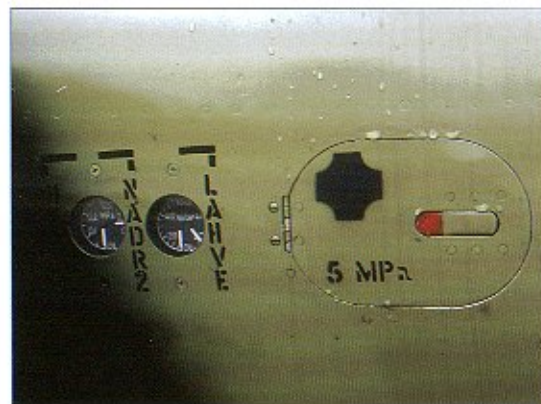


# L-39MS

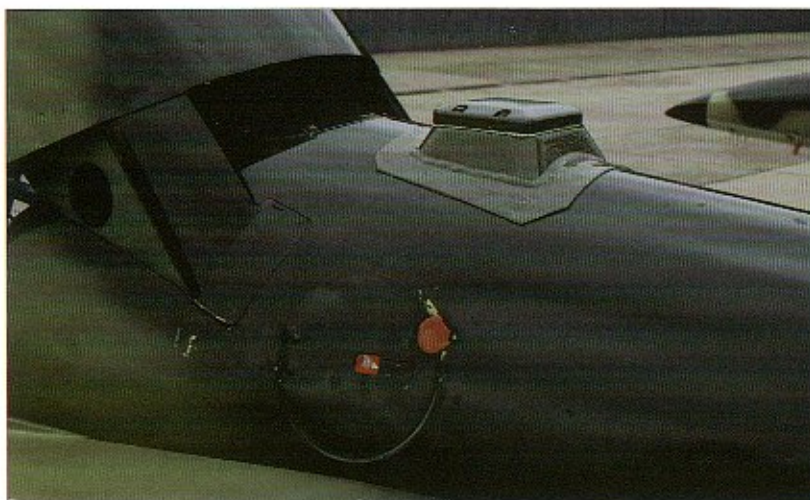
## Walk Around



Aero L-39MS is a significantly modified version of Aero Vodochody's Albatros family. The differences can be seen following in both general and the close up views.







# L-39MS

## Walk Around

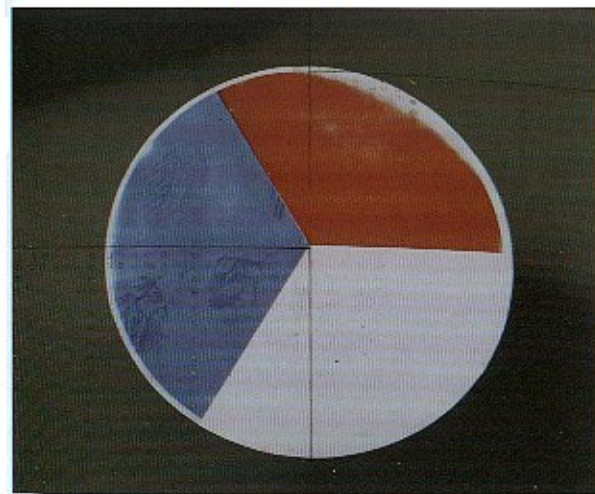




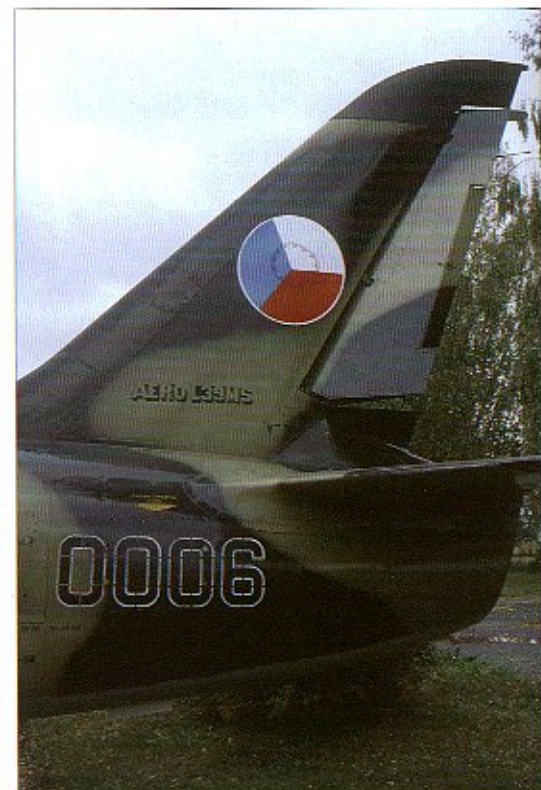
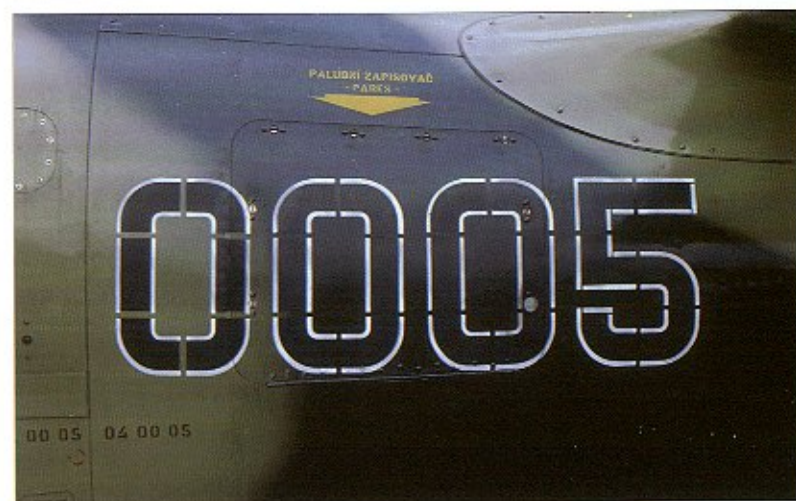


Opposite page: this detail shows how the single piece canopy is joined to the fuselage (above left). The inspection and priming points for the pressurised air and oxygen. The handle controlling the mechanical hydraulic pump for opening the cockpit canopy (on the bottom pictures).

A view of the position of the under-wing pylons and the pitot-static tube (this page right).





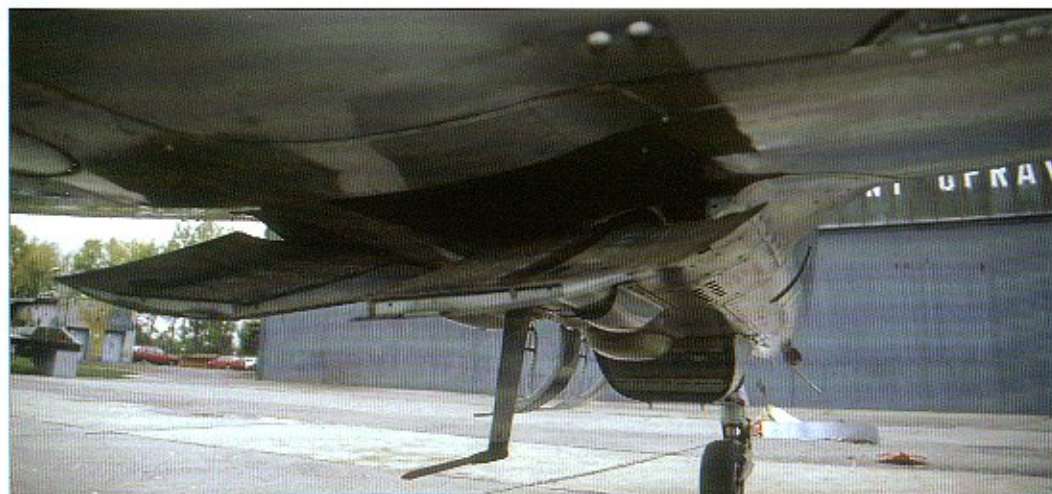


A detail of the tail surfaces. Vortex generators were not used on the L-39MS version.

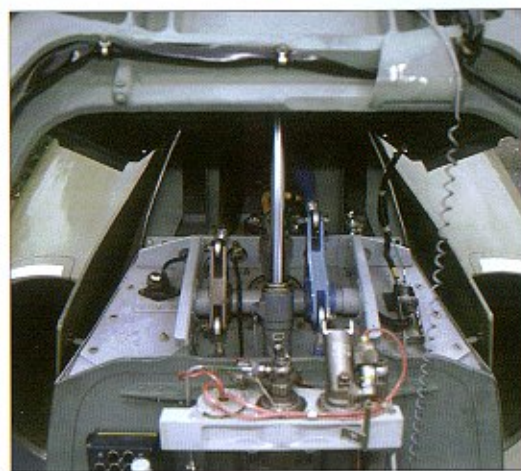
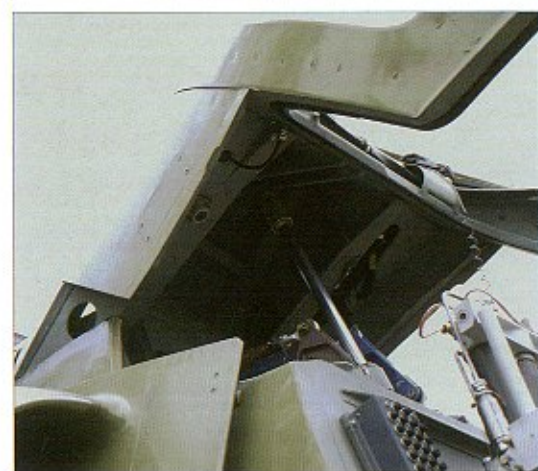
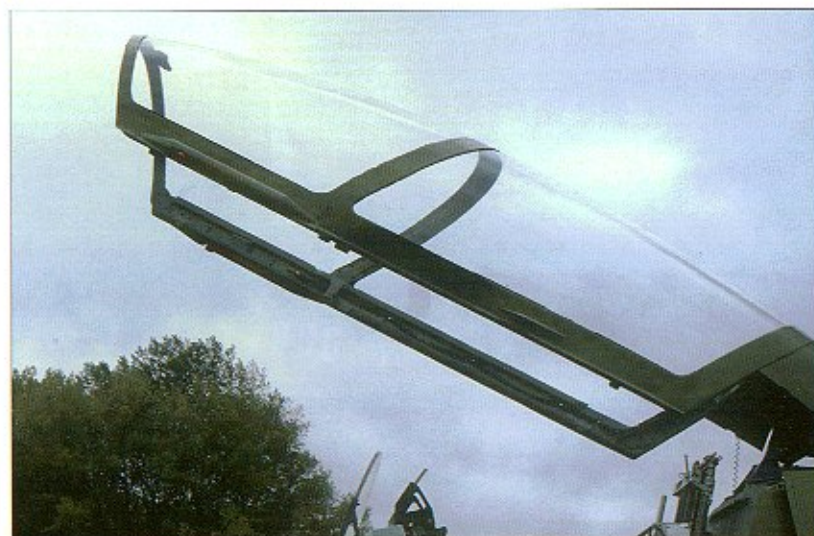
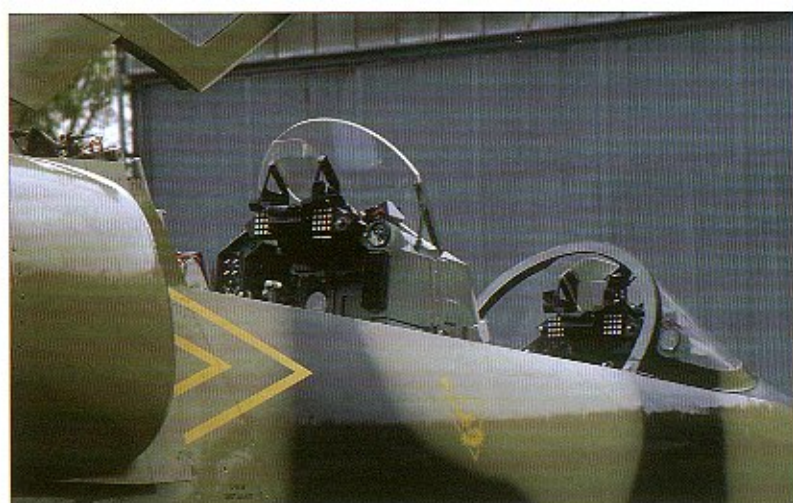




The location of the twin-barrelled GSh-23L gun in its pod under the fuselage. The antenna on the underside of the fuselage is made of dielectric material. A view of the on partially deployed air brakes.







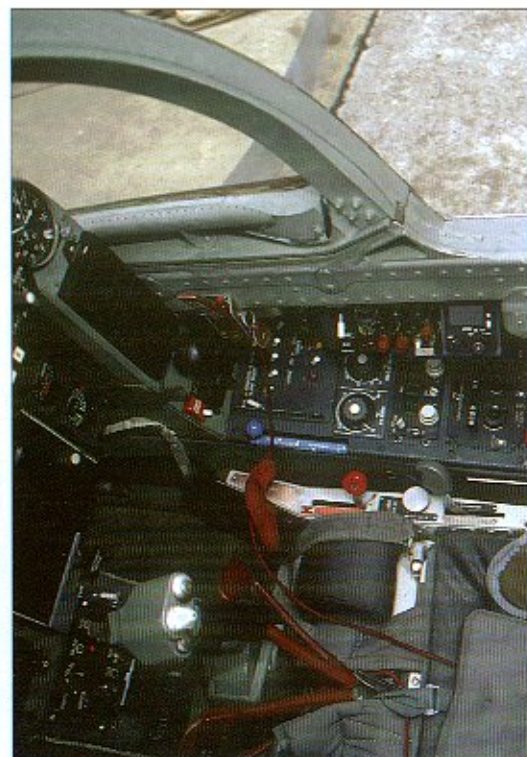


# L-39MS

## Front Cockpit Details



A general view of the single-piece canopy and its opening mechanism (left). L-39MS has both cockpits separated by a transparent bulkhead. The front cockpit with the dominant HUD (Head Up Display) above the instrument panel.





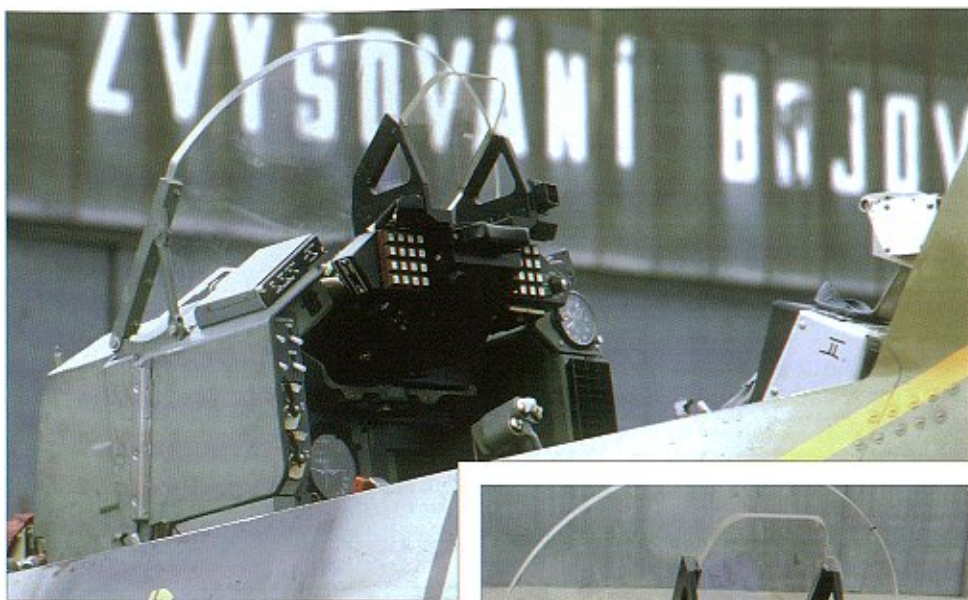
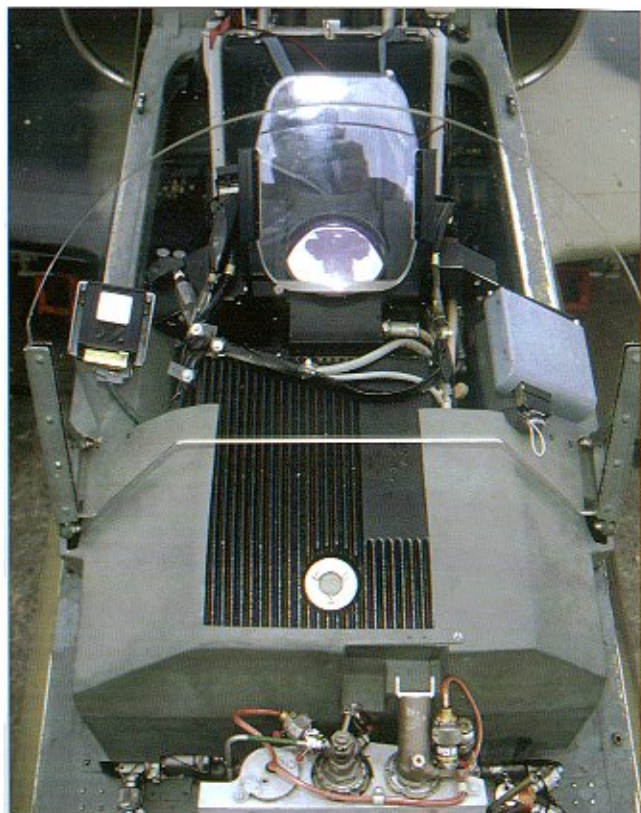


The L-39MS introduced new single multifunction display in both cockpits. The weapon system is computer controlled. The side panels are similar to the old versions.

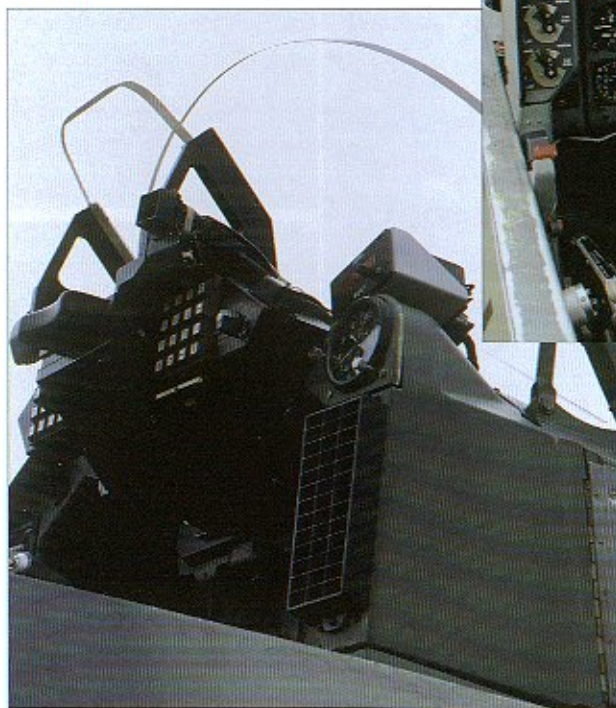
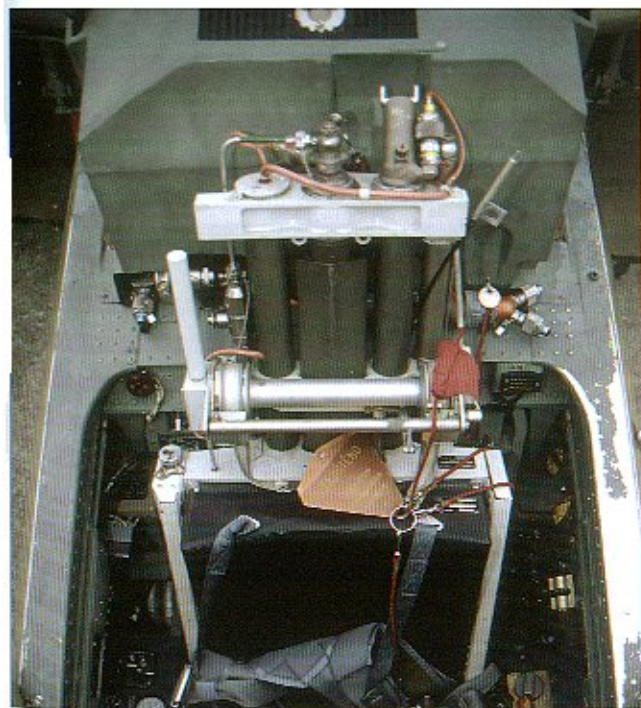


**L-39MS  
Front  
Cockpit Details**



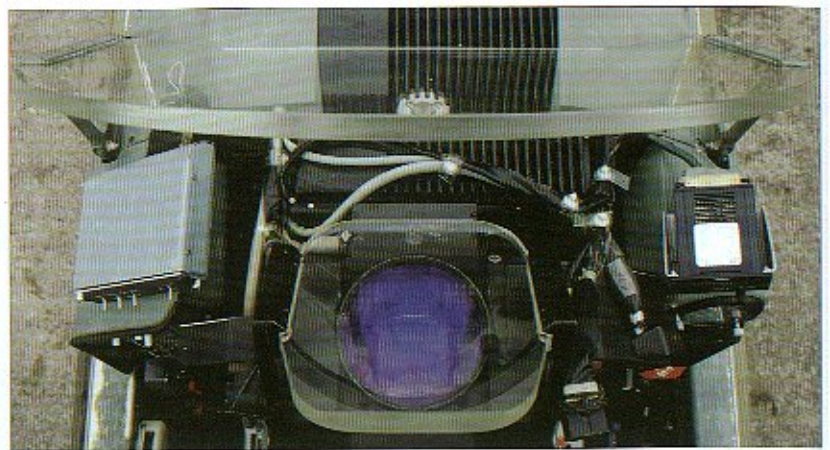


The rear cockpit is equipped with similar instruments and weapon systems to the front one. The ejection seat with head-rest removed (bottom left). The transparent bulkhead between the cockpits, is made of thick glass, is clearly seen on these pictures.



