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RO-RA AVIATION SYSTEMS GMBH is a reliable systems supplier and innovation leader who offers the development, qualification and production of applications for Interiors, Structures and Engine Components.

The company focuses on future-oriented products and solutions by processing metals of almost all grades and delivers moulding solutions of elastomers and filled thermoplastics. State-of-the-art turning and milling centers are being used for the production of metal parts in-house.

**RO-RA brings value to the customer by:**
- Light weight solutions
- Highly functional and innovative applications
- Customized technical solutions (Build-to-Spec and Build-to-Print)
- Flexibility in Production
- Excellent quality and maturity
- Competitive Pricing within a global industry

RO-RA is a component system supplier and partner to the global aviation industry for more than 10 years.

**The product spectrum currently contains but is not limited to:**
- Interior Tie-Rods, Pivot Kinematics, Shock-Absorber, Injection Moulding and Damper
- Structural Struts & Rods, Hinges & Latching Mechanism and Attachment Bracketry
- Aircraft Wing Fuel Tubing Connectors and Flanges
- Engine precision parts
- High complex milling/turning operations
RO-RA develops and manufactures all different kinds of tie rods including drag links, rotary rods and connecting elements in conjunction with integrated shock mounts and attachment brackets.

The development comprises of the conceptual design, 3D modeling, 2D engineering, stress calculation and verification, ultimate compression & tension load analysis & testing, fatigue cycling & wind-milling analysis & testing, weight evaluation as well as environmental testing according the industry standards or unique customer requirements.

The AEROSTRUT® system includes an integrated/inner distortion lock mechanism with independent anti-twist devices. The system allows significant improvements during the installation process at the assembly lines of our customers.

The adjustability range for the ends is up to +/- 75mm or +/- 3 inches in overall.

The AEROSTRUT® system is supplemented with fork end locking clips which are clipped on the threaded sleeve by one hand, a no-loose prevention feature for the interface pins and a maximum turn-out device.
The AEROSTRUT® system provides major benefits to the aviation industry by:

- Significantly reducing cycle times at installation
- Plug & play solutions
- Light weight
- Reduced testing for design adaptations
- No tooling for adjustments and adjustability requirements
- No wire lock
- No counter nuts
- High adjustability with a range of +/− 50mm or 2 inches
- High resistance against environmental conditions
- Optional loose prevention
RO-RA develops and manufactures all different kinds of structural rods including metallic rods, engine mounting rods, engine rod assemblies, steering rods, turnbuckles and rotary/swaged rods. The development comprises of the conceptual design, 3D modeling, 2D engineering, stress calculation and verification, ultimate compression & tension load analysis & testing, fatigue cycling, windmilling analysis & testing, weight evaluation as well as environmental testing according the industry standards or unique customer requirements.

Our structural struts are manufactured by using aluminum, titanium or stainless steel and are swaged in a cold forming process (rotary swaging without changes to the microstructure). Comprehensive testing is made to qualify structural struts including dye penetrate inspection, electromagnetic particle examination, grain size and grain flow inspection, radiography or radioscopy inspection, allowable defects testing (on threads, transverse section, longitudinal section) and paint thickness inspection. Special processes such as insert threading and thread forming are in place. The milling of rod ends is done in-house.
Our modern production provides a comprehensive in-house production with full control of the critical manufacturing processes, including:

- Tube swaging
- Tube swaging with swaged-in inserts
- Rod end and fork end milling
- Top of the edge qualified bearing swaging equipment
- Surface treatment
- Final assembly
RO-RA develops and manufactures all different kinds of Connectors, Flanges, VI-Breaker and Air Ducts. The development comprises of the conceptual design, 3D modeling, 2D engineering, stress calculation and verification and weight evaluation.

Our connectors are manufactured by using aluminium or titanium and are typically machined out of block or bar material to ensure that highest part integrity is provided. RO-RA has developed special machining processes to reduce machining time and set-up costs.

