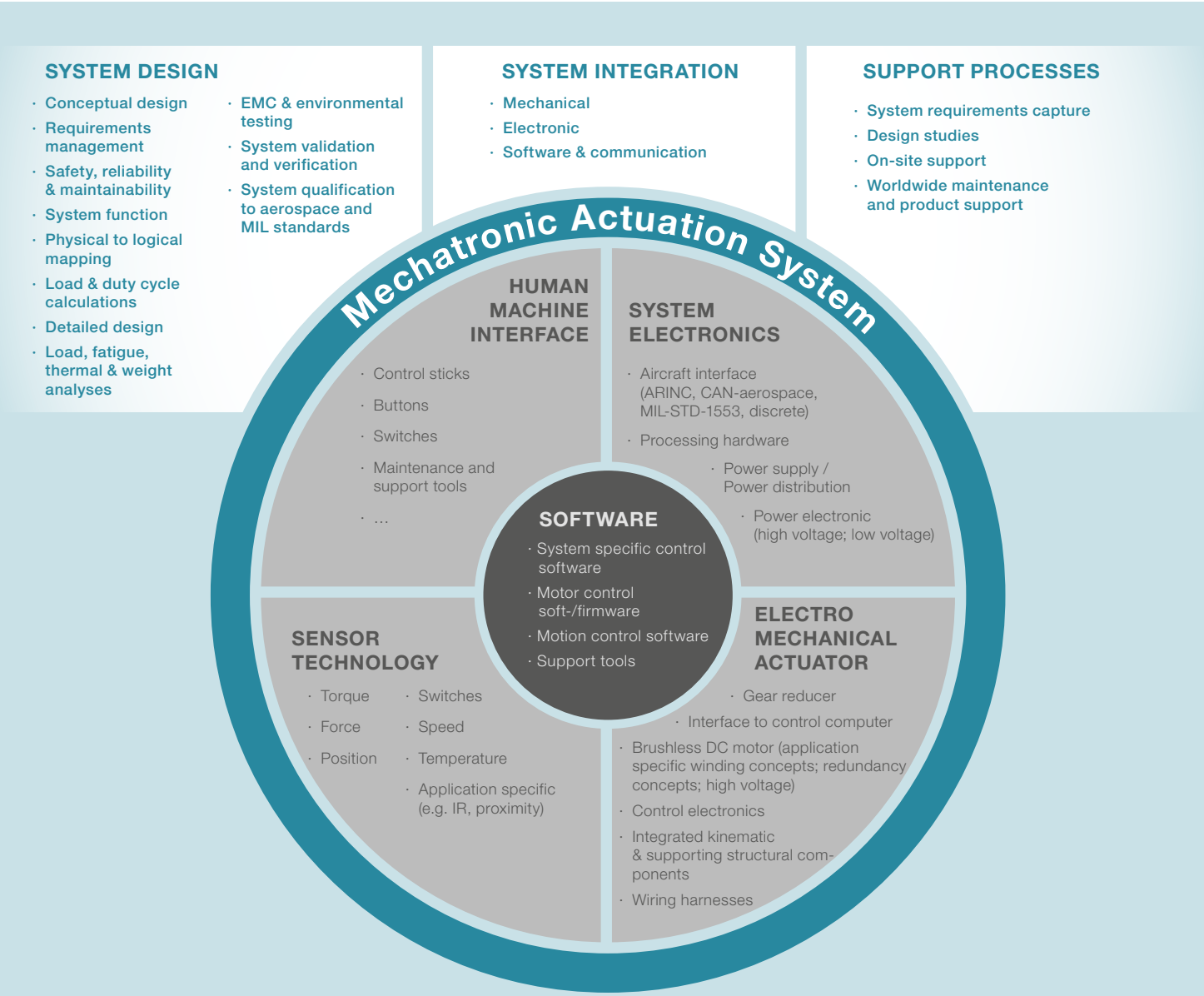
WITTENSTEIN | aerospace & simulation

# Company Profile

Mechatronic
Actuation Systems

# Electromechanical Actuation

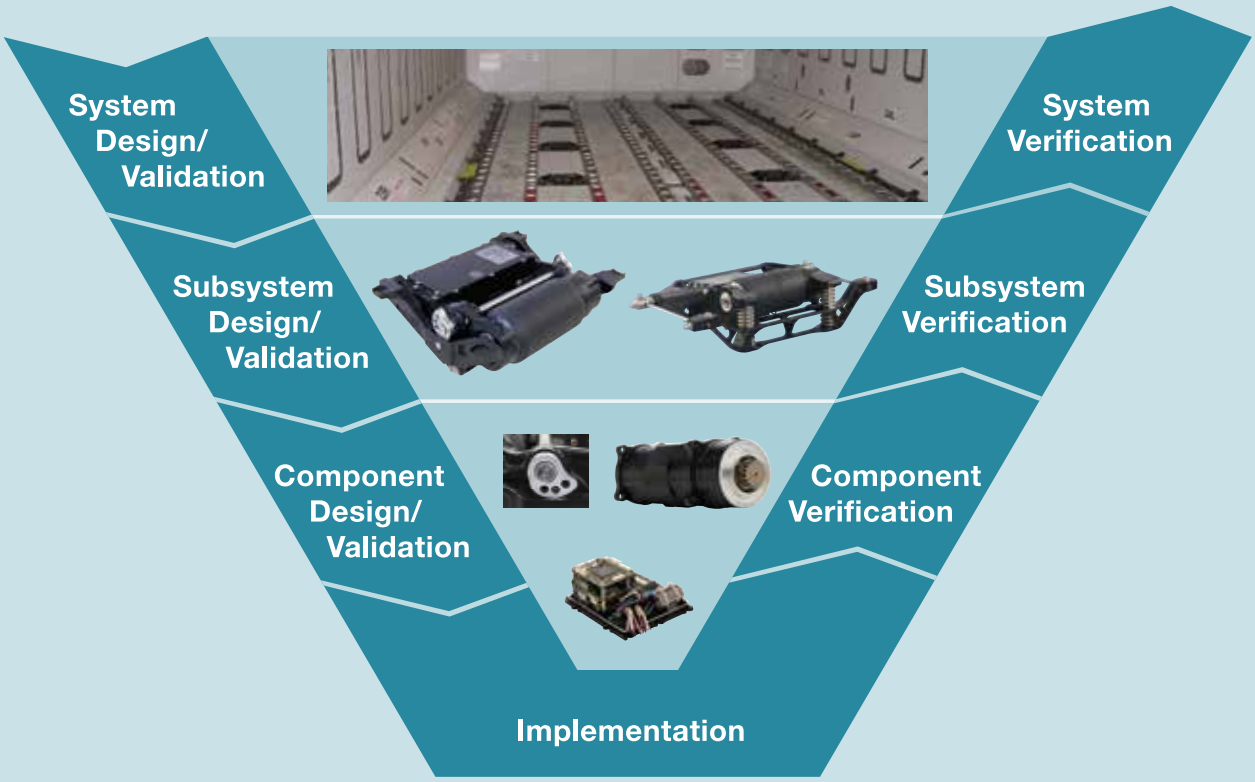
## Provision of complete mechatronic actuation systems:




Based on more than a decade of experience in aerospace gearbox, motor, sensor and electronics design, WITTENSTEIN aerospace & simulation has the ability to develop, integrate and supply mechatronic and electromechanical actuation systems in aircraft. The company's rigorous and mature system design processes assure delivery of products that meet all of our customer requirements. Today WITTENSTEIN's innovative systems are deployed in mission critical and flight control systems where technical challenges of high performance, robustness and reliability, confined space envelopes and lowest weight are a key to success.

# Turnkey System Solutions

## System Life Cycle Competence from Design and Engineering through Production and Support




WITTENSTEIN aerospace & simulation's EASA 21G and 145 certified organization is a reflection of its mature processes and capabilities that assure high quality production, service and support to meet customer requirements through the whole product lifecycle.

Our world-wide service and product support network is reviewed and continuously improved to meet the current and future needs of OEMs and operators.

# Servo Actuators

Photo: AIRBUS

## A380 Passenger Doors

The electric door actuation system on the A380 replaces conventional manual door opening mechanisms. The system includes three actuators: the Swivel Actuator which opens and closes the aircraft door, the De-Arrest Actuator which secures the door in the open position and the Flight Lock Actuator that ensures the door remains locked during flight. To safeguard the integrity of the system in critical situations redundant windings are integrated in the Swivel Actuator.