**L-39MS  
Rear  
Cockpit  
Details**

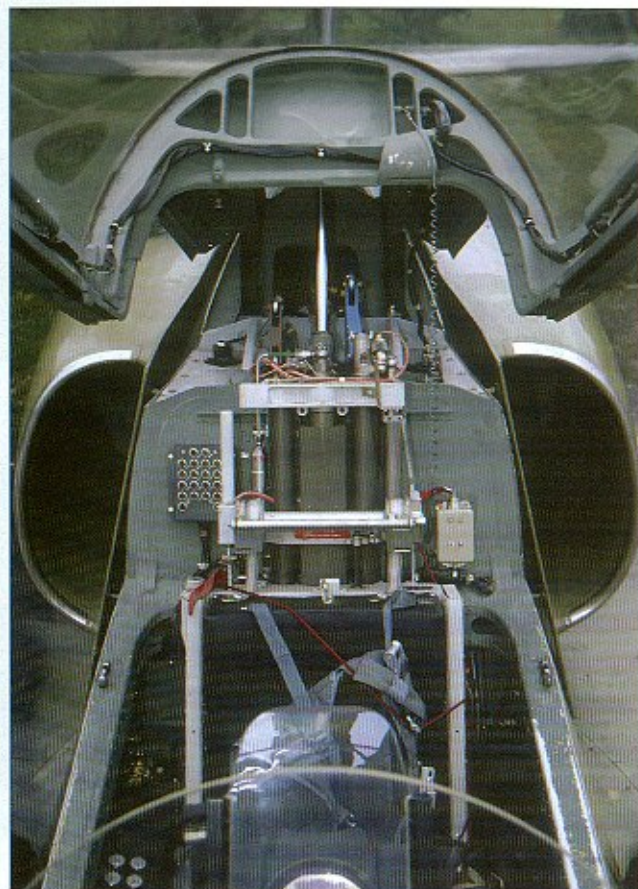




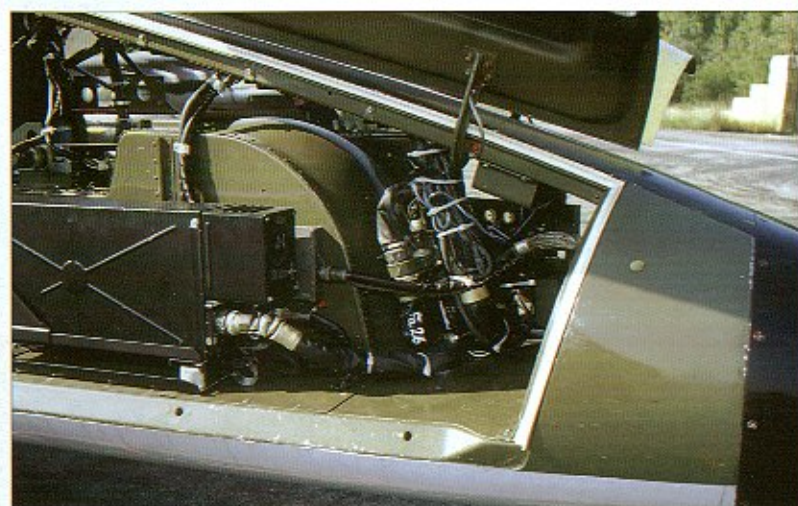




The side instrument panels in the rear cockpit are similar to the front ones. Details of the single-piece canopy and its hydraulic opening mechanism (both right).







## Nose Details



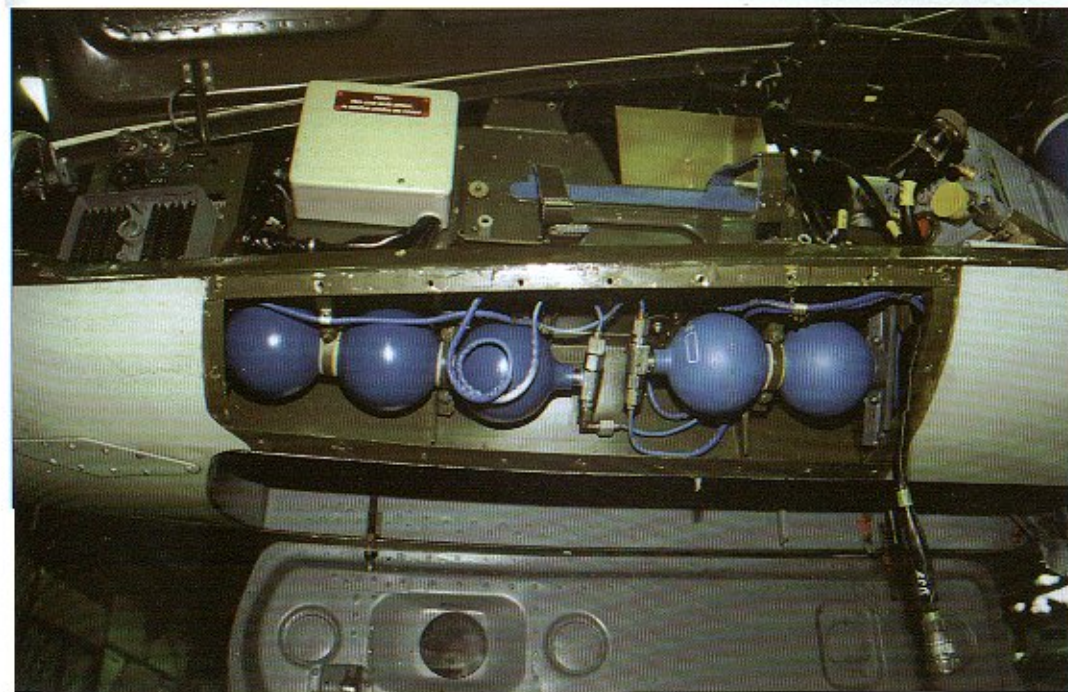




These two pages show details of the nose instrument section of the L-39ZA. In this section the batteries, transducers, communication systems and oxygen bottles are located.



The front undercarriage well divides the nose instrument section in the centre. All the instruments are easily accessible via the two side cowlings.



The aircraft's nose cone is made of dielectric material and covers the RSN-5S navigation system antenna.

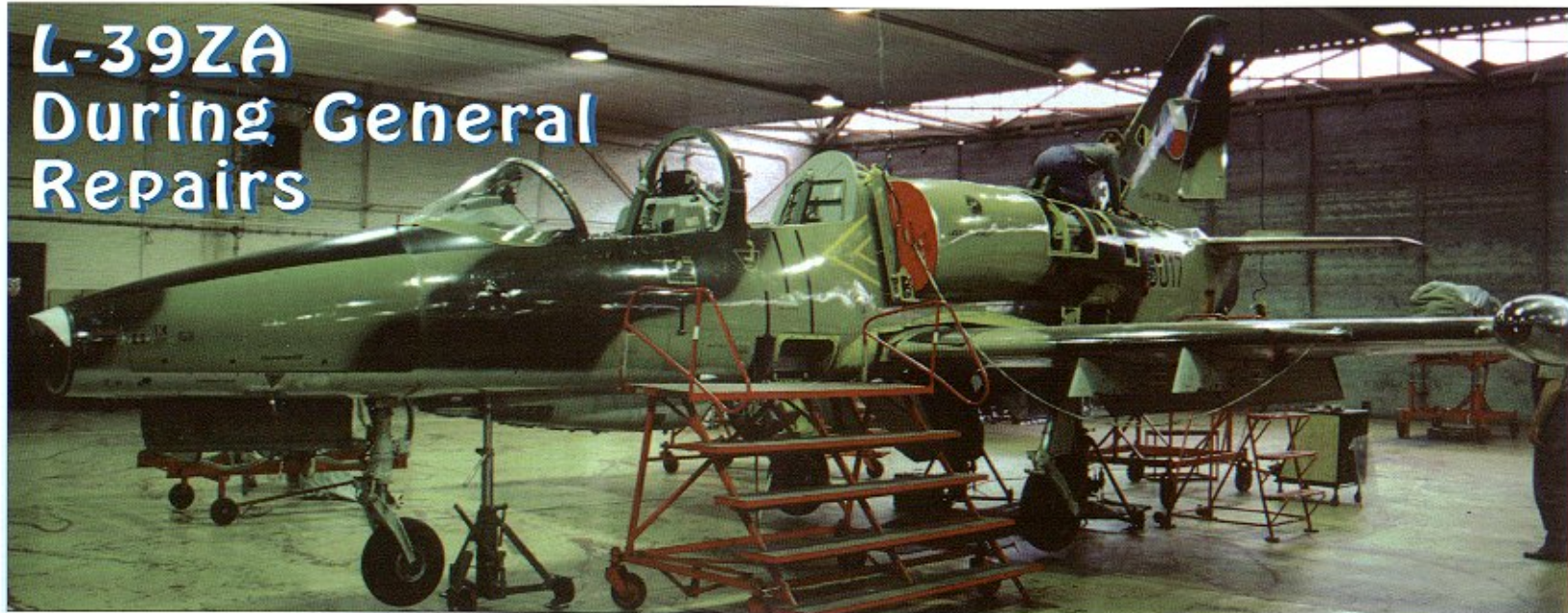




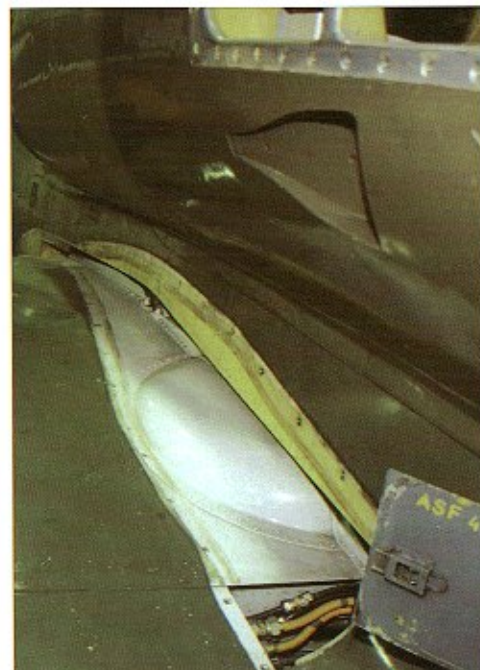
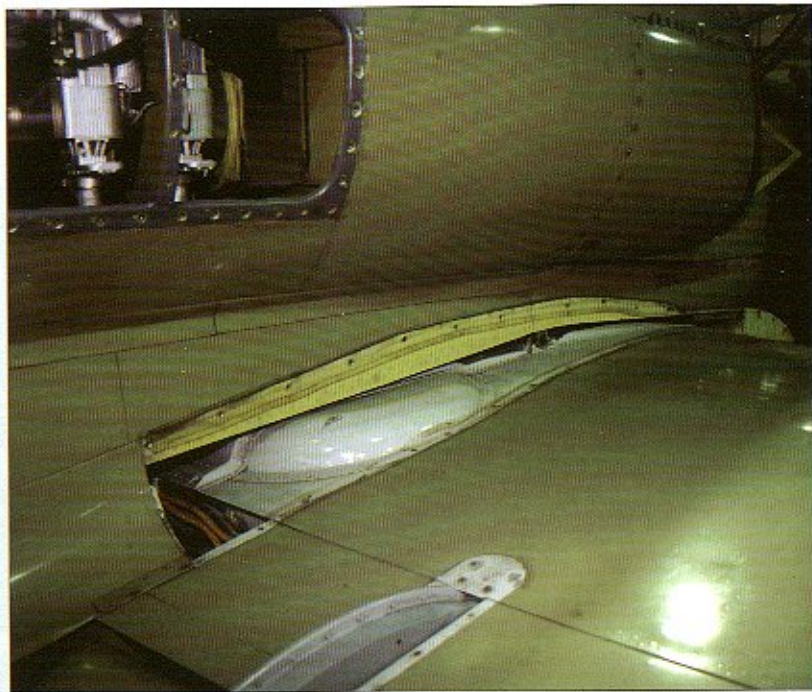




# L-39ZA During General Repairs







The single piece wing is attached to the fuselage by four joints. The pictures clearly shows, that after removal of the aerodynamic covering, the control rods and electric cabling are accessible for maintenance.

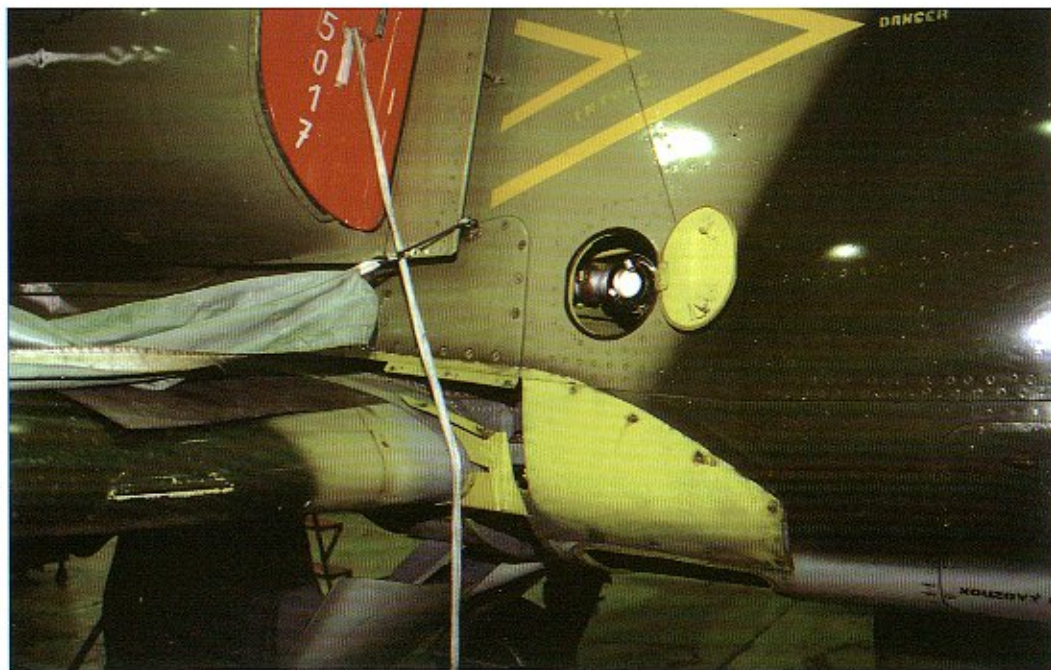




With the aerodynamic panel over the wing-to-fuselage joint removed the control rods and hydraulic system elements are exposed.



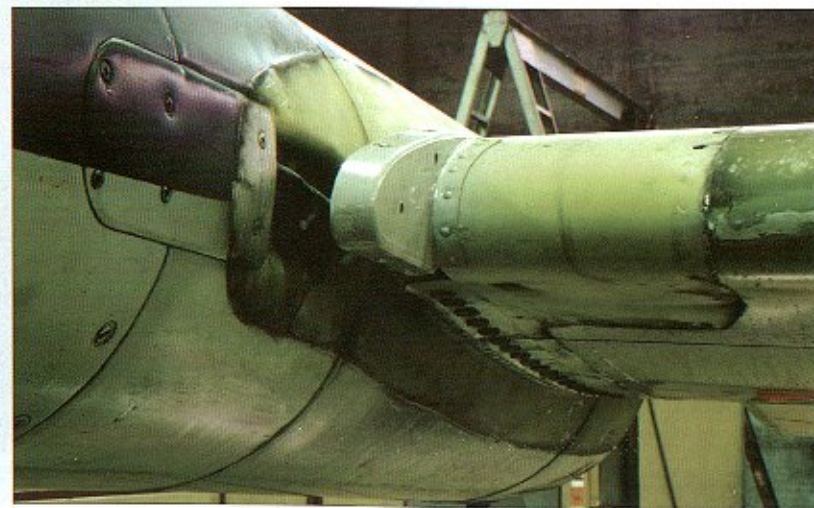
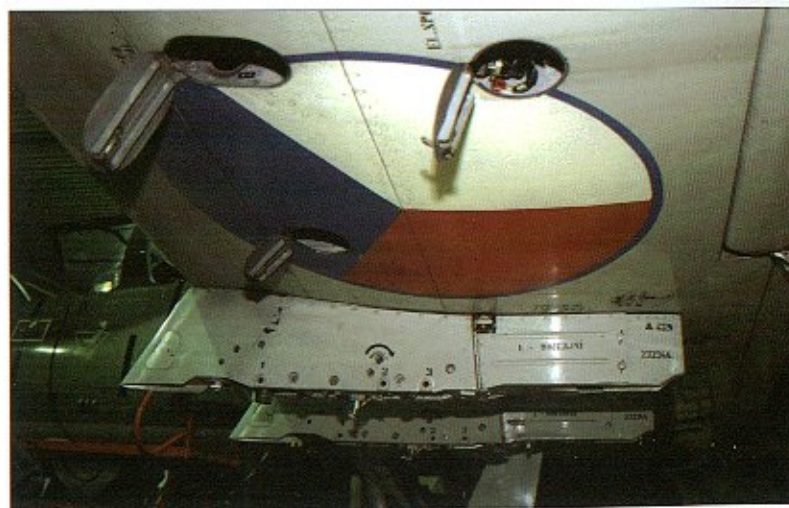
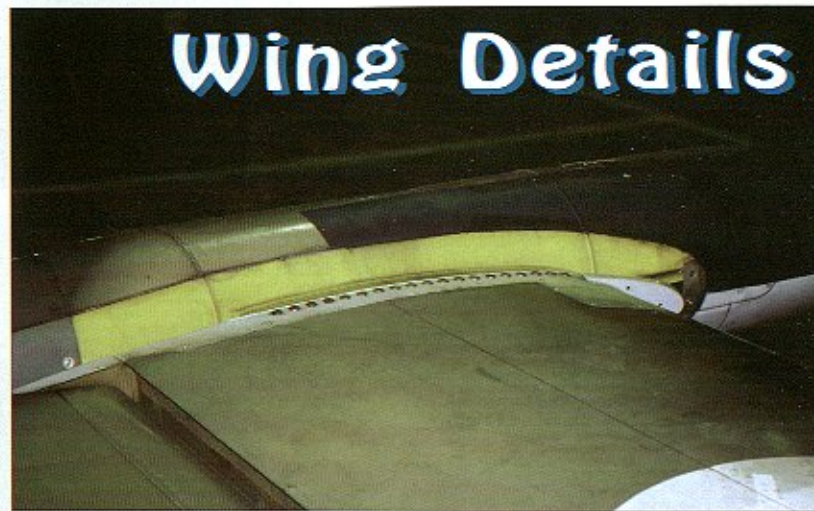
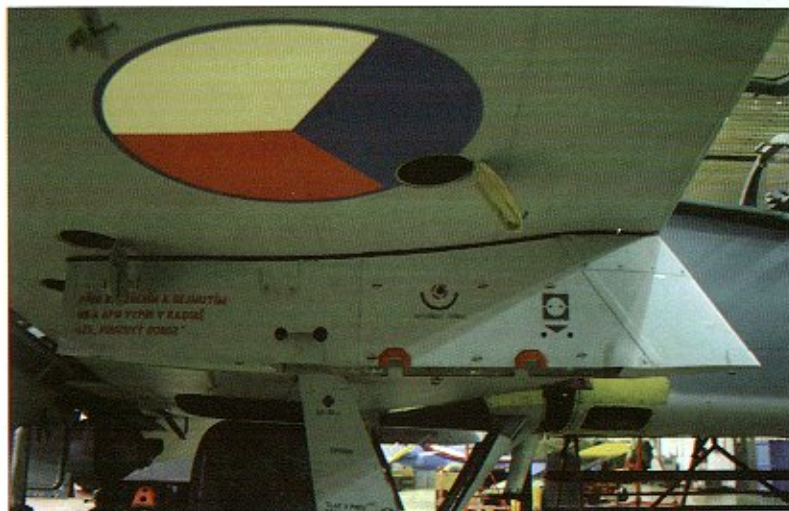
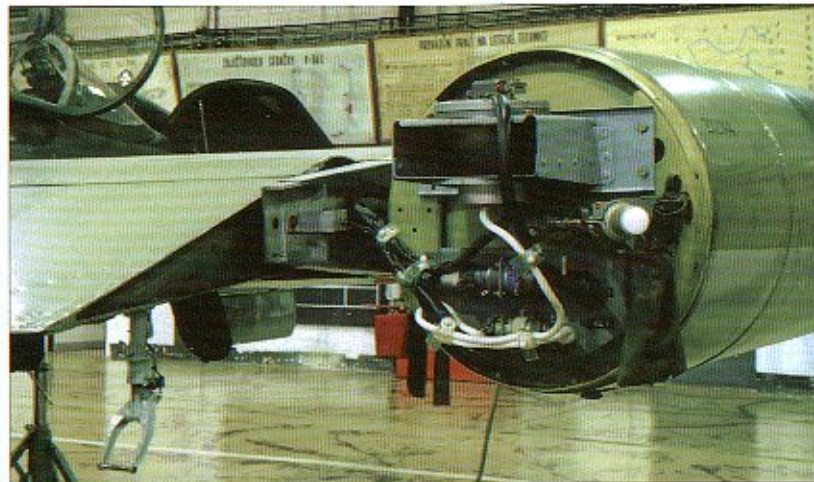
# Wing Root