The geometries of the connectors are all different and are fully customized for each customer. Comprehensive testing is made to qualify the Connectors including dye penetrate inspection, electromagnetic particle examination, grain size and grain flow inspection, radiography or radioscopy inspection, allowable defects testing [on threads, transverse section, longitudinal section] and paint thickness inspection.
Our modern production provides a comprehensive in-house production with full control of the critical manufacturing processes, including:

- Pre-cutting of Material
- Turning and Milling of Parts
- Cleaning of Parts
- NDT inspection
- Surface treatment
- Final assembly
The machining metal packages comprise of different aluminum, titanium, steel and plastics complex machined brackets which are fully assembled, tested and surface treated. The assembly of the detail components include the injection grouting of the bearings, surface treatment, fasteners installation and sealant application.

The milling metal parts comprise of different premium and high-tensile steels and adequate surface treatment. High-tensile steels are mainly used for engine products.

**RO-RA mills and machines offer a wide range of raw materials, including:**
- All kinds of aluminum (AL2024, 2099, 6061, 7050, 7075)
- Steel, stainless steel and hard steel with high chromium and nickel alloys
- Titanium
- Inconel
We provide benefits to the aviation industry with:

- High flexibility in production
- Competitive pricing
- Wide range of material applications
- Improved cycle times
ENGINE PRECISION PARTS

The machining metal packages comprise of different aluminum, titanium, steel and plastics complex machined brackets which are fully assembled, tested and surface treated. Additionally, RO-RA develops and manufactures all different kinds of engine rods. Our structural struts are manufactured by using titanium or inconel.

The assembly of the detail components include the injection grouting of the bearings, surface treatment, fasteners installation and sealant application. The milling metal parts comprise of different premium and high-tensile steels and adequate surface treatment. High-tensile steels are mainly used for engine products.

RO-RA mills and machines offer a wide range of raw materials, including:

- Steel, stainless steel and hard steel with high chromium and nickel alloys
- Titanium
- Inconel
We provide benefits to the aviation industry with:

- High flexibility in production
- Competitive pricing
- Wide range of material applications
- Improved cycle times
All common plastics and special technical plastics (e.g. glass fibre filled) are used for the development and production of aviation products. Thermoplastic-elastomers (TPE) are applied in areas where product requirements and temperature are sensitive. Other thermoplastics are utilized including PPS, PEI, PC, PA, POM and ABS. The application of PEEK will be introduced.

**Following processes are in use at RO-RA:**

- Glass fiber filled or carbon fiber filled
- Two-component injection moulding
- Insert moulding
- Internal gas pressure moulding
We provide benefits to the aviation industry by:

- Flexible manufacturing system
- Wide range of material applications
- Improved cycle times
The core competences of RO-RA are the development, product definition, qualification & testing as well as the production of pivot point kinematics which comprise of the pivot mechanism, damper unit, lift assist and damper bin brackets.

The development comprises of the conceptual design, 3D modeling, 2D engineering, stress calculation and verification, acoustics and vibration computation, ultimate compression & tension load analysis & testing, fatigue cycling & windmilling analysis & testing, weight evaluation as well as environmental testing industry standards or unique customer requirements.

The benefits of our lift assisted kinematic system are:

- Simple and quick installation and removal of the stowage bin units by using an integrated clip system
- Light weight solution by utilizing thermoplastic materials for the pivot point elements considering high stiffness, loading and cycling requirements.
- Very low lift assist requirements for the closing of the stowage bins and significant support of the damper system during the opening process

The pivot point kinematics was developed to support narrowbody and widebody interior configurations and provides a modularity concept.
**DAMPERS**

**RO-RA** develops and manufactures all different kinds of linear and rotary dampers, actuators, gas springs, hydraulic dampers, vibration dampers, lifting columns, piston rods or seat reclines in conjunction with integrated quick release ball cup features. The development comprises of the conceptual design, 3D modeling, 2D engineering, stress calculation and verification, ultimate compression & tension load analysis & testing, life cycle testing, windmilling analysis & testing, weight evaluation as well as environmental testing industry standards.