Photo: AIRBUS

## Geared Motor Unit – Actuator for Aerial Refueling System

The Hose Drum Drive System controls the hose of an air tanker during flight refueling. WITTENSTEIN supplies the actuator system which includes a dual redundant motor, a gearbox, and sensors for monitoring winding temperature and motor shaft position. A key feature of the actuator is a miniaturized electronic ID plate for recording the specific parameters of the individual actuator measured during the final acceptance test. These data can be uploaded by the system control electronics allowing a more tailored control of system behavior, including ease of maintenance.

## Cargo Loading System – PDU (Power Drive Unit)

The Electrical Cargo Loading System Power Drive Units (PDUs) are located in the cargo compartment floor of the forward and aft cargo compartment of the A380. The main role of the PDUs is to provide adequate traction under all environmental conditions to move air freight pallets and containers in and out of the cargo compartment. The PDUs are active during the loading and unloading process of the cargo compartment. Self-erecting PDUs are located in the ball mat area and equipped with two separately acting AC servo motors.

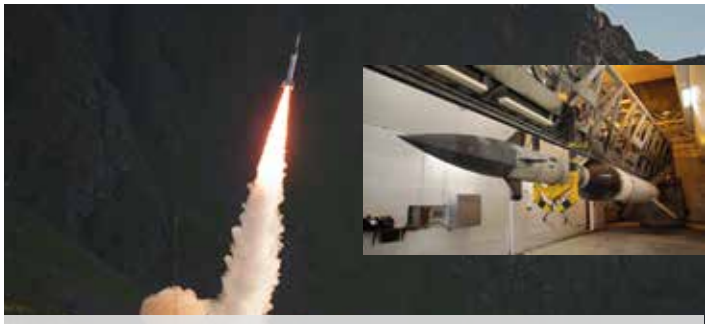
The first motor provides the necessary traction force and the second motor provides the lift function to positively engage or disengage the drive. Spring loaded PDUs are located in the longitudinal area of the cargo compartments and are mounted between the roller tracks and support the weight of the pallets via two spring packs.

# Flight Controls

Photo: Diamond Aircraft

## Fly-by-wire for General Aviation

The Technical University of Munich is investigating fly-by-wire systems for general aviation aircrafts by equipping a Diamond DA42 with electromechanical flight controls. WITTENSTEIN is providing all components of the electromechanical actuation system. These comprise highly compact rotary actuators as well as actuator control electronics and a stand-alone center stick unit including force feedback functionalities. The innovative WITTENSTEIN technology gives an efficient fly-by-wire solution for General Aviation.



## Canard Control System – SHEFEX II

The SHEFEX program was conducted by DLR (Deutsches Zentrum für Luft- und Raumfahrt) to investigate new re-entry technologies with the focus on a revolutionary design of heat shield for protection against high temperatures. WITTENSTEIN provided the electromechanical actuation system for position control of the canard control surfaces. This actuation system is an entirely new concept in integrated compact electro-mechanical drives incorporating revolutionary new gearbox technology and control electronics to provide high torque and speed in space environment. The experiment was successfully accomplished on 22nd June 2012.


## Flight Control System – Active Sidestick for Supersonic Aircraft

The T-50 Golden Eagle is a family of supersonic advanced trainers and multirole fighters. WITTENSTEIN provides the electromechanical and sensing elements of the aircraft's active sidestick consisting of motor-gearbox units, the mechanical backup system and triple redundant position sensors for each axis, packaged in a highly compact mechanical arrangement. WITTENSTEIN also provides the design of the motor control electronics and software together with the know-how for force feel control. This aircraft family is the first to be equipped with active sidesticks in series production.


## A350XWB – High Lift Backup System

In the drive to the more elctric aircraft, mechanical systems are being replaced with high performance electrical systems. As a part of this drive, WITTENSTEIN has developed and is producing a series of electrical motors which power the High Lift System of the A350 XWB aircraft. These high performance and light weight motors have been designed to operate flawlessly in the harsh environment of a commercial aircraft wing, near vacuum and below -50°C. They are also an initial application of a high voltage power system (540VDC) on a commercial aircraft, thus making electric power a viable solution for flight critical components.