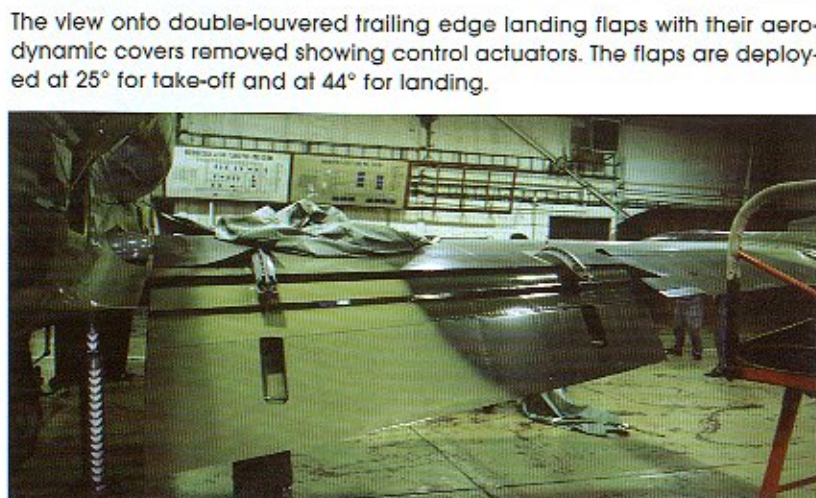
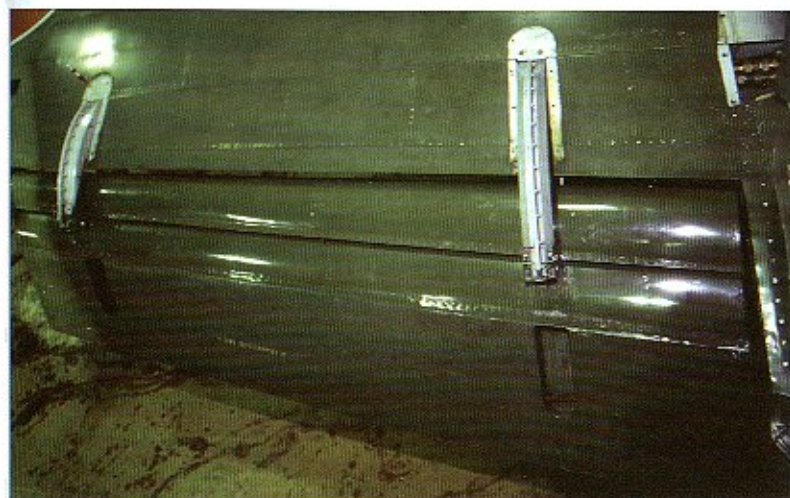
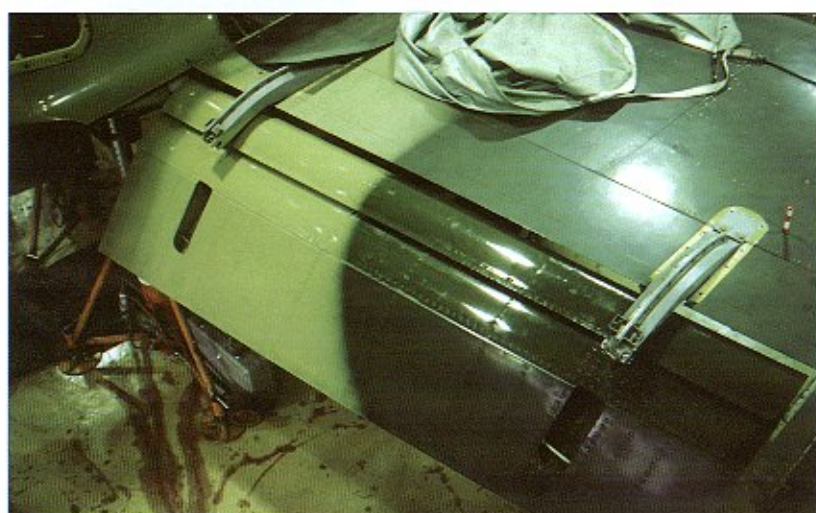
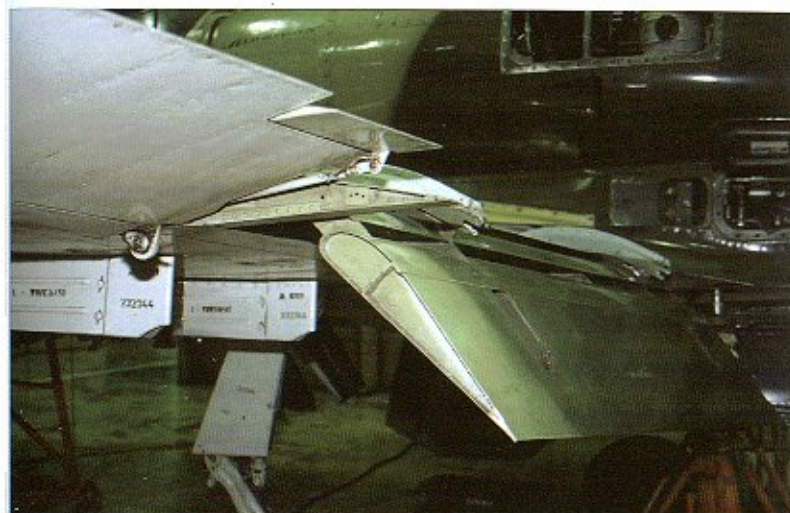
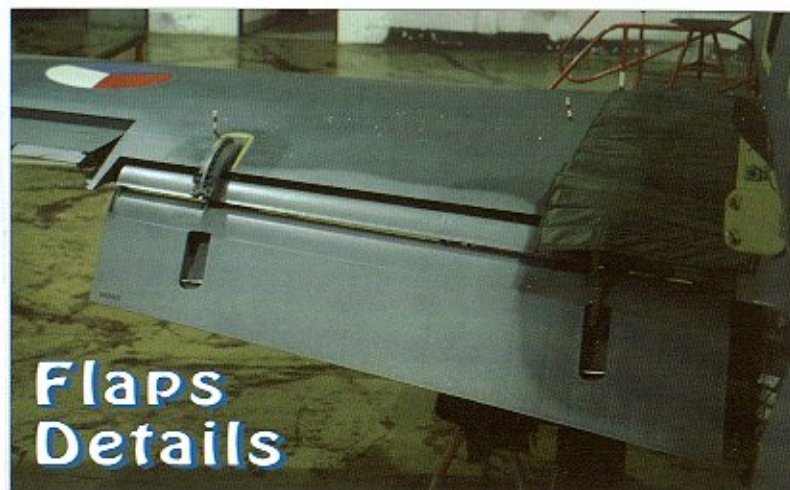


Aerodynamic wingtip tank cover removed including the IFF aerial. With the aerodynamic covers removed the fixing of the wingtip tanks to the wing can be seen (Other pictures).



## Wing Details

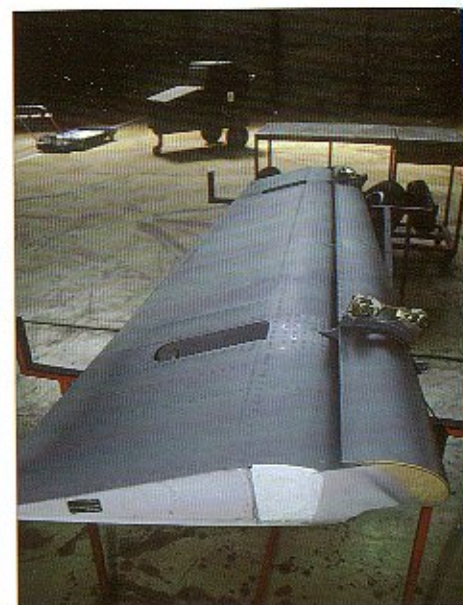




The view onto double-louvered trailing edge landing flaps with their aerodynamic covers removed showing control actuators. The flaps are deployed at 25° for take-off and at 44° for landing.



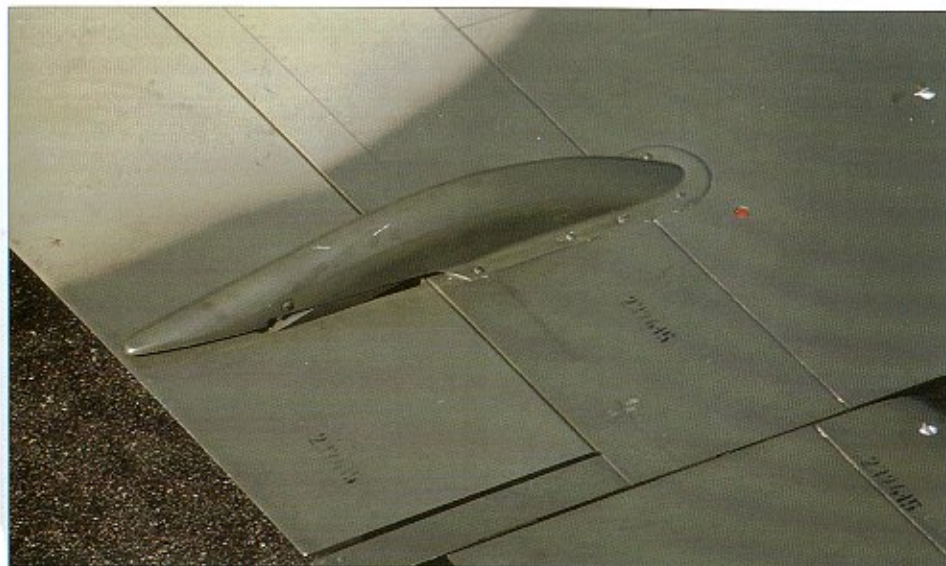
# Flaps Details



Detail of the flap guides and their hydraulic actuating system.

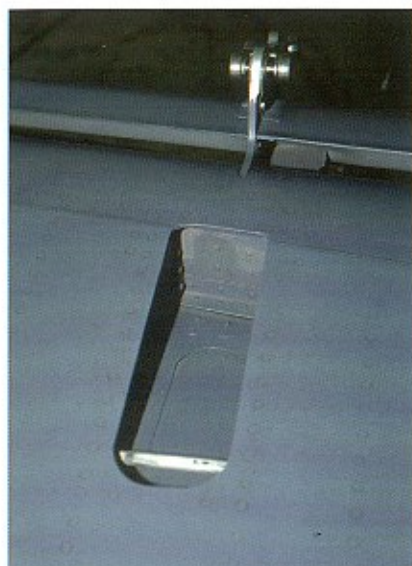


## Flaps Details



Detail of the landing flaps upper attachment (above right).

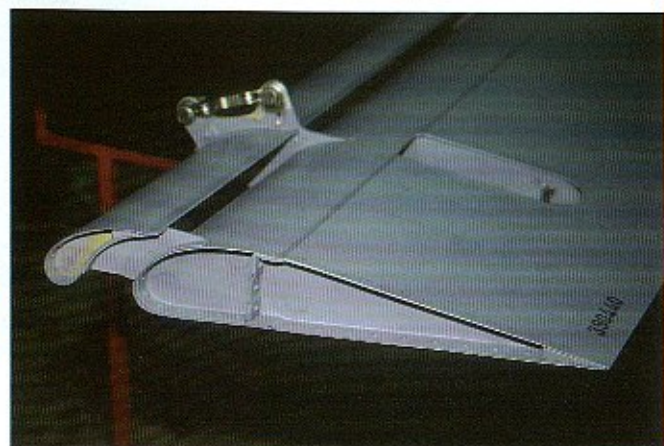
Detail of the flap hinge (bottom). The red flaps position indicator "police-man", here in the closed position on the L-39ZA (top left).



## Undercarriage Position Indicator Details



The same indicator on a L-39C is in a different colour (bottom left). The undercarriage position indicator. (centre left).

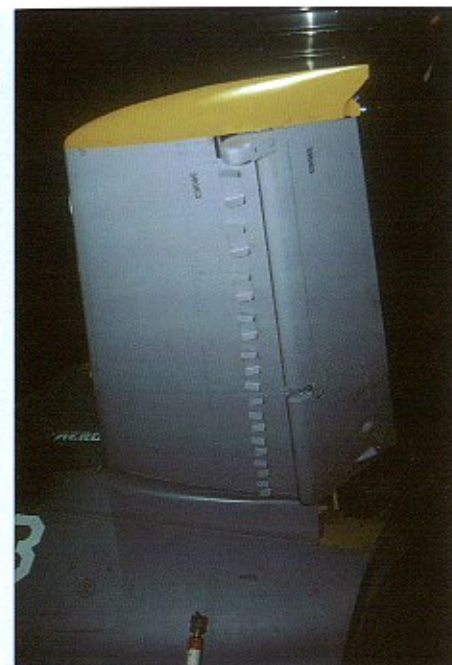




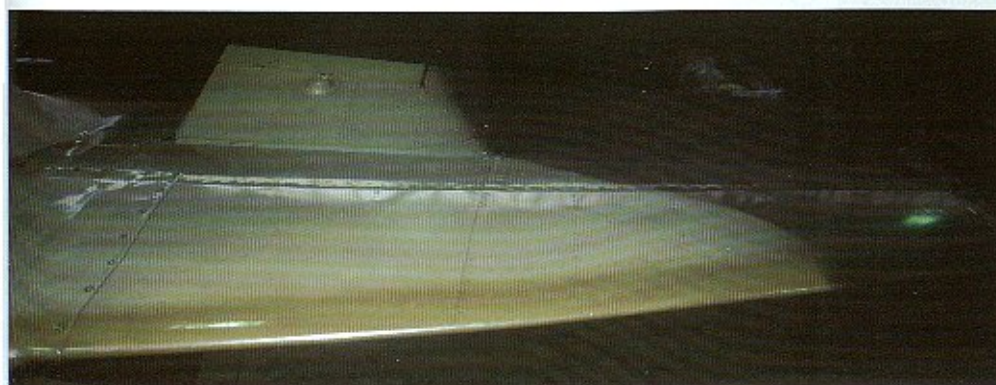
# Tail Unit Details



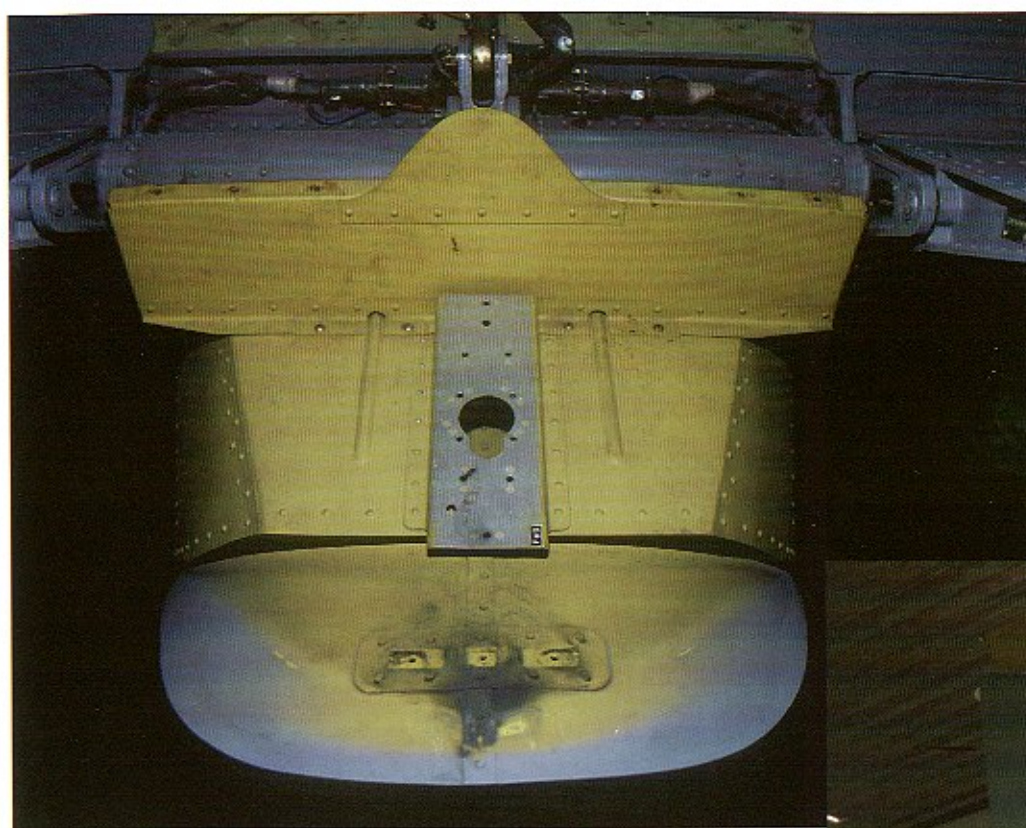




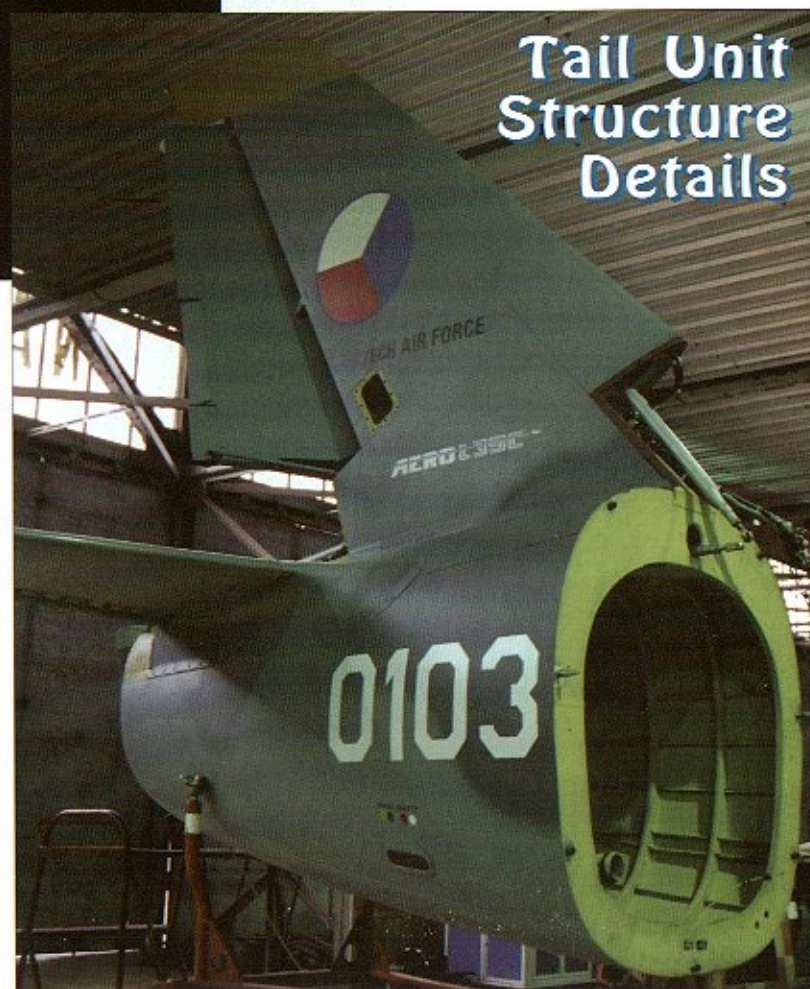
Details of the tail surfaces on the L-39C and L-39ZA versions. The moving parts are mass balanced, so that on the ground, without control pressure they come the rest in an "up" position.



