

# RUAG



Military aviation – We provide security.



### For the Air Force, high operational readiness is crucial

Military jets and helicopters are complex systems. Airframe, avionics, engines, components and equipment must be perfectly harmonized and ready for take-off at all times. To ensure this is the case, regular and fully dependable servicing is essential. Professional maintenance, support, repair, modification, upgrading and testing of all components and overall systems require a trustworthy partner with access to wide-ranging expertise and plenty of experience.

In the Swiss Air Force and Armed Forces, we know that RUAG Aviation has highly specialized engineers, technicians, mechanics and company test pilots in every area – be it jets, propeller aircraft, helicopters or support systems. We can rely on their expertise, combined with a wealth of experience and a commitment to the highest quality, at all times. Following years of successful collaboration, we are completely confident that our aircraft and helicopters are in the very best of hands at RUAG Aviation.

Lt Gen Markus Gygax  
Commander of the Swiss Air Force

## Total system life cycle support for aircraft and helicopters

### Structural components

Development, design and construction of structural components and assemblies for military jets, e.g.:

control surfaces for the F/A-18 Hornet C/D and E/F, elevator assemblies for the F-5 Tiger E/F

### Guided missiles

Maintenance

Upgrades

Spare parts management

### Engines and propellers

Overhauls

Miscellaneous technical procedures

Painting

System enhancements

Troubleshooting

Configuration and modification management





### Components and equipment

- Fuel supply
- Shift transmissions
- Oxygen and nitrogen supply
- Ejection seats
- Hydraulics
- Cockpit condition testing
- Fuel control testing
- Generators

### Total system support

- Repair of structural components
- Structural analyses
- Systems engineering
- Component engineering
- System integration
- Detailed documentation

### Self-protection systems

- Radar test systems
- Sensor and self-protection solutions
- Test equipment for self-protection solutions

### Simulators and software

- F/A-18 simulator
- Mission Planning System (MPS)
- Mission Planning & Debriefing System (MPDS)
- Flight Data Monitoring (FDM)
- HUMS Data Analysing System (HDAS)
- PT6 Data Acquisition Tool
- Obstacle Management System (OMS)
- F-5 radar training
- Super Puma simulator
- MISIM ADS 95 Ranger UAV mission simulator

### Avionics

- Modification and modernization
- System integration
- Communication and navigation systems
- GPS systems and instruments
- Displays

# Total system support

The Swiss Air Force entrusts its entire aircraft and helicopter fleet to RUAG Aviation for maintenance, repair and overhauls, for both routine and incidental servicing. Individual components and overall systems are put through most reliable tests. In addition to conventional maintenance work, we also offer a number of aerodynamic and mechanical testing and analysis procedures. RUAG Aviation has also carried out final assembly of several Swiss military jets and helicopters, including the F/A-18 and EC 635, giving us extensive and valuable specialist knowledge about the systems we maintain. Thanks to numerous licensing agreements with the manufacturers, we are authorized to provide support services for F-5 and F/A-18 jets, Cougar/ Super Puma and Alouette III helicopters as well as Pilatus PC-6/7/9 propeller aircraft. As part of our comprehensive quality assurance procedures, all aircraft and helicopters serviced by RUAG Aviation are test-flown by one of our company test pilots before being handed over to the customer. Here is a selection of the services we offer:

## Engineering:

- Systems engineering
- Avionics and component engineering
- Development, design and construction of structural components and assemblies
- System integration
- Development of upgrades and system enhancements
- Computer-aided configuration management
- Development of proprietary repair



Total systems support: F-5 jets are maintained for the Swiss Air Force

- processes
- Development of tailored maintenance plans
- Performance and stability analyses
- Aeroelasticity analyses
- Structural analyses

## MRO:

- Repair of structural components
- Prototype production
- On-site support services
- Helicopter outfitting
- Complete helicopter paintshop services
- Detailed documentation of all work procedures

## Logistics:

- Spare parts logistics
- Fleet management
- In-service support
- Programme and project management