# Control Loading Systems

## Control Loading Systems

### Inline Solution

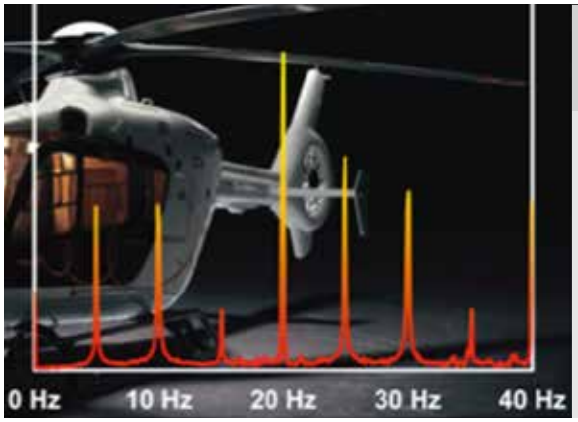
The WITTENSTEIN inline control loading systems provide a customizable turnkey solution for any aircraft type. The flight controls system consists of standard mechanical linkages combined with integrated actuators and force sensors, all coupled via the WITTENSTEIN Aktiv8® software suite. A variety of actuator sizes are available and can be configured to suit any application. WITTENSTEIN has successfully designed and produced control loading systems for a variety of fixed and rotary aircraft types, such as the Boeing 707, EC135/635 or AW139. The fidelity of WITTENSTEIN control loading systems is capable of meeting all levels of EASA and FAA qualification standards.

### Drop-in Solution

The Aviation Combined Arms Tactical Trainer or AVCATT is a mission training and rehearsal system used by the United States A rmy. It consists of six dual helicopter cockpits along with a command center and debrief area. Each cockpit can simulate either a UH-60A/L, OH-58D, CH-47D, AH-64A or AH-64D helicopter, allowing the combination of multiple aircraft types during the mission. The system recognizes the different sticks and grips of each helicopter type and then automatically reconfigures itself via software to represent the aircraft. WITTENSTEIN provides electrically coupled integrated modular actuators for each primary flight control axis, as well as the associated sticks and grips for the different helicopter models.

## Active Steering Wheel

WITTENSTEIN's Active Steer-by-Wire system allows a wheeled vehicle to be controlled without using mechanical linkages. This allows the vehicle designers the freedom to optimize the vehicle driver position and overall vehicle configuration to meet new and diverse technical requirements. Examples could include multiple driver stations in a single vehicle, autonomous vehicle steering systems, command superposition solutions and remote driver control. The Steer-by-Wire system functions by translating driver input into an digital signal that controls wheel actuators. Road disturbances are sensed and fed back to the steering wheel actuator to provide active feedback.




## Actuation Kits for Vibration Platforms

Higher level simulation training systems require realistic feedback of the aircraft vibration environment for qualification by a certifying authority (FAA, EASA). WITTENSTEIN has developed a dynamic and powerful actuation kit that can drive the vibration platform of virtually any aircraft simulator, ranging from a single seat to the entire simulator platform. The vibration actuation kit is highly flexible and can be configured to reproduce the vibrational frequency spectrum of any aircraft. WITTENSTEIN has many vibration kits in operation with popular models being the Airbus Helicopters EC225, EC175 and AS350.

# WA&S Customer Services

## Research & Development

Our expert engineers are industry recognized innovators of aerospace drive system technologies. We conduct a wide range of engineering services from feasibility studies to rapid prototyping or in-depth research studies of emerging technologies. Take advantage of our expertise and pioneering spirit – we look forward to finding a customized solution that fits your needs.

## AOG Service

We offer a range of individualized services, including AOG, focused on quick turn-around for time critical situations.

## Collaboration with Satair Singapore

To provide improved service to our Asian clients we established a Customer Service agreement with Satair Singapore. By using the local facilities and experience of our partner, it is possible to quickly repair and return to service our products in a more cost efficient manner.

## EASA Part 145

The experienced and certified WITTENSTEIN Customer Service Team guarantees a fast repair of the highest quality and care – with short lead times and full support. In addition, our comprehensive testing facilities offer a variety of material analyses and reports that are available upon request. Rely on our quick response time, non-bureaucratic processing and personal attention.

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