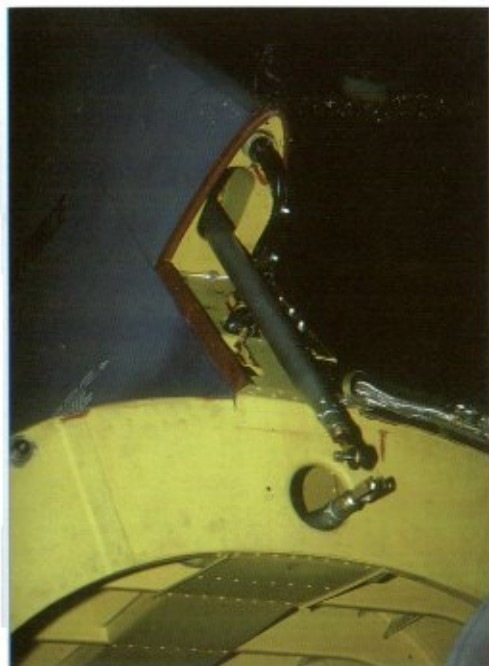




## Tail Unit Structure Details







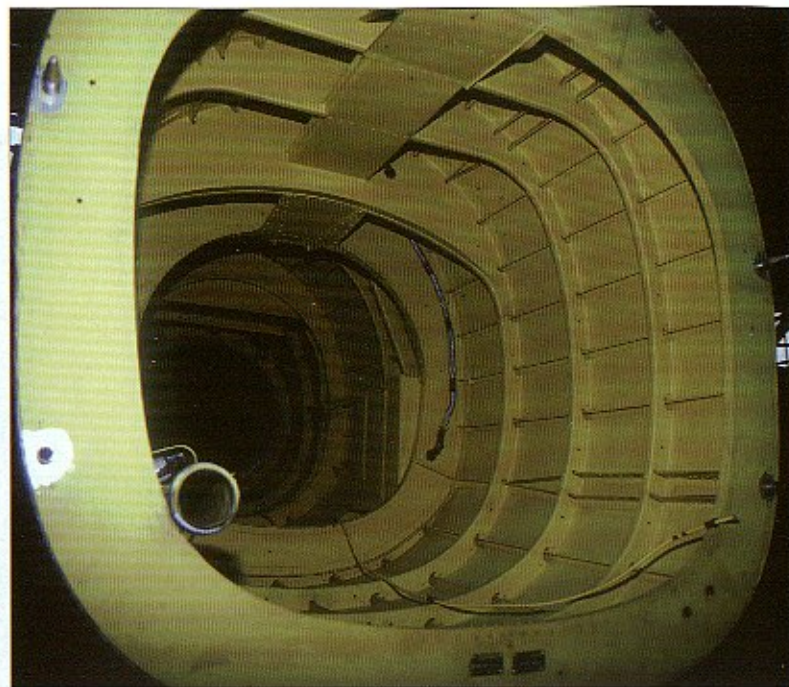
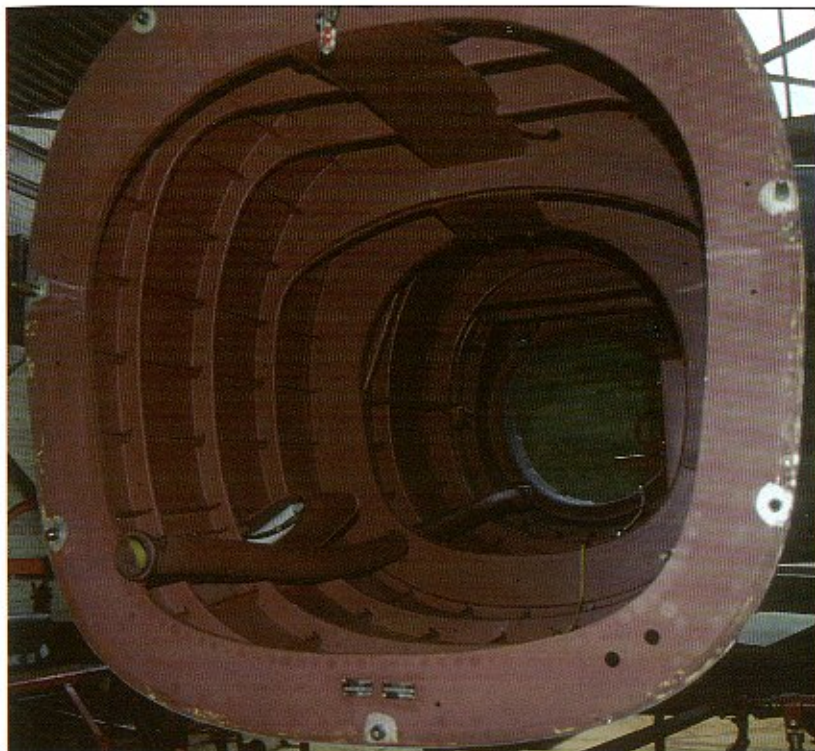
Opposite page - the rear fuselage part including the tail unit is quickly and easily removed to provide access to the engine for maintenance or replacement.



The views on this page shows the rudder control rods and the engine exhaust pipe.



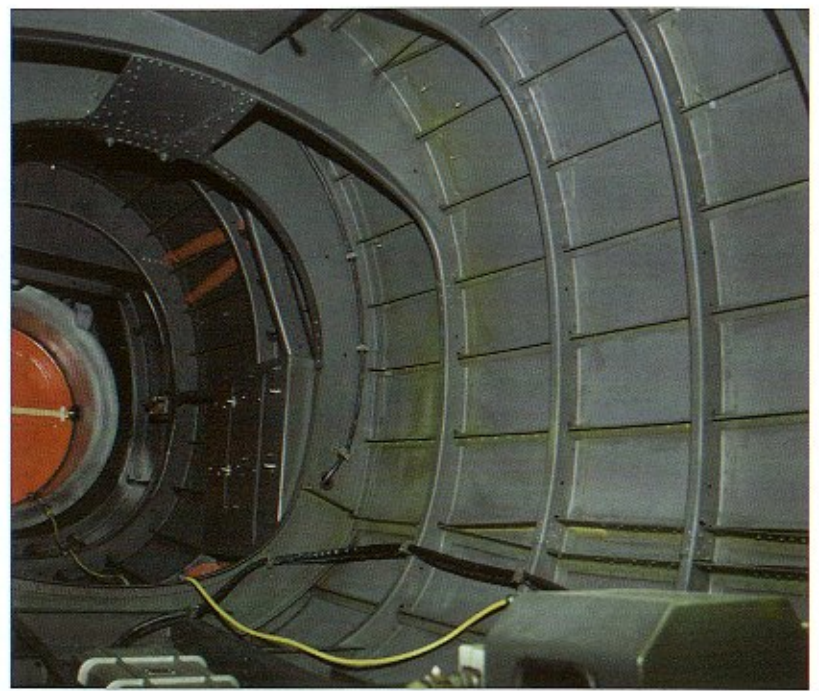
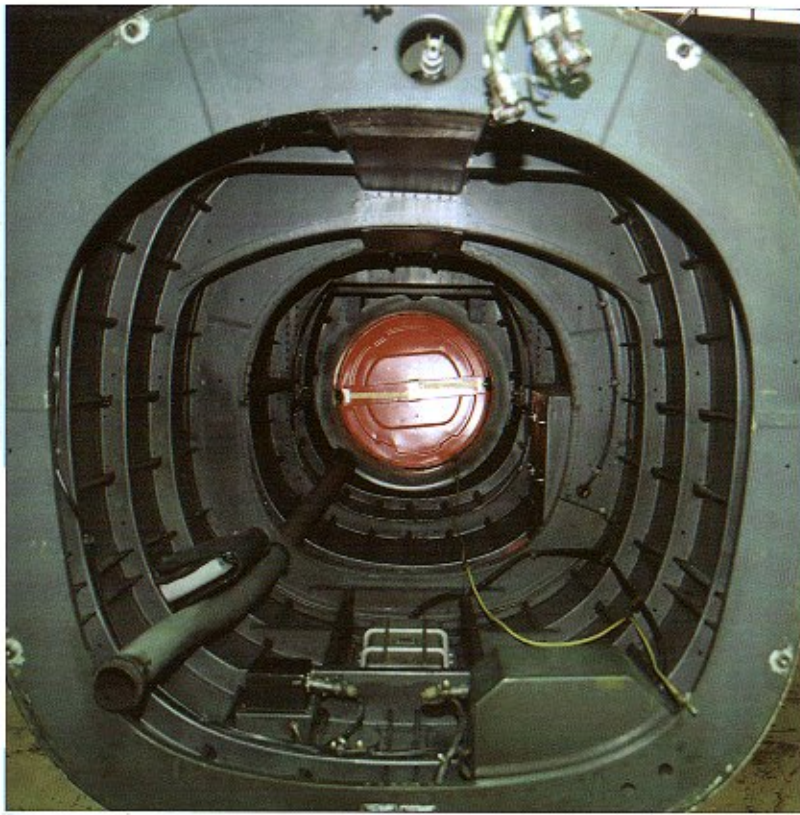




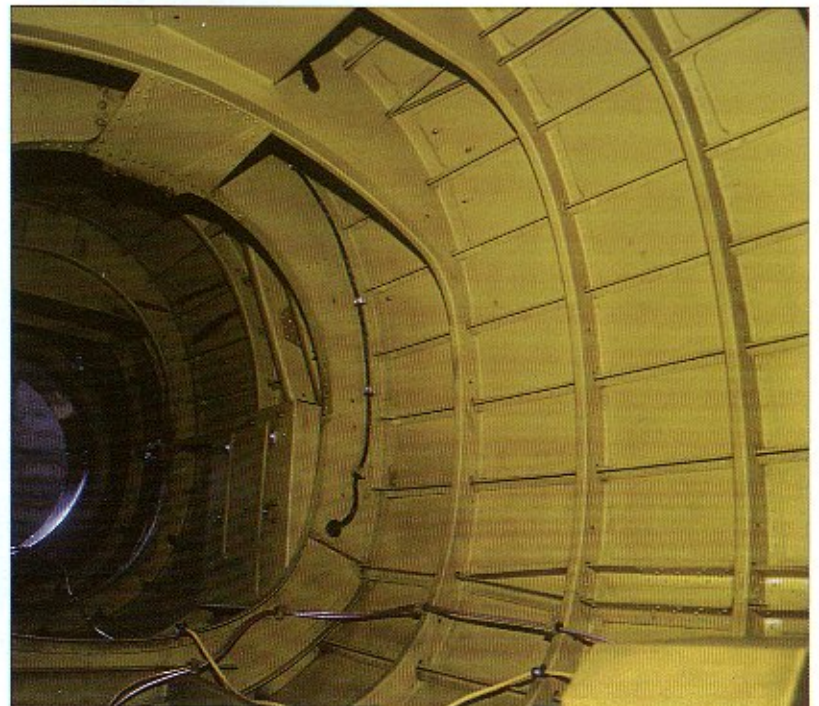
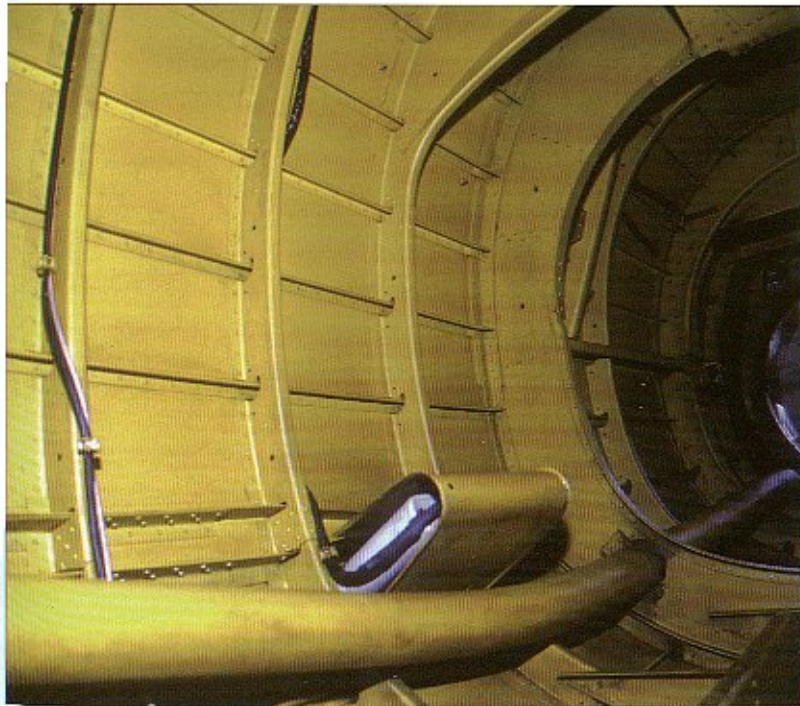
The design of semi-monocoque removable rear part of the fuselage is seen on these two pages. Note the differing colours.



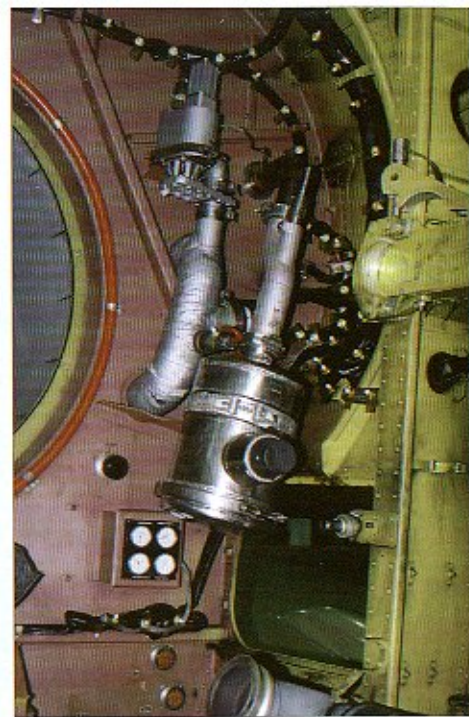
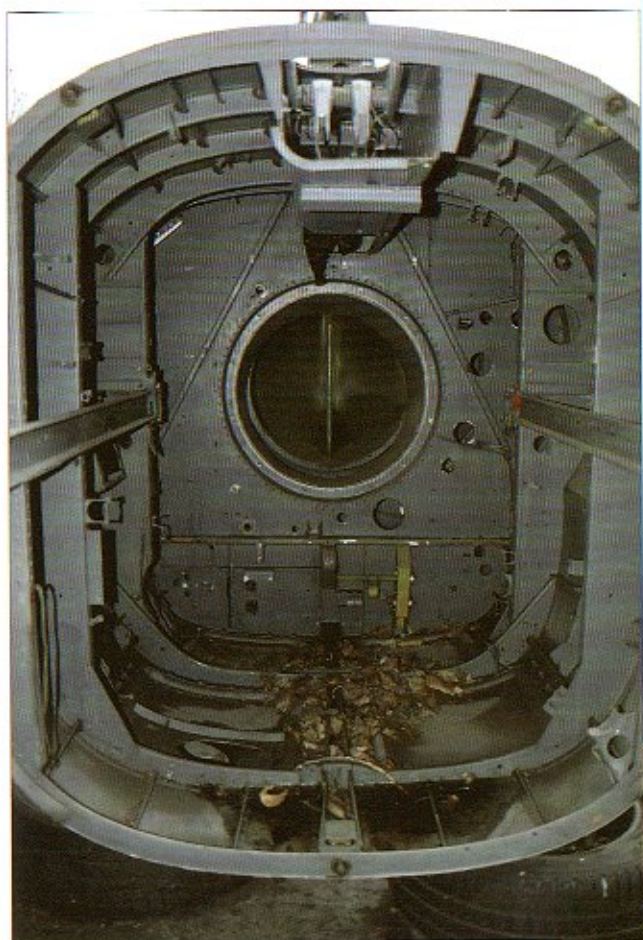




## Tail Structure Details

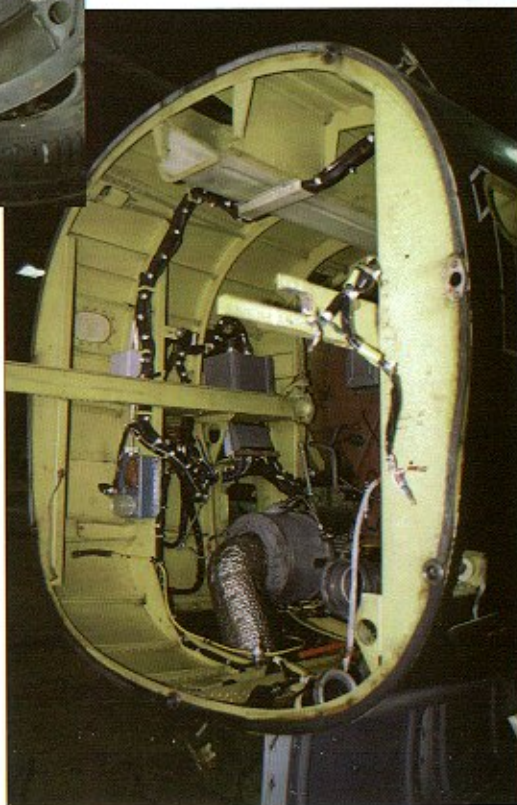






# Centre Fuselage Structure Details

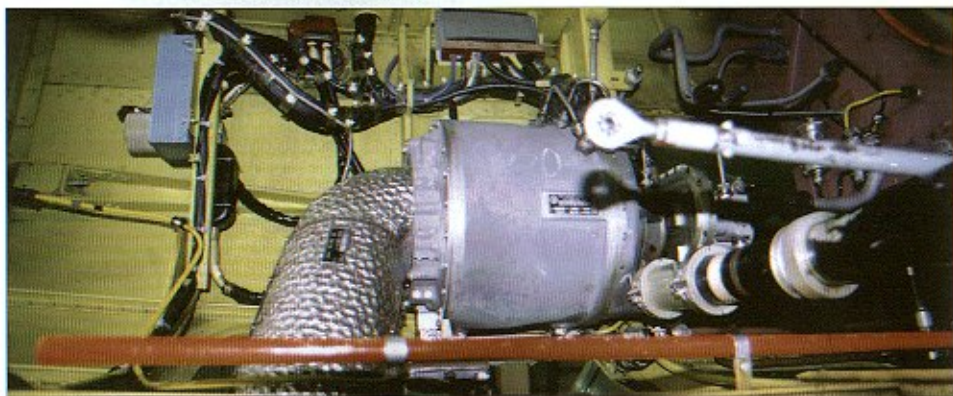
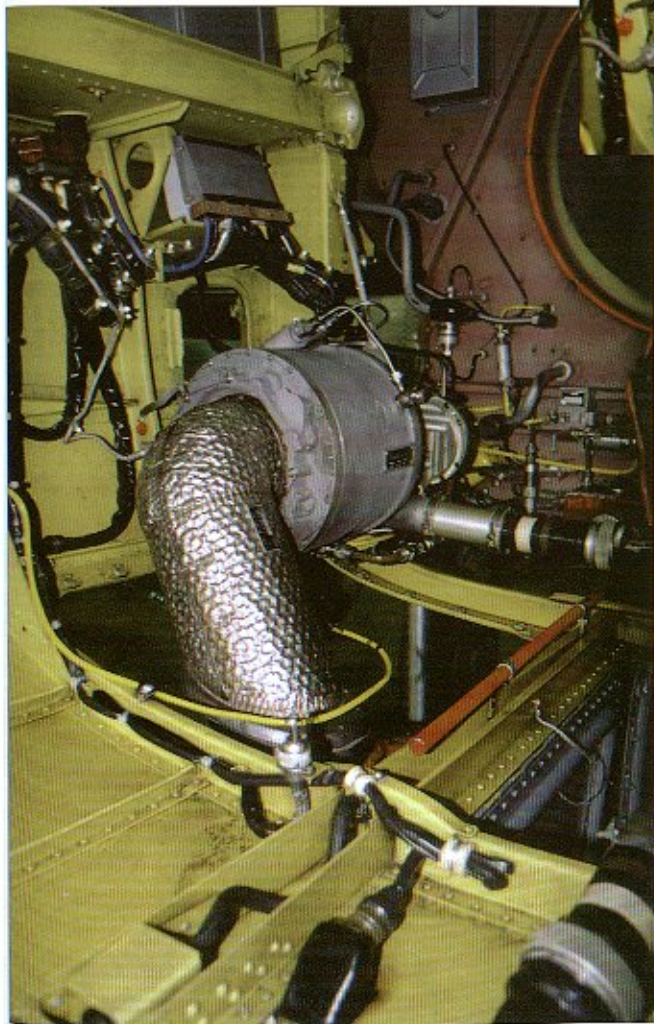
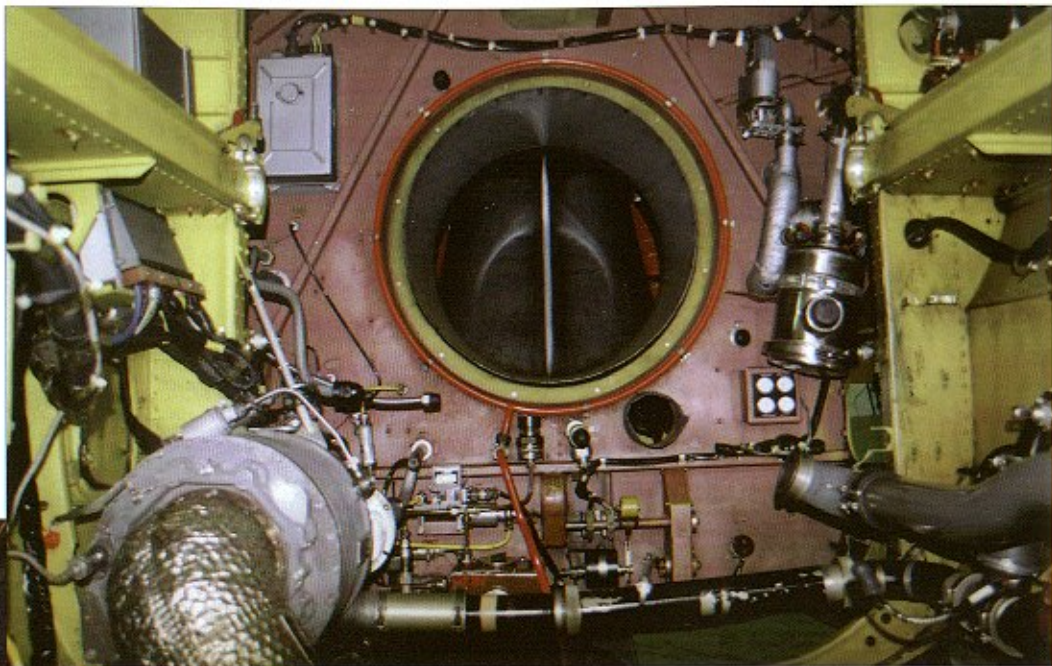
A view of the area where the centre and the rear parts of the fuselage are joined. The top picture shows the firewall and the air inlets to the engine with all accessories, components and cabling removed. The bottom two pictures show details of the engine support rails.





# Auxiliary Power Unit SAPHIR-5 Details

A view into the engine compartment with all accessories and systems fitted. The APU SAPHIR-5 with thermal insulation on its exhaust can be seen on the left side.