System upgrades under the Super Puma upgrade programme



Final assembly of the EC 635 for the Swiss Air Force



Day 1: An F/A-18 arrives at RUAG Aviation for a total overhaul



Various components are removed for servicing at the relevant competence centres

# Engines and propellers

Customers from all over the world trust RUAG Aviation when it comes to maintenance, overhauls and repairs of fighter jet and helicopter engines and training and transport aircraft propellers and engines. They know that our specialists always work with the highest precision according to original OEM manuals and using only genuine parts. This enables them to find the ideal specific solution for even the most challenging cases, with turn around times unequalled anywhere else in the world. Thanks to many years of close collaboration with the Swiss Air Force, we have extensive operational experience that is extremely helpful in our maintenance work. Since we have our own testing facilities, our customers are assured that all the work we do, from acceptance of an engine to delivery, meets our strict quality controls and satisfies the most stringent demands. Here is a selection of the services we offer:

## Engineering:

- Configuration and modification management
- Development of system enhancements
- Inspection for defects
- Development of repair procedures
- Troubleshooting
- Spare parts management

## MRO:

- Cleaning and stripping processes
- Overhaul of mechanical components
- Mechanical surface treatment
- Surface coating
- Heat treatment
- Rotor balancing
- Spectrometric oil analysis
- Inspection for cracks: penetrant fluid, magnetic, eddy current and ultrasound testing
- Endoscopic inspection
- Rotor blade testing for the Alouette III

## Engine types and parts:

- General Electric F404-GE-402  
F/A-18 Hornet C/D
- General Electric J85-GE-21  
F-5 Tiger E/F
- Turbomeca Makila 1A1 and  
1A Super Puma/Cougar
- Pratt & Whitney PT6A turbines
- Artouste IIIB
- Air turbine starters (ATs) and  
auxiliary power units (APUs)
- Dynamic components (transmissions  
and rotor heads) for Super Puma/  
Cougar
- Hartzell and McCauley propellers

## Major licences:

- F404-GE-402: TA 1146-08 for the  
Swiss Air Force and other countries
- J85-GE-21: TA 2123-04 for the Swiss  
Air Force and other countries
- Makila 1A1 and 1A



In-house engine test bed



Precision work: maintaining a jet engine



Propeller maintenance for a Pilatus PC-7



The engines are removed and taken to the competence centre



Specialists at work: no detail is overlooked during engine servicing

# Avionics and equipment

Our many years of experience as a partner to the Swiss Air Force and the expertise we have thus acquired enable us to serve today's international client base in the maintenance, modification and new development of a variety of avionics systems and components. Our avionics experience includes the F-5 and F/A-18 jets and the Super Puma/Cougar helicopters, among others. Our globally unique testing facilities developed in-house for technologies such as the F/A-18 radar system underline RUAG Aviation's innovative capacity and outstanding engineering capabilities in this area. The same is true of our practical missim test equipment and our integrated self-protection system (ISSYS) for helicopters. In-depth expert advice and development of tailored solutions in all areas form an integral part of our service. Here is a selection of the services we offer:

### Engineering and upgrades:

- Integration of helicopter self-protection systems (ISSYS)
- Development of test equipment for self-protection systems (missim)
- Modification and modernization
- Enhancement and integration strategies for diverse avionics systems
- Hardware and software development
- Configuration management

### MRO:

- Communication and navigation equipment
- Radar, sensor and self-protection solutions



We maintain around 3500 different components

- Displays
- GPS systems and instruments
- Gas systems: oxygen and nitrogen supply
- Hydraulic valves and pumps
- Fuel supply systems
- Ejection seats
- Air conditioning
- Electromechanical equipment and generators

### Major licensing partners:

- Smiths Aerospace Corp.
- Martin Baker Aircraft Company Ltd.
- Triumph Gear Systems Inc.
- Carleton Life Support Systems Inc. (Cobham Group)
- Northrop Grumman Corp.
- Honeywell International Inc.
- GE Corp.
- Breeze Eastern Corp.
- Parker Hannifin Corp.
- Goodrich Corp.
- Moog Inc.