Our **AEROLIFT®** system provides improved homogeneity of damper motion and a massive reduction of the “air jump” effect due to a new, innovative valve system. The system includes a safety relief valve for overload protection in case of misuse.
The AEROLIFT ® system provides major benefits to the aviation industry with:

- Damper systems especially developed for the aircraft industry
- High performance lifetime
- No air jump during operation
- No pressure loss during opening/closing process
- Load-dependent damping action
- High corrosion resistance
- Multiple end fitting designs available based on customer requirements
**AEROSHOCKS**

**RO-RA** develops and manufactures all different kinds of shock mounts with axial and radial applications (also combined), different stiffness, damping behaviors and amplitudes as well as integrated devices in metal brackets, injection moulded & glass fiber reinforced brackets or other substructures.

The **AEROSHOCK®** system comprises of the machining and milling of metal parts and applications with the design & manufacturing of elastomeric shock absorbing, noise, temperature and vibration dampening devices. The standard features include axial & radial applications with a stiffness range of around 25N/mm to 4500N/mm.

The standard features include axial applications with different stiffness ranges and hardness behaviors according to the customer’s requirements (from stiffness range of 25 N/mm to 4500 N/mm) with respect to different amplitudes and end stops.
RO-RA develops customized and integrated AEROSHOCK® solutions for our customers, including:

- Elastomeric rod ends
- Seat rail attachment shock mounts and absorbers
- Fixed pin lower attachment shock mounts and absorbers on hard-points to AC structures
- Axial & radial shock mounts for monuments & overhead stowage bins with adjustable brackets
- Axial & radial shock mounts for sidewalls with adjustable brackets
- Lining panels axial shock mounts with quick release fitting systems
- Shock mounts with spherical bearings
- Bushings
- Supporting bearings
- Active absorbers
- Vibration isolators
RO-RA’s development competence covers services from the concept development through to complete qualification and production of the components. Our Range of services involve:

- Conceptional Design
- Research & Development
- Application Engineering
- Acoustics & Vibration Computation
- Ultimate Compression & Tension Load Analysis
- Fatigue Cycling & Windmilling Analysis
- Kinematic Analysis
- Design & Development Validation by all known OEM requirements
- Environmental Testing
- Qualification & Verification

Simulations and calculations of assembly cases and stress are carried out in the RO-RA development centre on state of the art work stations by using the FEM software MD Patran/Nastran. The design is made on latest CAD work stations with CATIA V5.

Finished parts and assemblies can be tested and qualified directly at RO-RA by using state of the art testing technology. For special tests RO-RA has cooperation’s with selected partner companies who can carry out testing on demand.
RO-RA’s principal of quality standard – **Ultimate customer satisfaction by delivering on time, on budget and of outstanding quality** – is supported by the entire crew. As a partner of the aerospace industry RO-RA is certified according to AS/EN 9100:2009 and EASA EC 748 – Part 21 Subpart G. RO-RA is holding the necessary certifications for the aviation industry as well as various approvals from OEM’s and Tier-1 supplier.

**Quality Control:**

Alongside of the best educated personnel, state-of-the-art aids and machines are used for production accompanying controls of parts from the CNC controlled 3D coordinate measuring machine to the laser controlled sealing screening machine.

A matter of course are as well evaluations by using all common statistic methods and latest software modules in order to fulfill the quality requirements of the customers and to guarantee stable and capable production processes.
Established Customer Base

- Aero Vodochody
- Airbus
- Bombardier Aerospace
- B/E Aerospace
- Diehl Aircabin
- Embraer
- FACC
- Jet Aviation
- Lufthansa Technik
- Pilatus
- Rolls-Royce
- PFW
- Zodiac Aerospace
- Strata