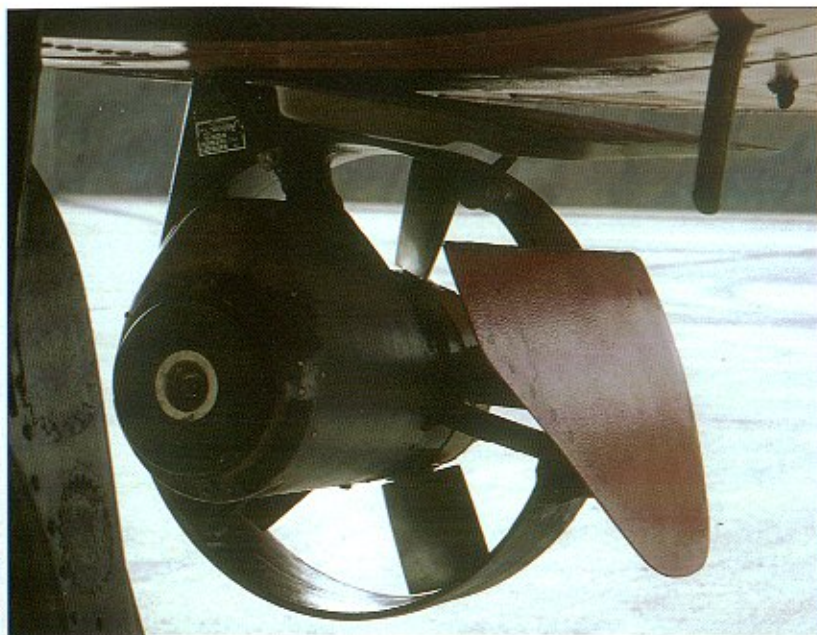
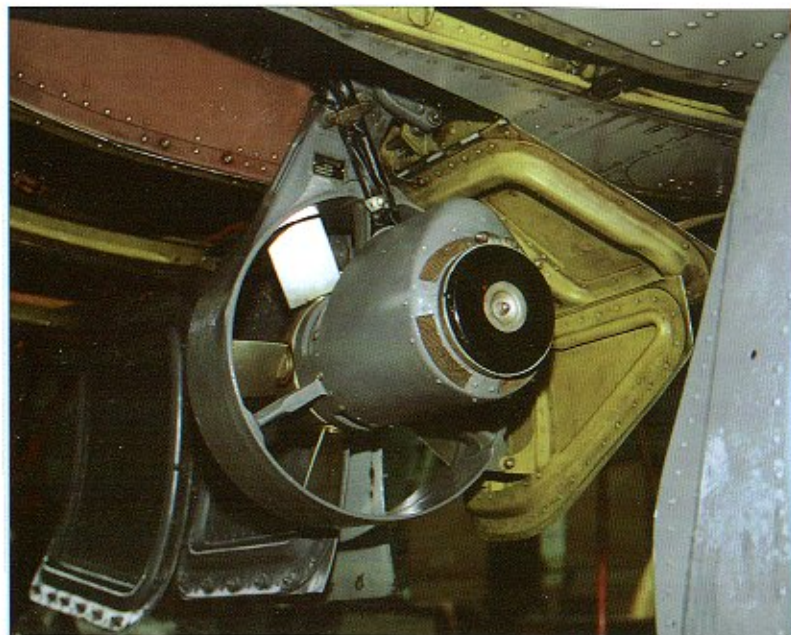


# Power Supply Turbine Details

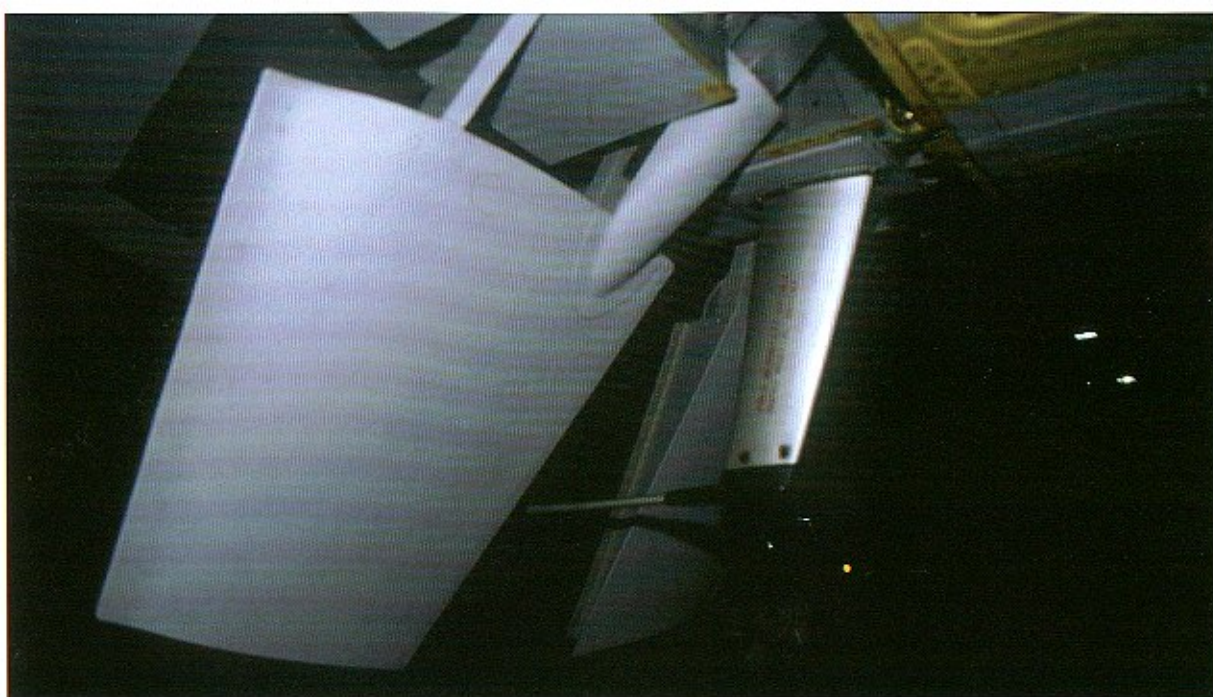


The ram-air emergency power supply V-910 turbine is positioned aft of the right undercarriage leg. It can be deployed from the cockpit. When in its locked position it is covered by two cowlings.







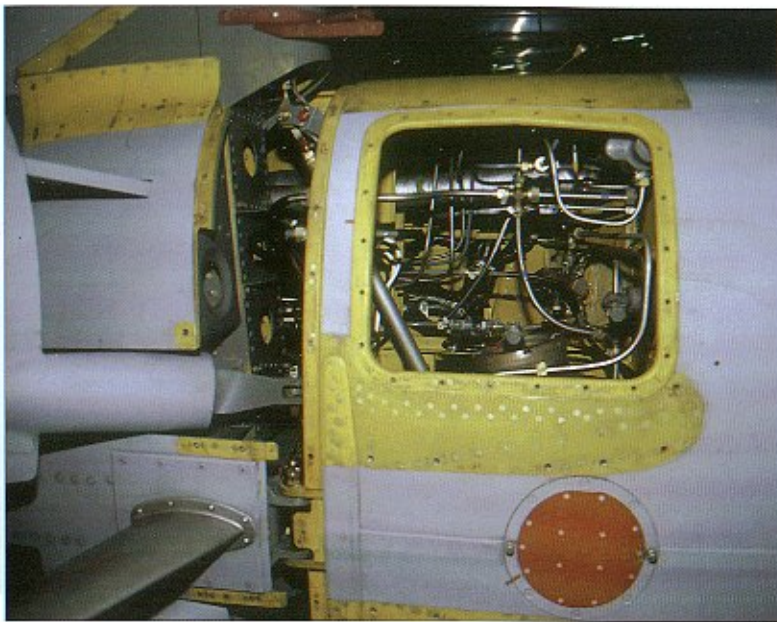


# L-39C Air Brakes Details

The two air brakes are located below the wing trailing edge. These are deployed at 55° by a single hydraulic actuator.











The fixed wingtip fuel tanks have separate fillers, a landing light at the front and a position light on their sides. The L-39MS has significantly larger wingtip tanks.







photo by Petr Soukup

The fuel pressure gauge can be used as an indicator of correct system function during engine tests after maintenance (two pictures top left).

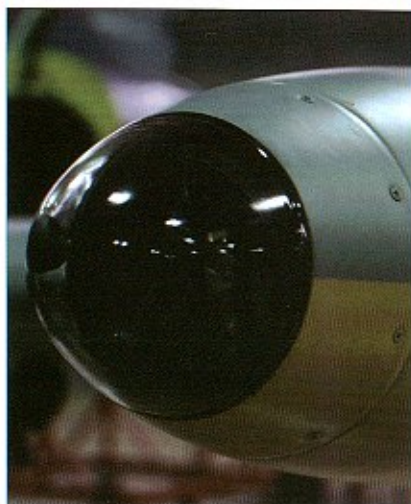


photo by Petr Soukup

Drop tanks can be attached to both Inner under-wing pylons (on both L-39ZO and ZA versions).

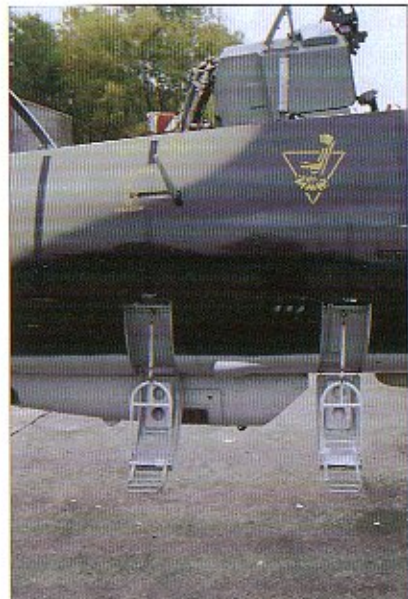


The bottom picture shows a L-39ZA during take off with its landing lights on. (right)



photo by Petr Soukup

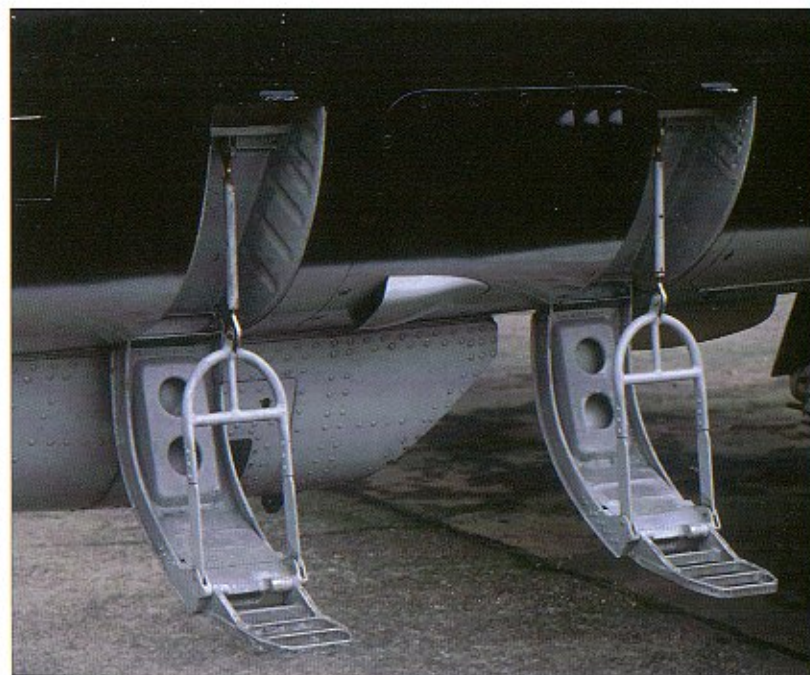




The cockpits are reached by pop-up and kick-in steps positioned on the left hand side of the fuselage. Pop-up steps are closed and secured by ground personnel prior to take off. Once again note the variation in colour of internal surfaces between different aircraft.



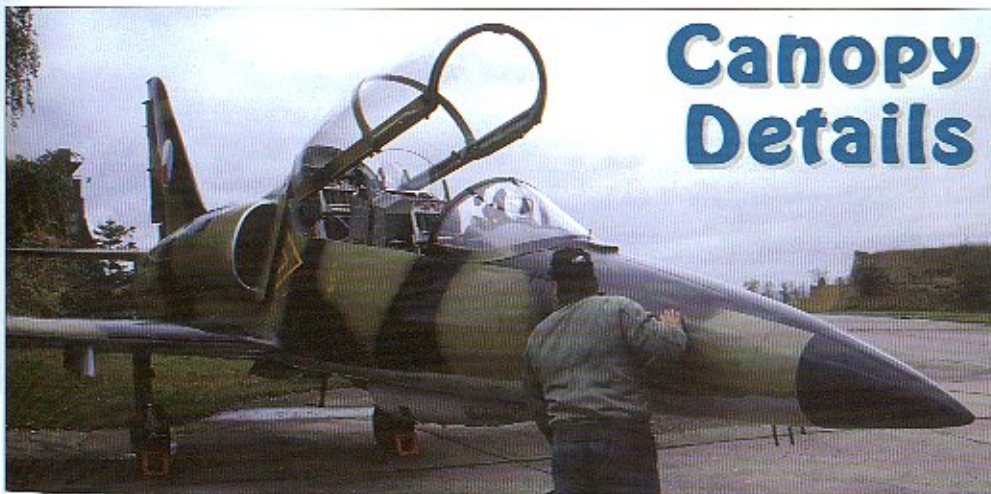
# Steps Details



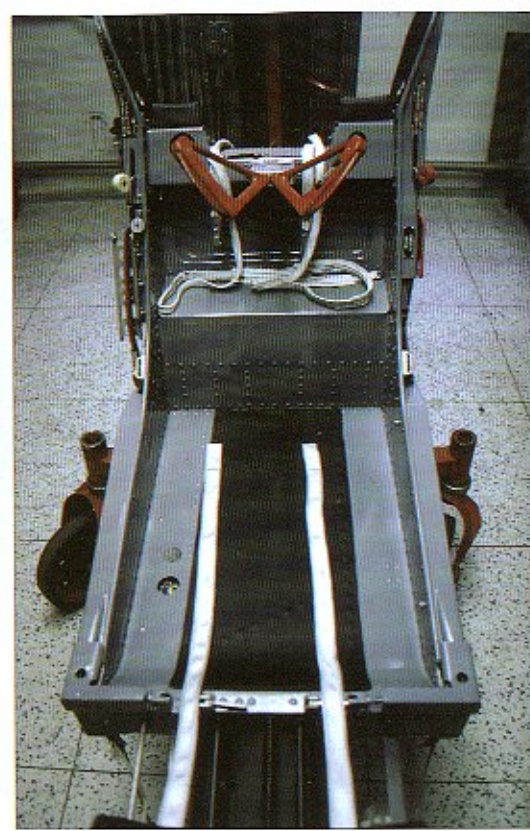




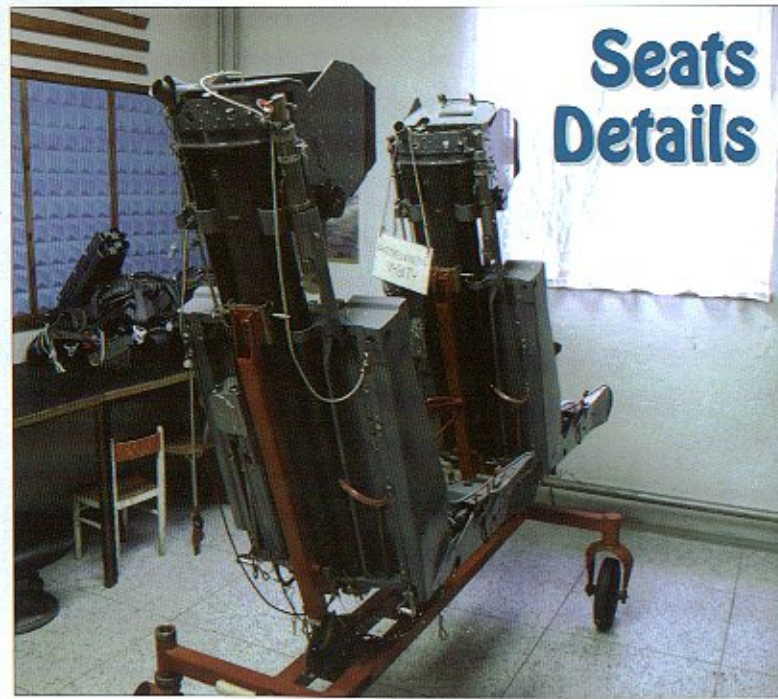
The L-39C, V, ZO and ZA have manually operated canopies opening to starboard. By comparison the L-39MS has single-piece, upwards then backwards hydraulically opening canopy. This canopy can be jettisoned in an emergency. Small explosive devices used to jettison the canopy are located in the bottom part of the frame. (bottom right). Partially closed curtain used in instrument flight training (middle).





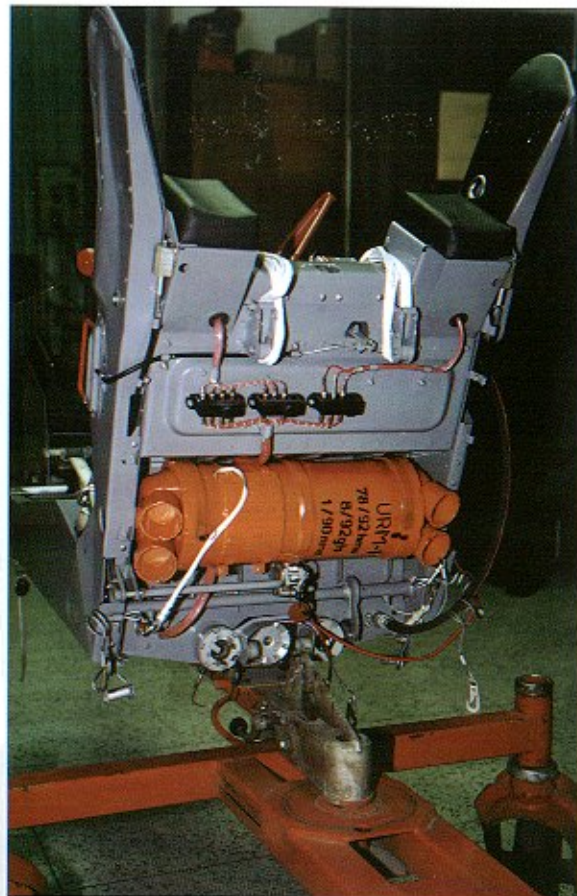


The VS-1BRI ejection seat. It is shown removed and without any ancillary equipment in these pictures.

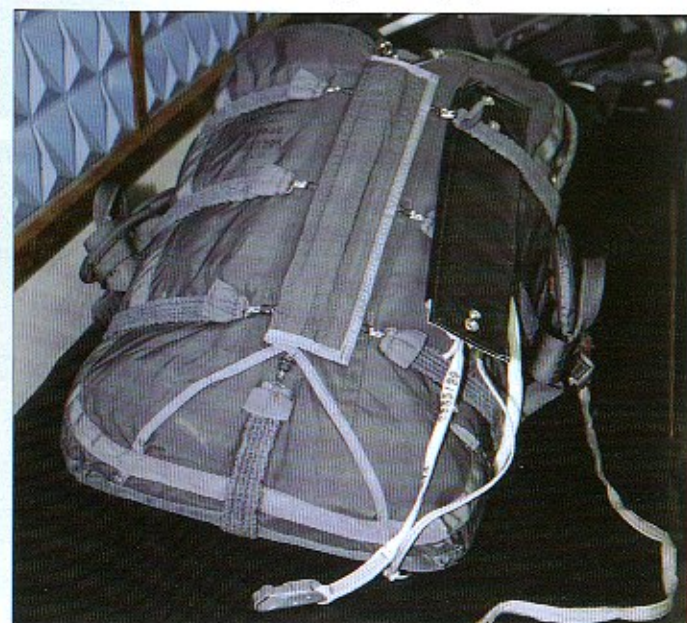
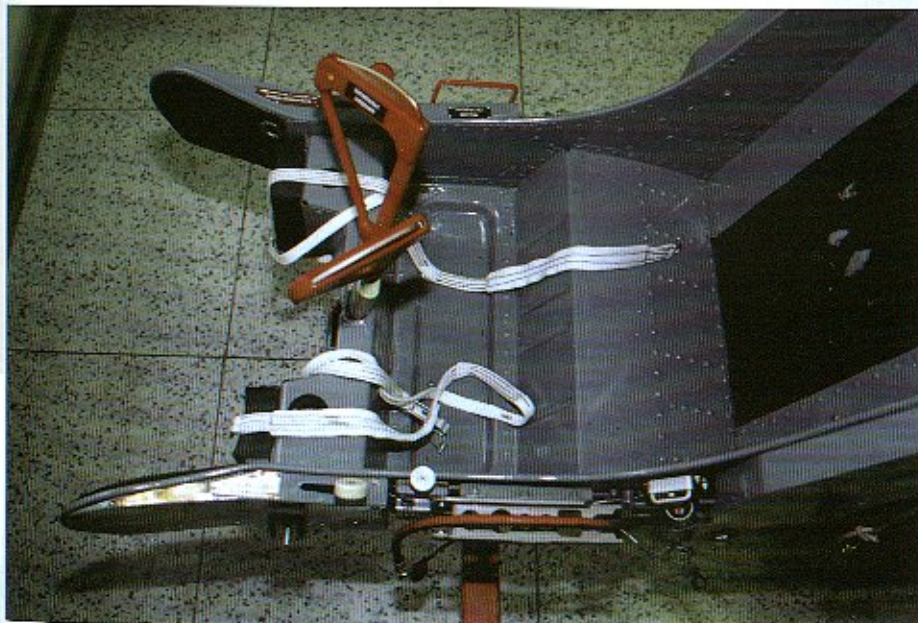


## Seats Details





A view of the rocket booster which has a thrust of 19kN. The booster is only ignited after the ejection seat is safely clear of the cockpit. This photo shows the pilot's parachute and harnesses, a pack of emergency survival rations and the radio (below right).