System integration: head-up display for the F/A-18



ISSYS: testing of helicopter self-protection system



missim: test equipment for self-protection systems



All maintenance work is complete. Testing on the in-house engine test bed



In-depth testing of all systems after completion of servicing

## Software and simulators

Operation, maintenance, development, support, upgrades and engineering for flight simulator systems are among RUAG Aviation's greatest strengths. Our capabilities cover the F/A-18 simulator and F-5 radar training as well as the Super Puma and Ranger UAV mission simulator. Furthermore, our software engineers have developed several highly complex software applications:

### Mission Planning & Debriefing System (MPDS)

These software applications enable planning, analysis and debriefing of complex missions with multiple military aircraft involved. The systems are successfully proven and in use within the Swiss Air Force. As an independent and reliable partner, RUAG Aviation provides customer-specific and innovative MPDS solutions to an international customer base.

### Flight Data Monitoring (FDM)/ HUMS Data Analysis

FDM and HUMS Data Analysis are services and software applications to analyse digital flight data. They serve to improve flight safety and are valuable tools during pilot training and maintenance procedures.

### PT6A Data Acquisition Tool

Diagnostic software for efficient analysis of engine and fuel system faults in PT6A turboprop engines.



Flight data monitoring with FDM software developed in-house



Super Puma simulator: interior view



Super Puma simulator

### Obstacle Management System (OMS)

OMS is a software application to manage ground obstacle data. It is used successfully by various civil and international aviation authorities.



The F/A-18 radar system is tested in a test facility developed by RUAG Aviation



Following servicing, RUAG Aviation test pilots put the aircraft through its paces



Day 40: Service complete, the jet is delivered to the customer in top condition

## Other services

### Unmanned aerial vehicles (UAVs)

As one of the leading technology companies in the field of UAVs, RUAG Aviation has developed several innovative systems. These include a skid landing system, as well as ARCHER, the first catapult launch system with a fully sealed oil/gas system, and OPATS, the first laser-based automatic landing system for UAVs. We also perform all MRO services for the Ranger, the first UAV approved to fly over inhabited areas, together with its associated control stations and launch and landing systems.



Catapult launch of the Ranger UAV

### Air defence

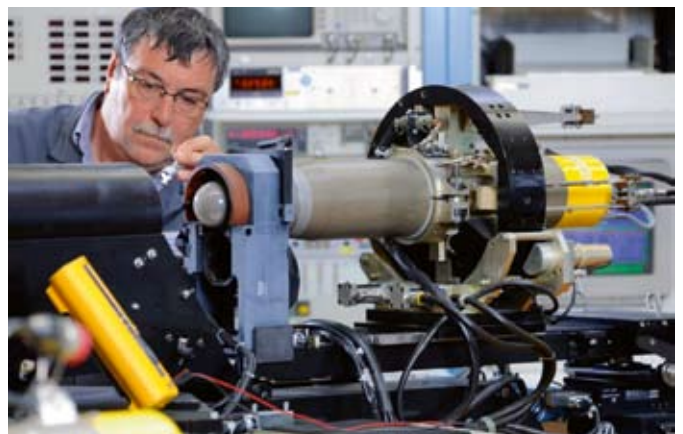
RUAG Aviation has comprehensive maintenance, testing and repair capabilities for the Skyguard 35mm Twin Gun Fire Unit and RAPIER Guided Missile System air defence systems. We also maintain testing facilities, simulators and IT systems and perform specialist training. Thanks to our many years of intensive collaboration with the Swiss Armed Forces and systems suppliers, customers in this market benefit from RUAG Aviation's multi-faceted expertise and valuable experience.



Skyguard: RUAG specialists in the field

### Sidewinder guided missile

As contractor to the US Air Force, RUAG Aviation is the world's only provider of depot level MRO work, upgrades, spare parts and other services for the Sidewinder AIM-9P-4/5 guided missile. Although this weapon system is no longer produced, it is still in use in many countries. Regular maintenance is essential for safe and reliable deployment. RUAG Aviation will continue to guarantee this service until 2020 at the earliest.



Precision work: maintenance on a guided missile warhead

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