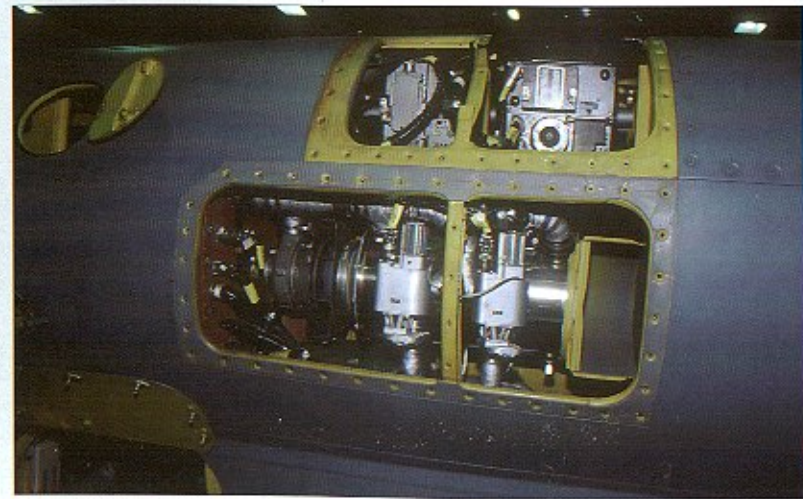
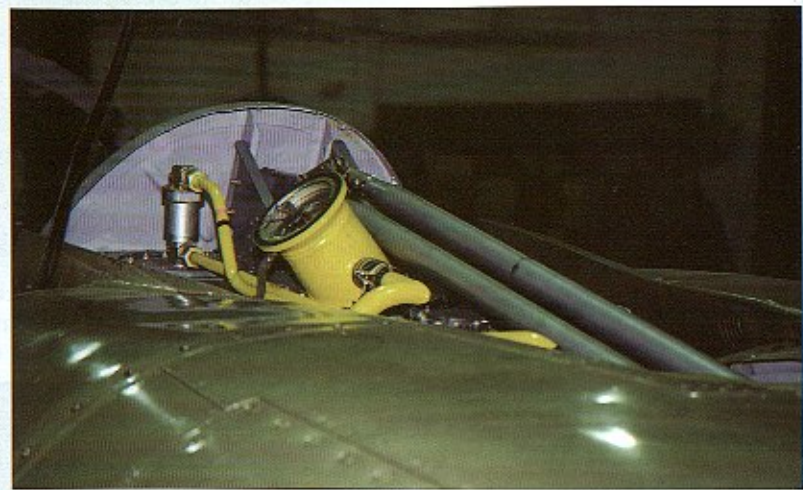




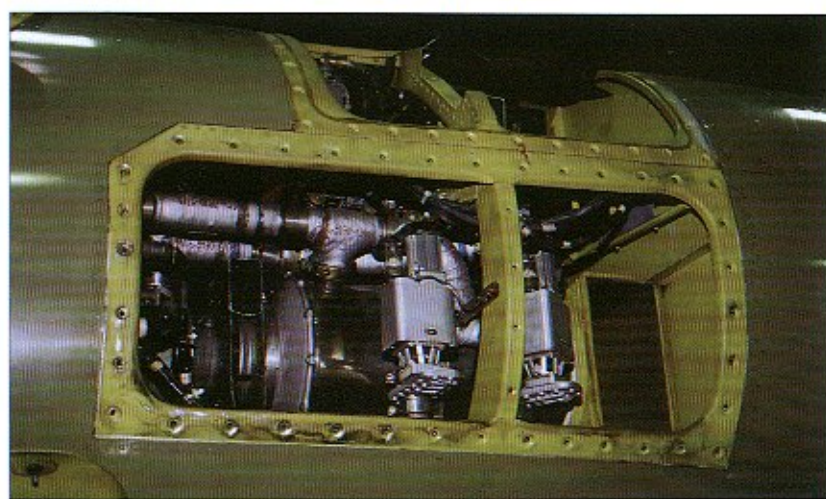
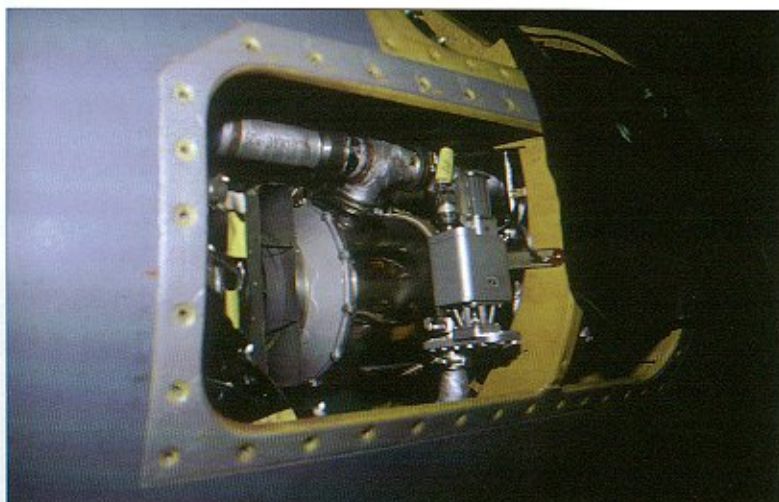
# Fuselage Internal Details



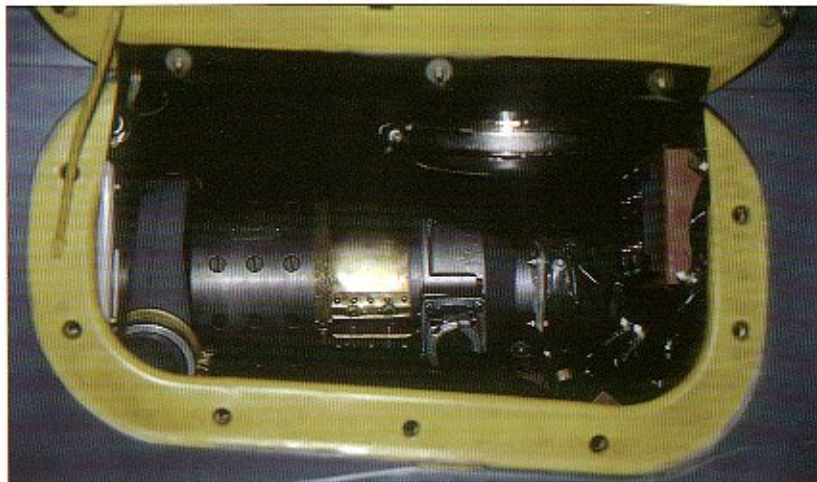
The gravity fed filler cap of the second fuselage fuel tank is located aft of the rear cockpit. The following pictures show various aircraft systems: the electric system, hydraulic accumulators, lubrication filling points, fire extinguishing system with CO<sub>2</sub> bottles and the air-conditioning system.



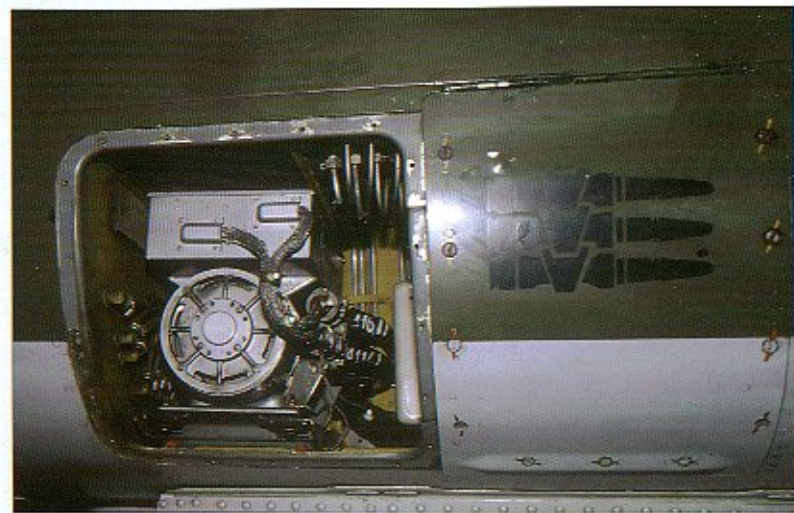
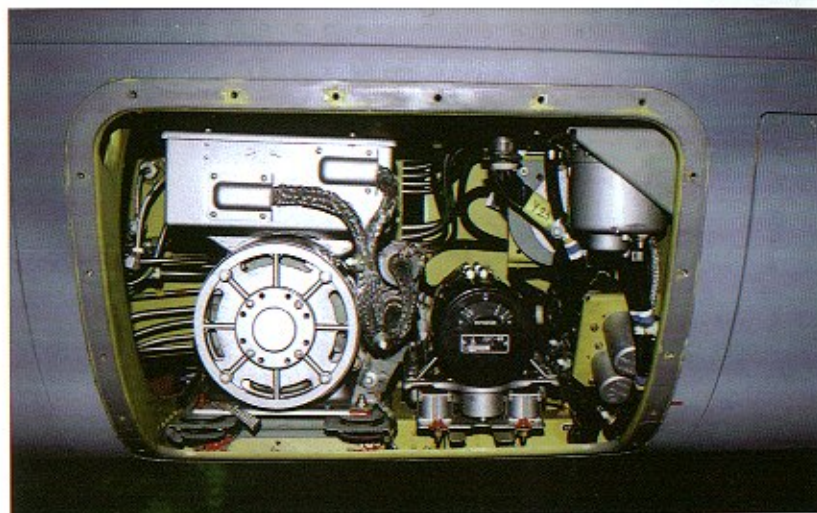




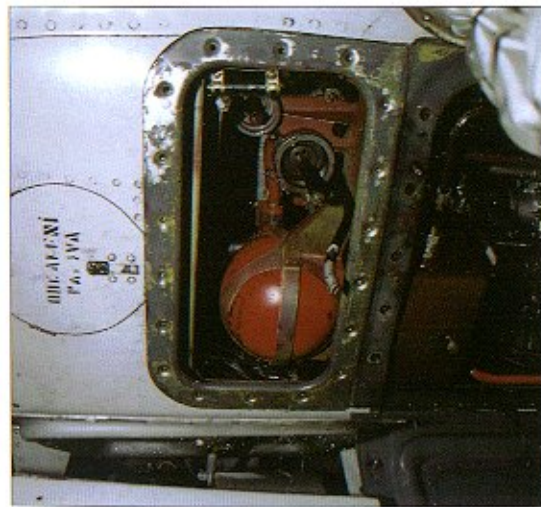




Inspection panels opened exposing the V-910 air ram turbine aft of the right undercarriage leg. On the left picture is an L-39C, and on the right a L-39ZA. The open box beside of the ammunition box on a L-39ZA (middle right) and the same fuselage compartment of an unarmed L-39C.



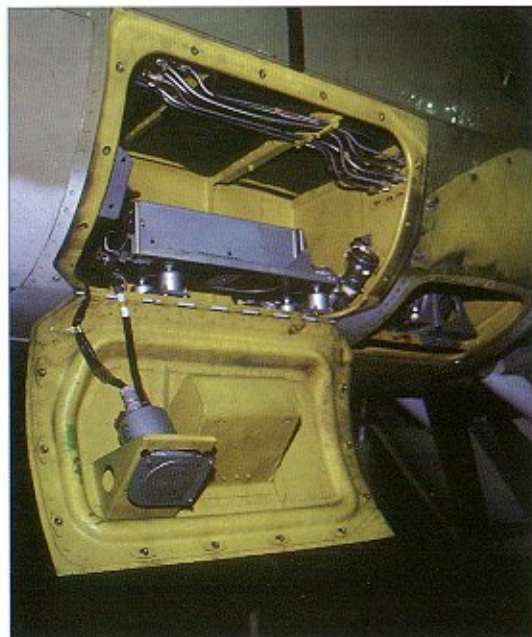
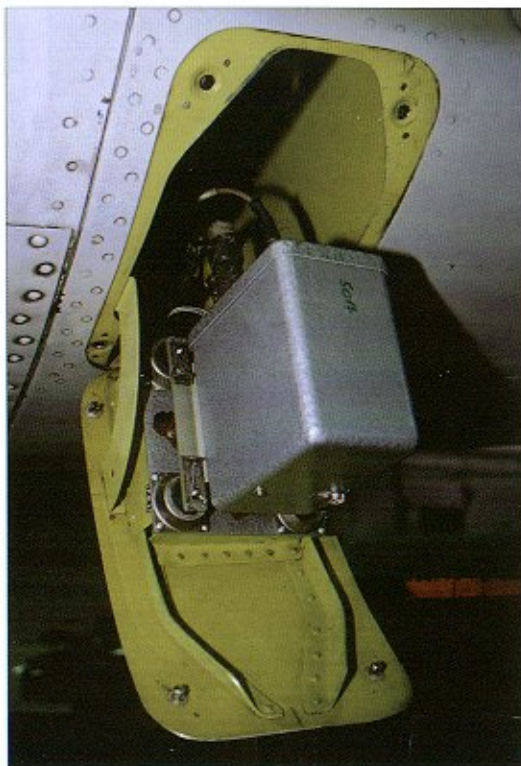
The inspection panel of the hydraulic system (bottom left) and the engine inspection panel on the fuselage port side (middle). The inspection panel of the fire extinguishing system and its red pressure bottle (right).



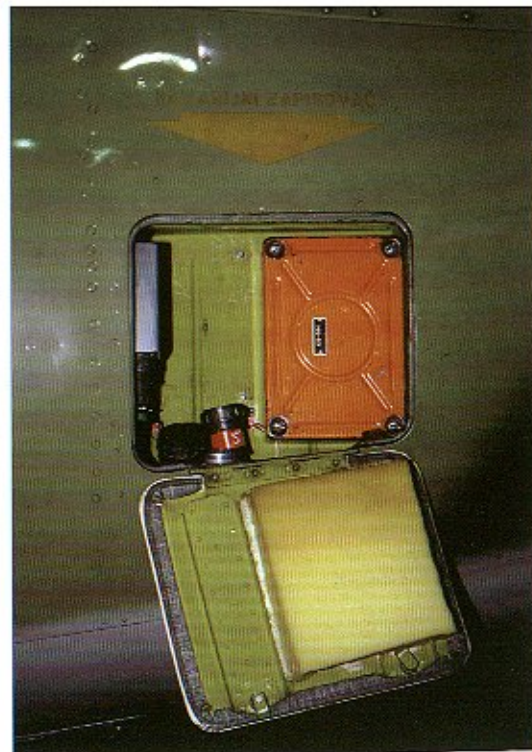
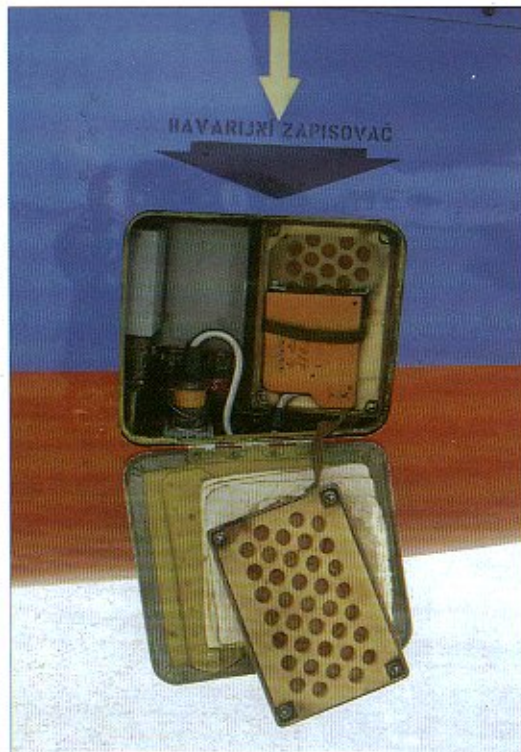




## Flight Data Recorder Details

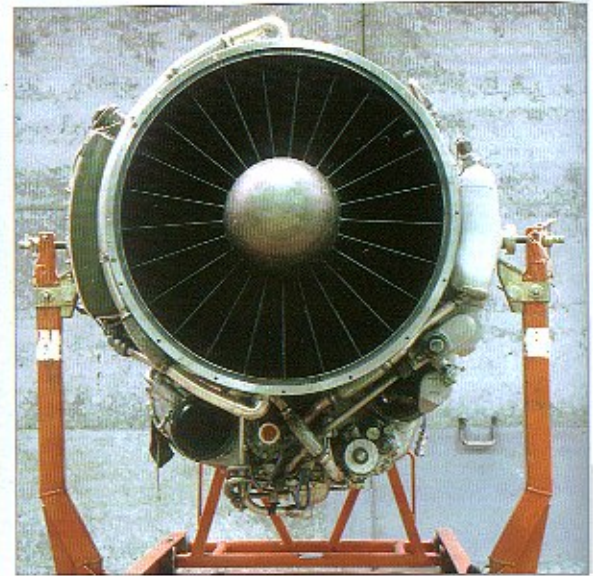


The flight data recorder model SARPP-12GM, this is the well known "Black box" fitted to most aircraft. This device records 15 different streams of flight data. (below)





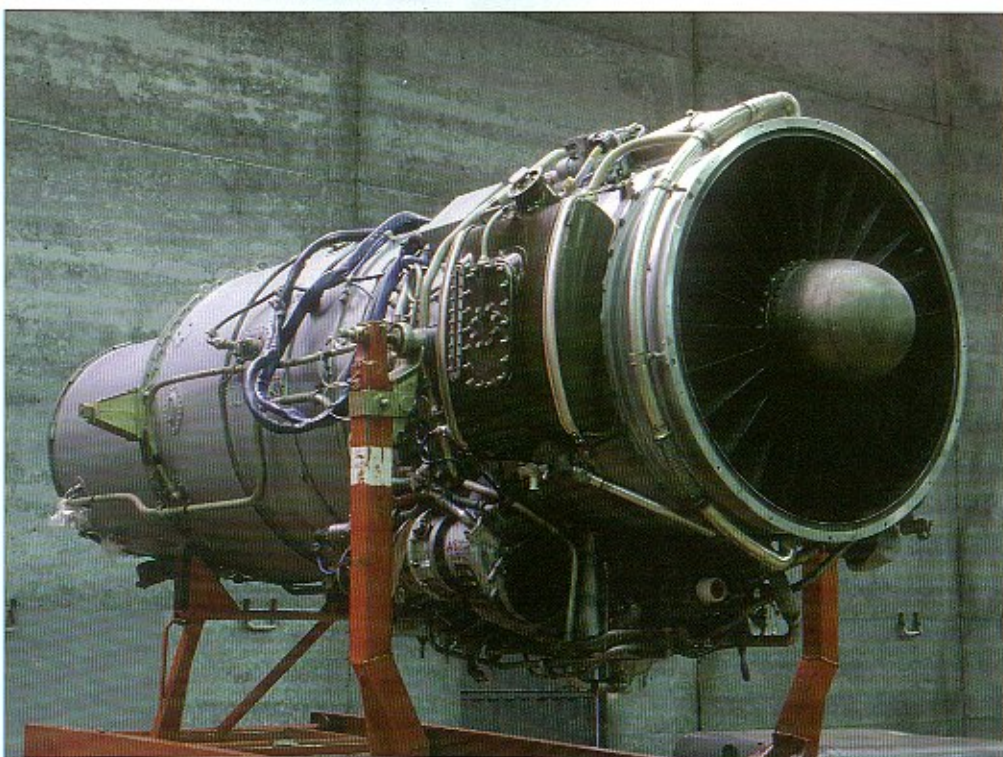
# Engine Details



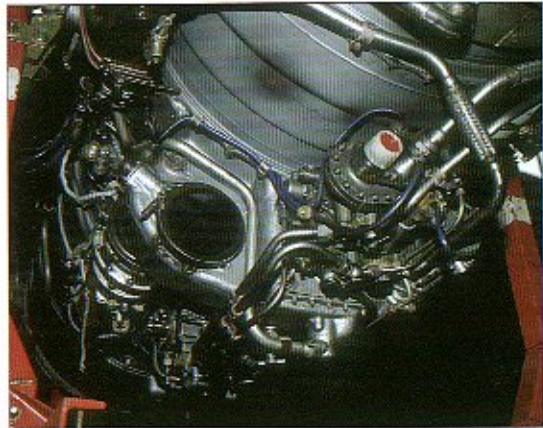
The AI-25TL engine is detailed on the following four pages. Its main components are as follows: the fixed air inlet, the axial compressor, the driven case, the circular combustion chambers, the three-stage axial turbine. Aft of the turbine is the combustion chamber and the exhaust nozzle. The engine is started by pressurised air from the SAPHIR-5 starter.











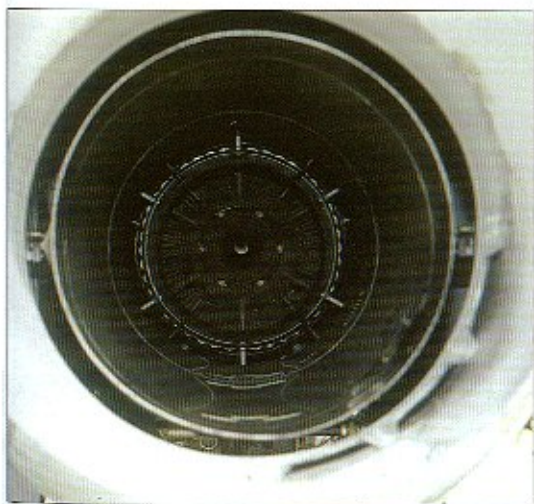
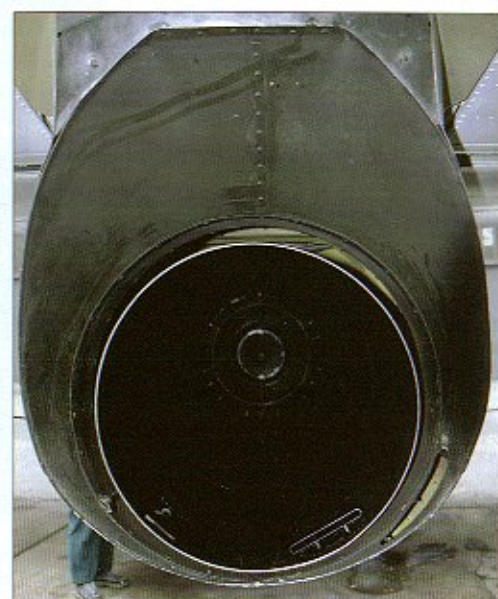
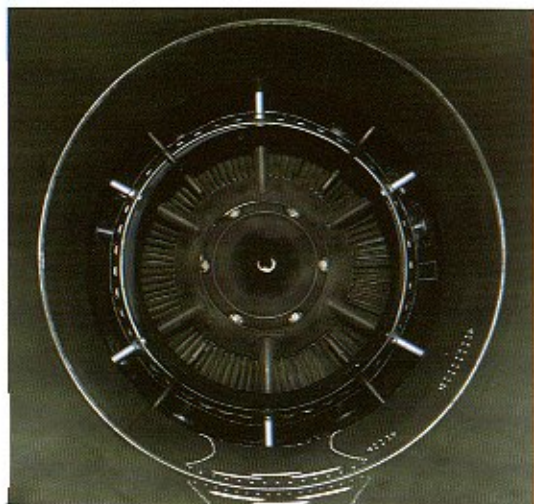
Three details of the AI-25TL engine (left). Two side views of the engine with incomplete nozzle (right).

Opposite page: the complete power plant before installation in the aircraft. On the right picture the engine having been fitted to the front part of the L-39C fuselage. Details of the engine exhaust (middle and below). The rear part of the L-39ZA and L-39C with rear fuselage attached (bottom), the on the right picture the L-39MS, with different engine.

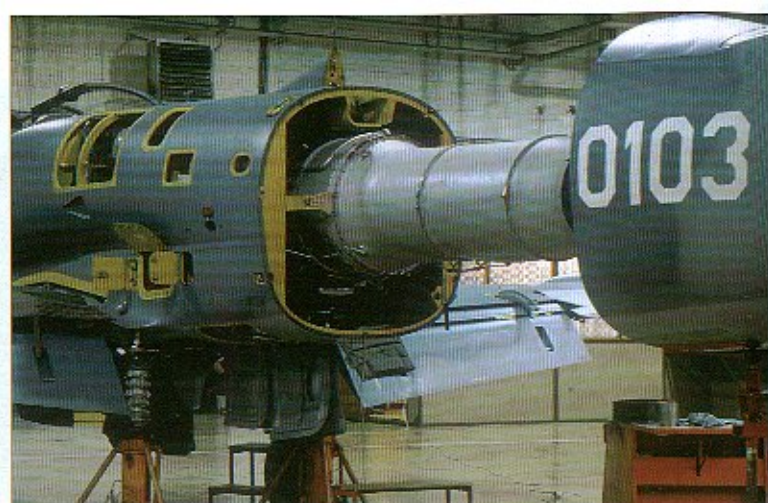




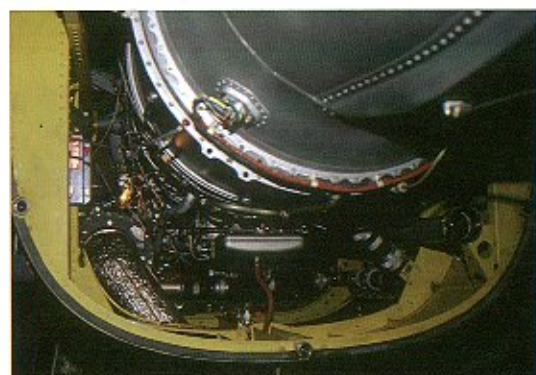
# Exhaust Nozzle Details



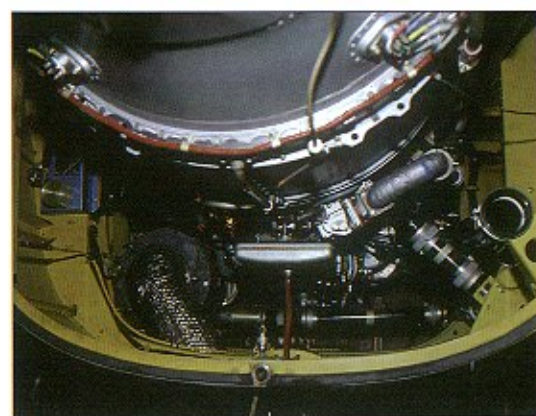




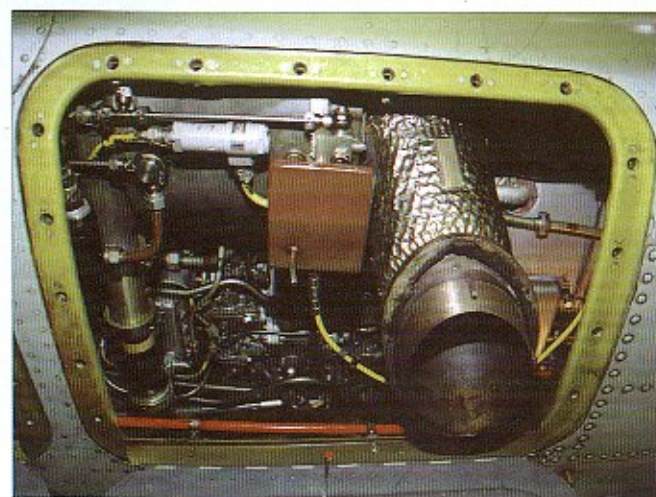
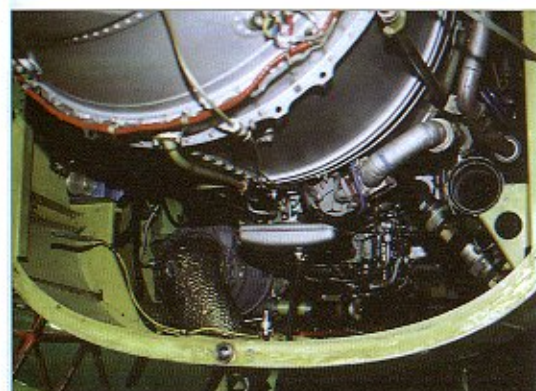
The position of the power plant in the fuselage. The fire extinguishing system is divided into two circuits. One is targeted at the engine intake ducts, the second acts on the whole length of the engine assembly. The inspection and assembly apertures allow fast access to all critical parts of the AI-25TL without the need to remove the rear part of the fuselage complete with tail unit.



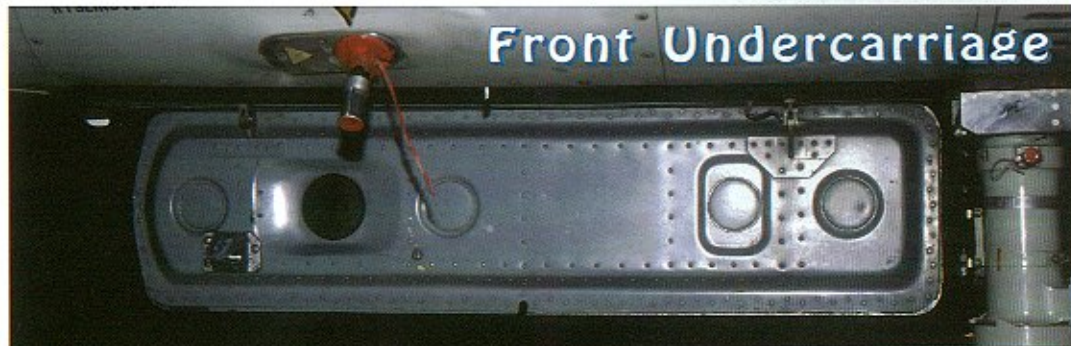
## Engine Compartment Details



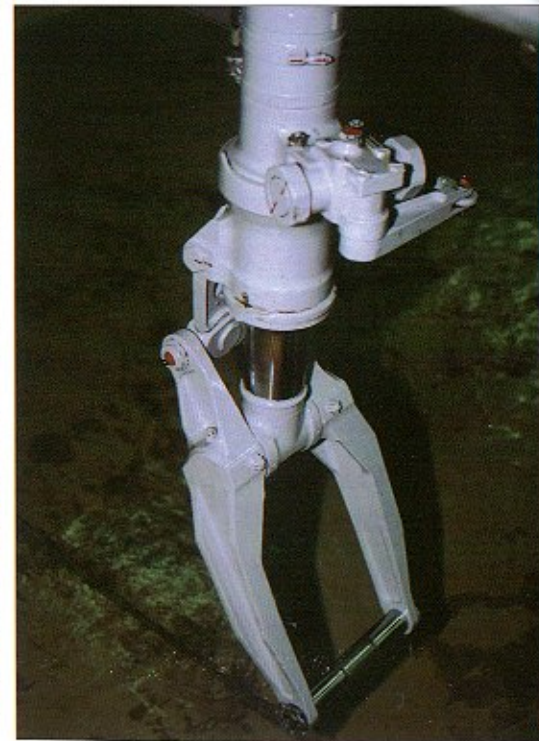




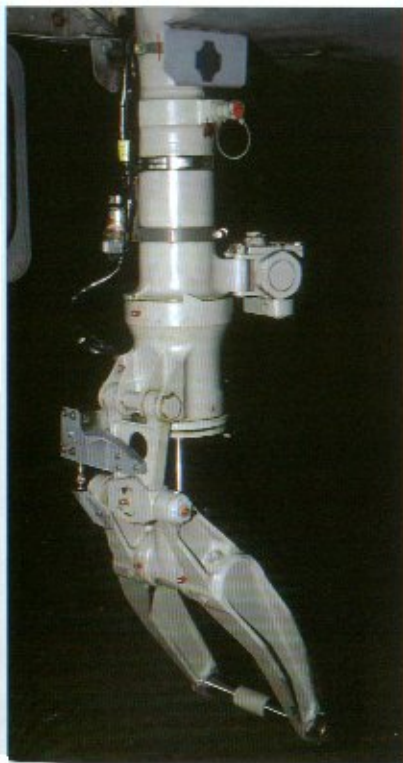




The front undercarriage well with the hydraulically operated retracting/lowering mechanism clearly visible. The ice sensor RIO-3 is positioned immediately beside the well door. The front undercarriage leg with its damper is not steerable, but it can be pivoted through 60° to the left and right.







The undercarriage of the L-39ZA and L-39MS versions is strengthened and the front leg has a K27 nose wheel. The different models are illustrated between the L-39C with K24 nose wheel (two left), the L-39ZA (four middle pictures) and the L-39MS (two pictures right).





The main undercarriage legs of the L-39C with twin-disc hydraulic brakes have low-pressure 610x185 mm tyres on K25 wheels. The wheel track is 2,440 mm and the wheel base is 4,390 mm. The main undercarriage retracts to the centreline. The legs have white indicator lights, which illuminate to indicate to ground control that the undercarriage is lowered.



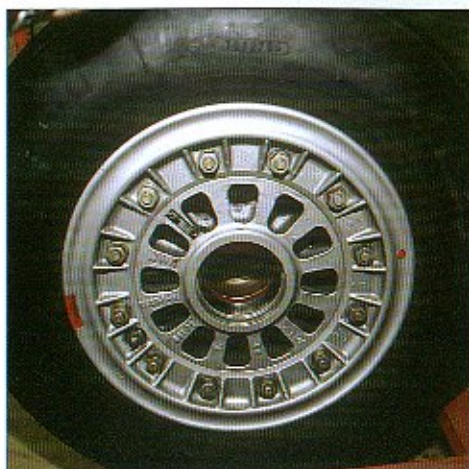




## L-39C Main Undercarriage Details



The main undercarriage legs during maintenance of the wheel and the braking system (above). The three pictures below show details of the L-39C's removed wheel.

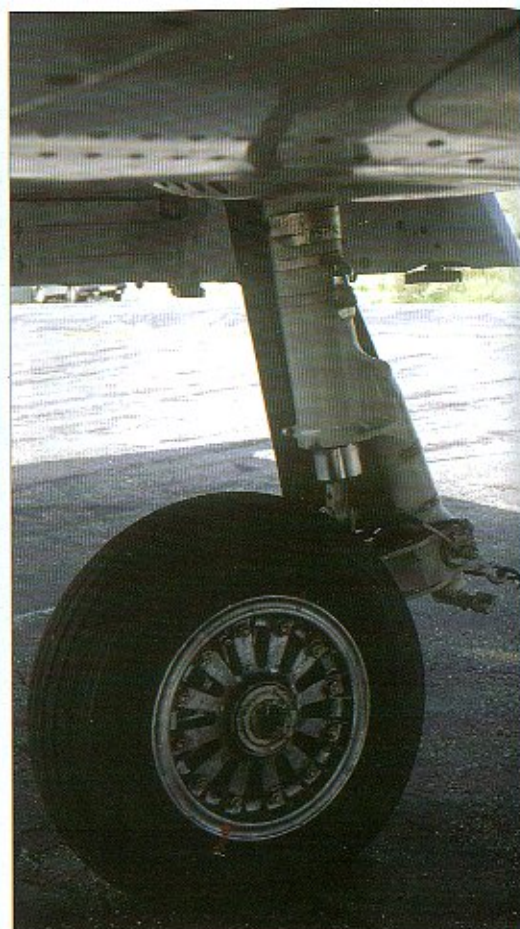




# L-39ZA Main Undercarriage



The main undercarriage legs of the L-39ZA with three-disc hydraulic brakes. Because of its likely intended use from unpaved landing strips the undercarriage of the L-39C was strengthened and equipped with 610x215 mm low pressure tyres on K28 wheels. The wheel track is 2,390 mm and the wheel base is the same as of L-39C at 4,390 mm. Note the differences in wheels compared with the L-39MS on page 103.



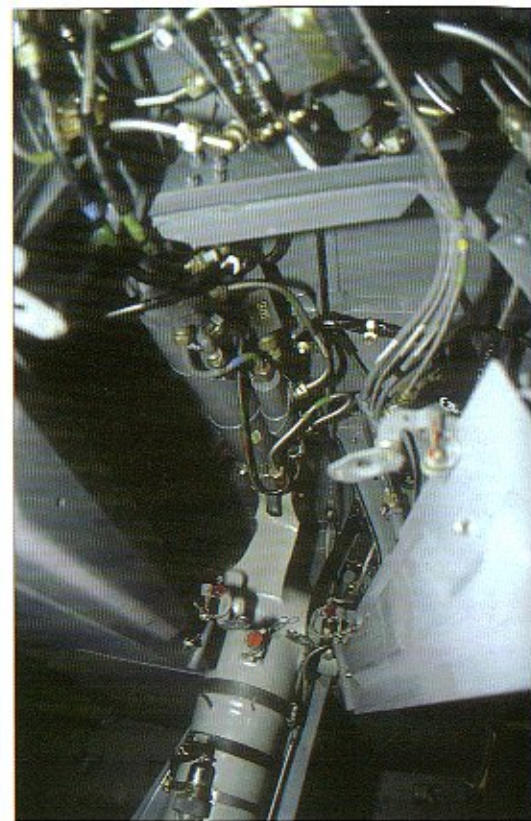
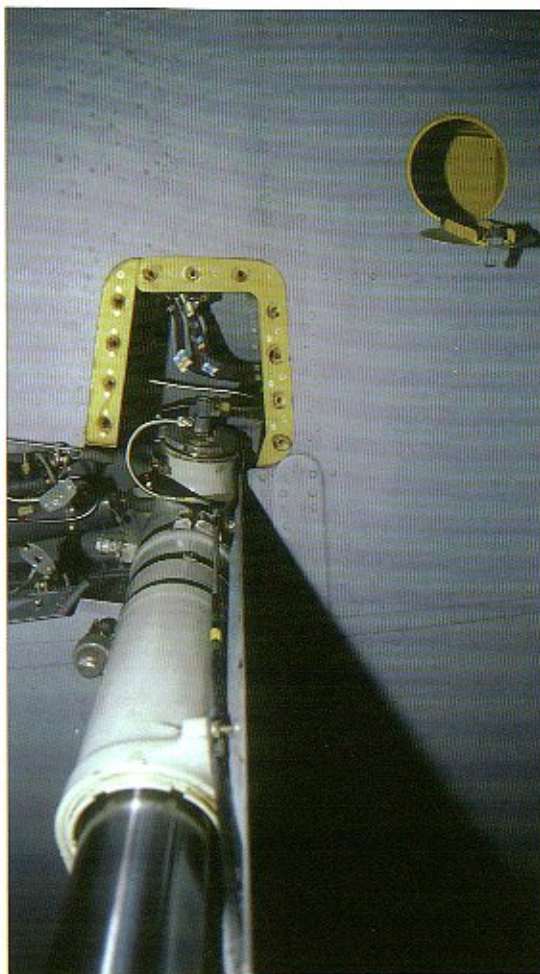




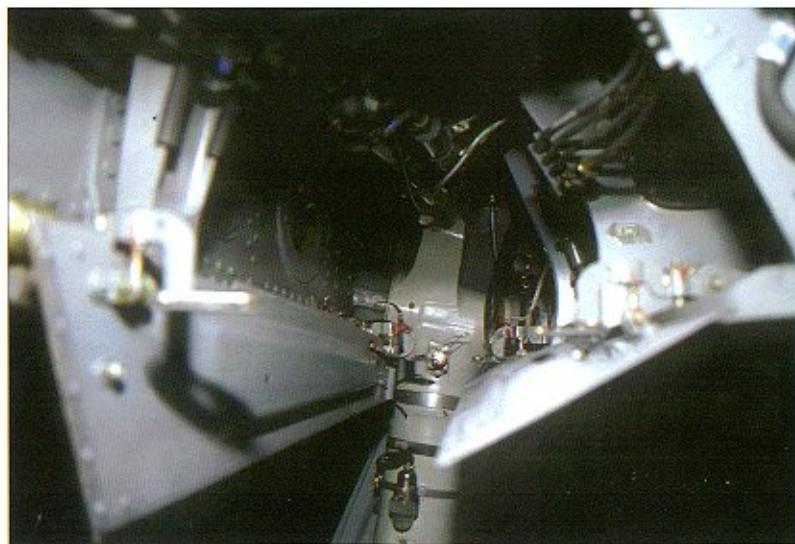




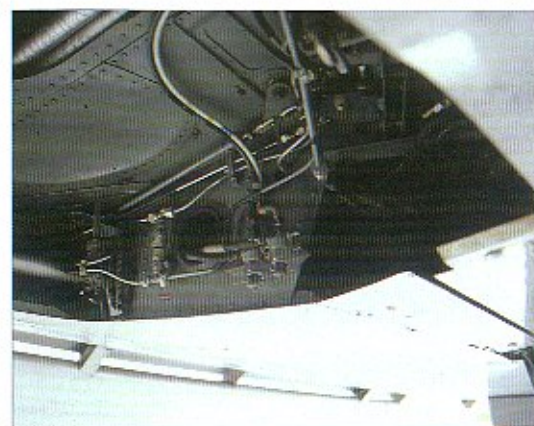
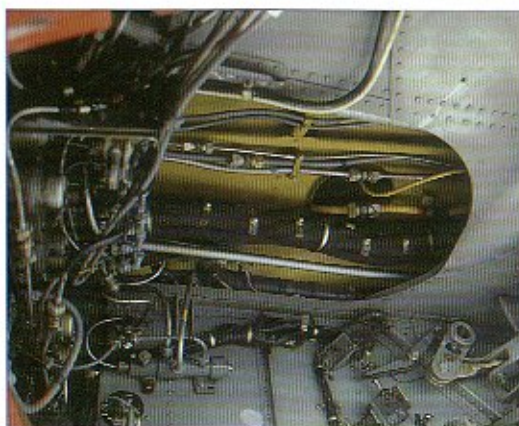
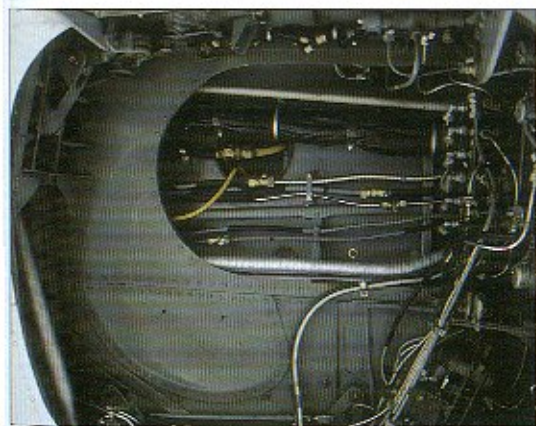
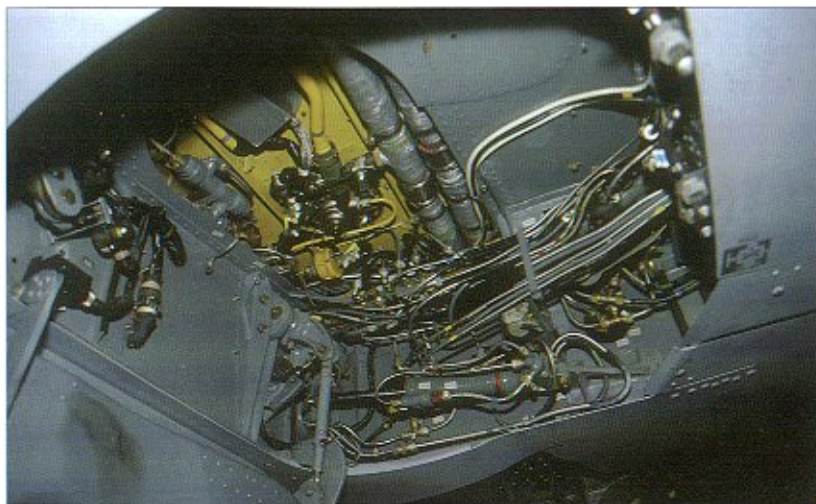
## L-39C Main Wheel Bay



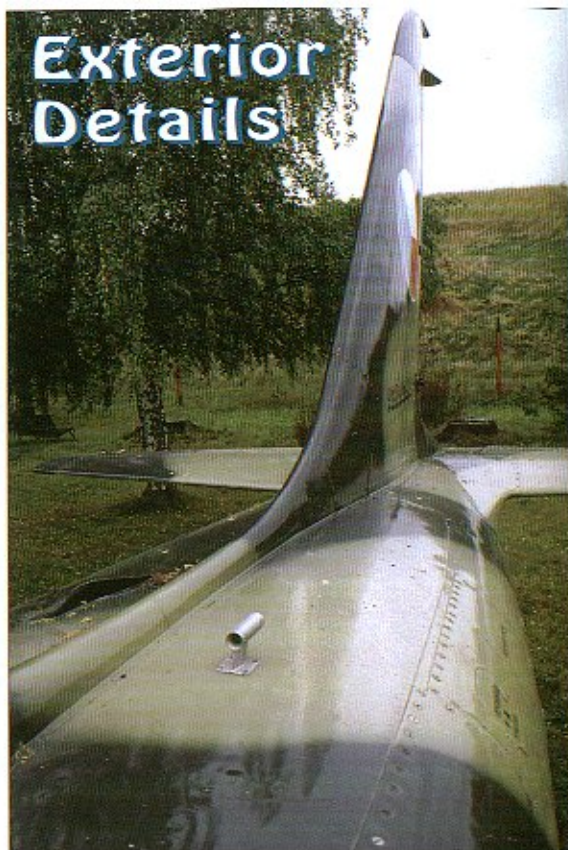
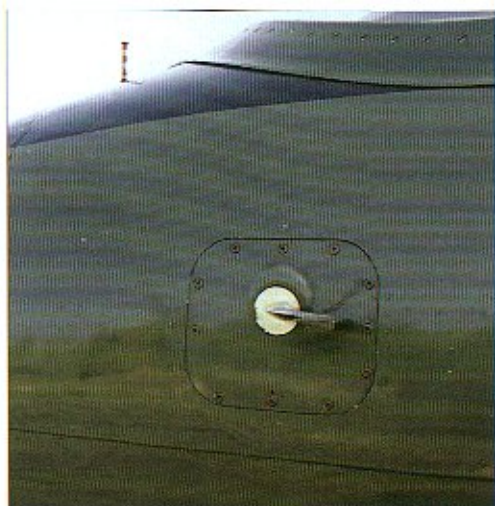
The main undercarriage wells with differing landing gear installations. To avoid damage of the piping and cabling inside the well, the undercarriage doors are designed to be closed at all times during operations.











## Exterior Details



Several details of the aircraft. The angle of attack vane in the L-39ZA (middle top). The signal flares ejector EKS-46 (below). The anti-collision warning beacon, mounted on the aircraft from the 1990s (right).

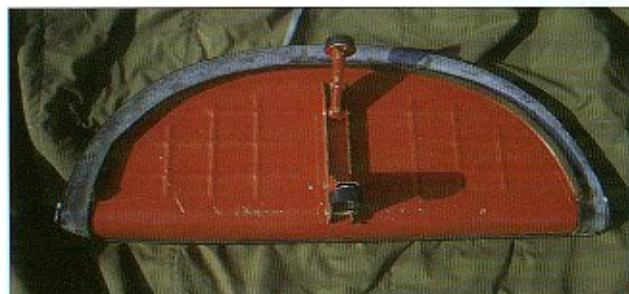
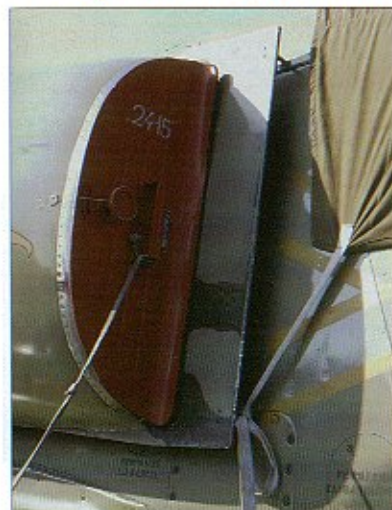




# Protection Covers



Canvas covers and other shrouds are standard accessories for all aircraft. They are necessary to protect the aircraft whilst on the ground, and



cover parts of the plane most susceptible to damage. There have been cases of birds nesting under incorrectly fastened covers. Seen

here are the most important canvases and covers used on the L-39s. Note the individual aircraft numbers painted on the covers.





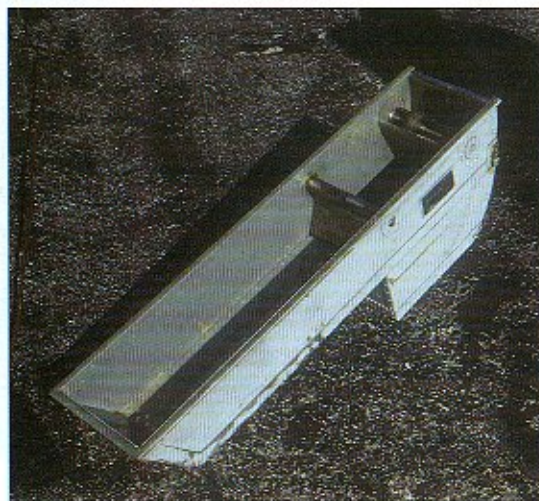
# Gsh-23L Gun Fairing Details





# Ammunition Box Details

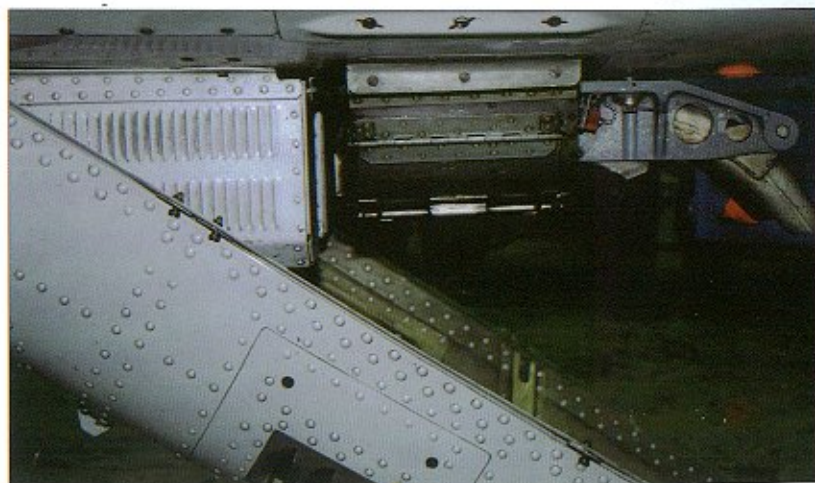
The L-39ZA and L-39MS versions are armed with the GSh-23L twin-barrelled 23-mm gun, which is housed in its fairing under the cockpit. The fairing has cooling vent holes to the rear and a blast guard around the barrels. The ammunition belt is stored in a removable ammunition box, accessible from the starboard side of the fuselage on a level with the cockpit floor.



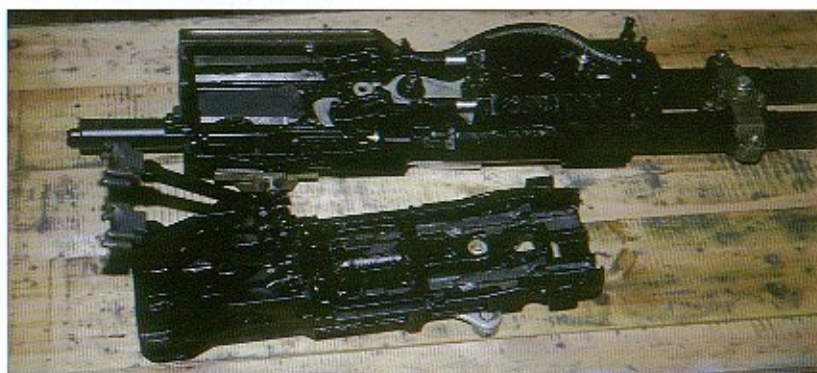
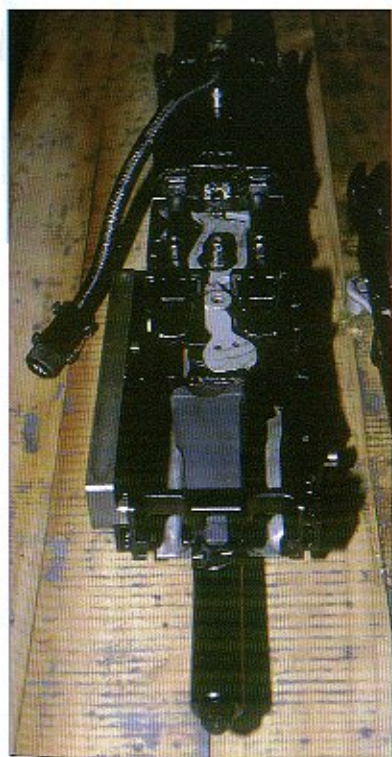
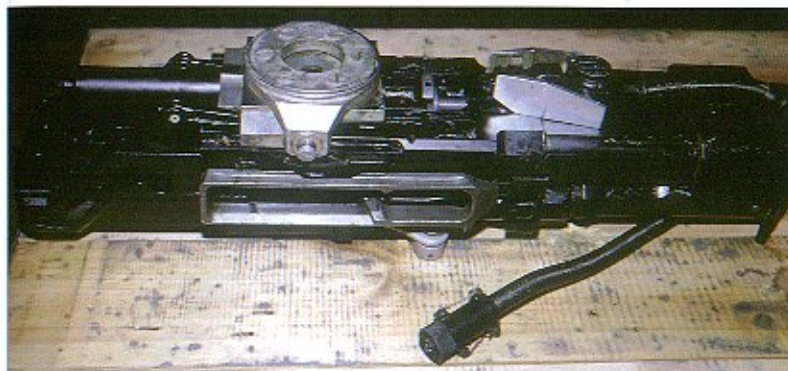


## Gun Fairing Details

A view of the gun mounting under the fuselage. The aerodynamic fairing is attached at the rear by hinges and can be opened backwards. The ammunition feed can be seen on this picture (above right). The fuselage is protected against blast damage by a stainless steel plate in front of the gun.



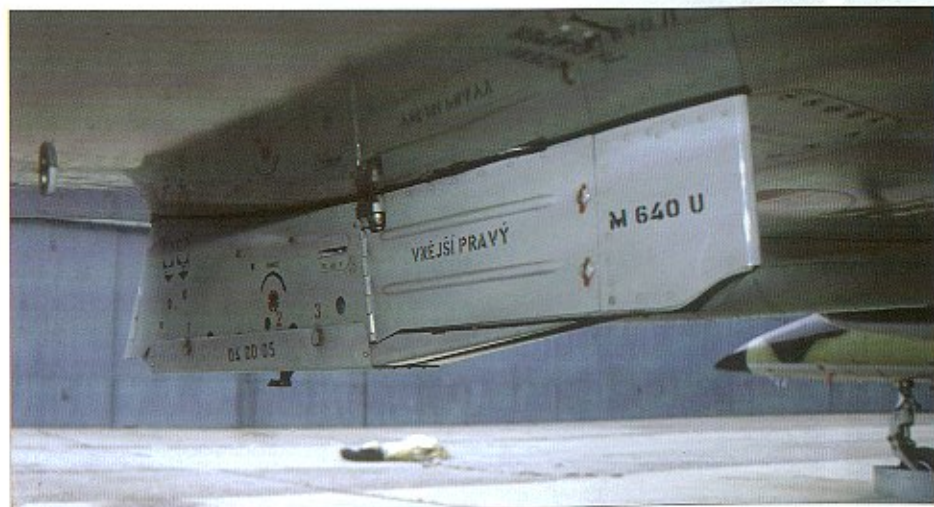
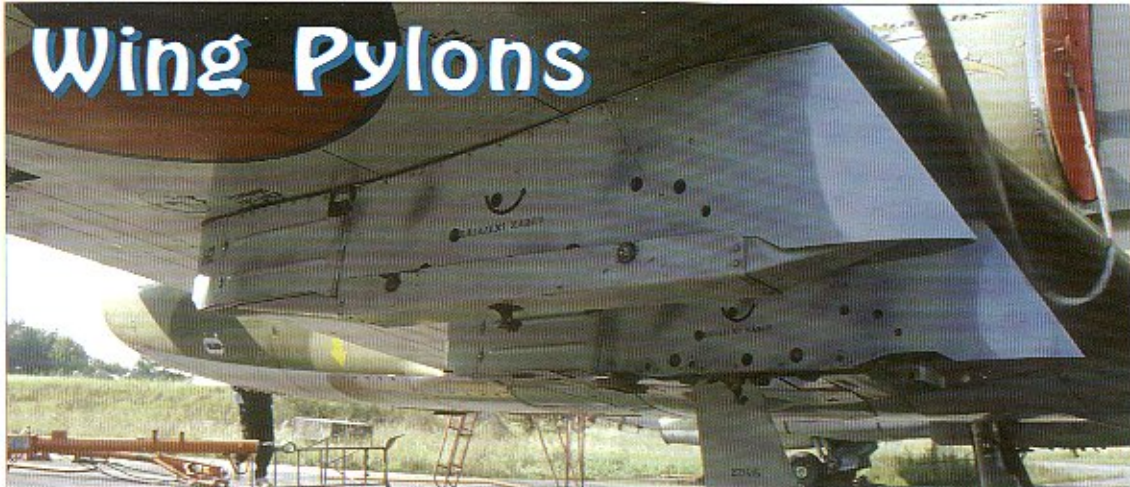




Details of Gsh-23L gun removed from the aircraft can be seen on this page.



# Wing Pylons

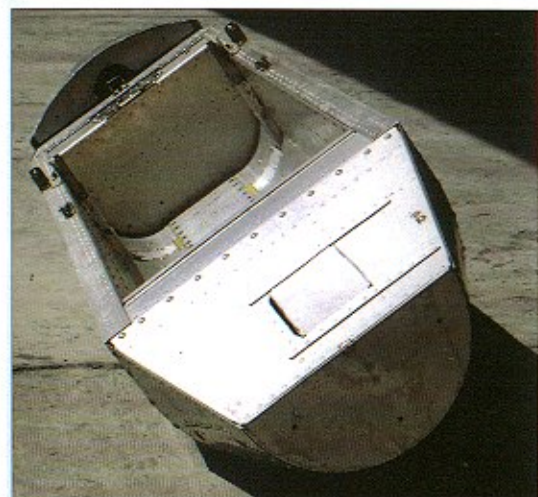


A wide range of conventional weapons can be carried on the underwing pylons. Different support catches and locks are used for different weapons. The wing pylons of the L-39ZA and the L-39MS are illustrated on this page.

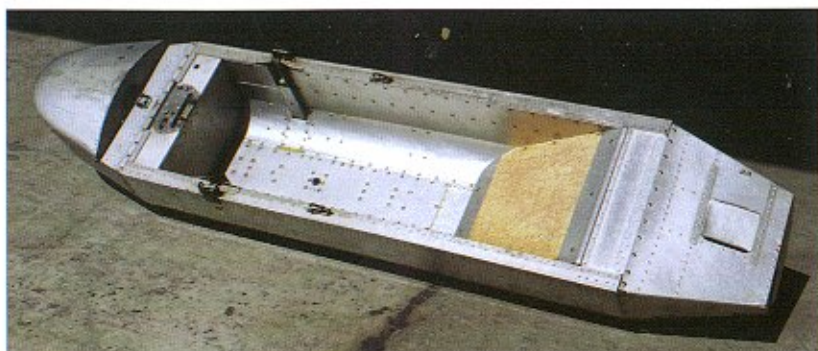




## Special Container



This special container is used for testing new parachute designs. The aluminium alloy container is attached on the outer under-wing pylon. Inside the container a steel replica of a paratroop/human body together with the parachute to be tested is fitted. Drops are made from various heights and speeds to test the parachute.







The L-39ZA with UZR-60 training pod (pictures above). This pod simulates R-60 (AA-8 Aphid) IR air-to-air missiles.



Two L-39Cs in grey "NATO" camouflage have a pair of UB-16 rocket pods attached. (above and right)



A group of concrete practice bombs. (right) The same bombs and drop tanks fitted on a L-39ZA (bottom).







A L-59E with UB-16-57 rocket pods (top left). Czech AF L-39MS with UB-16-57 rocket pods and R-60 (AA-8 Aphid) IR AAM (top right). A L-39ZA for the Nigerian Air Force (bottom left). A similar version for Algeria (bottom).







# L-139



photo by Jan Kouba



photo by Jan Kouba

Two pictures of the L-139 number "5501" in its original colours used for demonstration purposes (top), the same aircraft in an experimental "NATO" camouflage (4x below).

Note the falling spent shell cases as the GSh-23L gun is fired. (below centre)







A formation of three L-39MS/L-59 with "0001" in the lead (top). The other pictures show a L-59T serial number 0001, during a test firing of the GSh-23L gun (below left), in formation with an F-18 (below right).



photo by Petr Soukup



photo by Jan Kauba





The first prototype of the L-159 "5831" during weapons tests in Norway. The aircraft with a training pod designation SUU-20 used for practice bombs and unguided rockets (above left). The same aircraft with rocket pods carrying six rounds (below). The next picture in that column shows a weapon configuration including the indigenous 20-mm gun pod PLAMEN. The L-159 in the standard Czech Air Force camouflage and full colour national insignia, here armed with a TIALD pod under the fuselage, AGM-65 Maverick air-to-ground missiles and anti-runway Durandal bombs on the under-wing pylons (below). A production L-159 "6001" is fitted with AGM-65 Maverick and AIM-9 Sidewinder missiles (below right). Note the seventh fuselage pylon.







photo by Jan Kouba

Three pictures of a production L-159 ALCA during weapons delivery tests, conducted by the Czech Air Force in 2001. Notice the different style of "NATO camouflage" in comparison with the L-39C, L-139 and initial L-159s on page 116, and the two-colour "low-viz" Czech Air Force roundel on its right wing and full three-colour ones on its left wing, wing undersides and on the fin.



**L-159**  
**Alca**

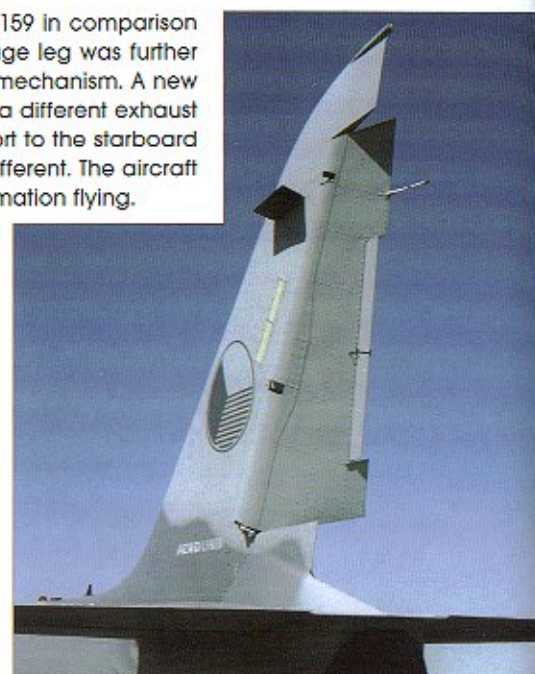


photo by Petr Soukup





Some details of particular improvements of the L-159 in comparison with the L-39, L-59 and L-139. The front undercarriage leg was further strengthened and equipped with a new steering mechanism. A new powerplant the F-124-GA-100 is distinguishable by a different exhaust nozzle. The SAPHIR APU is repositioned from the port to the starboard of the fuselage. The under-wing pylons are also different. The aircraft also received luminous strip lights for the night formation flying.





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