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# Hanwha AEROSPACE DIVISION

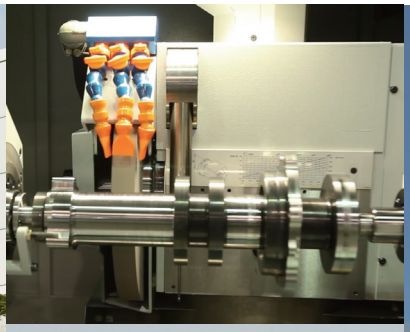
Innovative Solution for
Aerospace Precision
Control System

We create the future with
Technical Innovation & Ultimate Challenge

AEROSPACE BUSINESS AREAS :
Korean Fighter(KFX), Light Armed Helicopter(LAH), Light Civil Helicopter(LCH),
Korean Space Launch Vehicle(KSLV-II), Export Business
MAIN ITEM: Flight Control System , Fuel System, Hydraulic System, Landing Gear System, Avionics System

Hanwha Corporation

# HanwhaCorporation


## We Create the Future

with technical innovation & ultimate challenge

HANWHA Aerospace Division leads the Korean aerospace industry in the field of design, development, manufacturing, and repair & overhaul of flight control actuators, hydraulic & fuel system of aircraft, guided weapon, launch vehicle, defense and marine. It aims to grow as a core manufacturer by participating in all Korean aircraft programs and expanding into the commercial aircraft as well as the space area in both domestic and export market. We continuously strive to reinforce our research and development capacity in order to play a leading role in the aerospace industry through technical innovation and advanced technology.

## History of Aerospace Division

- 1989 Aerospace Division established at Cheonan as an Aircraft Equipment Manufacturer
- 1993 First article delivered for UH-60 Flight Control Servo Actuators
- 1994 First article delivered for F-16 Integrated Servo Actuator (ISA)
- 1994 Development completed for KTX-1(KT-1) Hydraulic Equipment & Flight Control Actuators
- 1997 Development completed for KTX-2(T-50) Flight Control Actuators & Leading Edge Flap Actuation System
- 1999 ISO 9001 Quality System certified
- 1999 Aerospace R & D Center established at Cheonan
- 2001 Development launched for KSR - ||| (Korean Sounding Rocket- |||) Hydraulic System
- 2001 MND Quality Management System certified by D.Q.A.A
- 2004 First article delivered for F-15K Flight Control Actuators
- 2005 AS9100 Aerospace Quality Management Standard certified
- 2006 Development phase for KUH(Korean Utility Helicopter) program started
- 2009 Built and moved to new plant in Asan from Cheonan. AMO(Approved Maintenance Organization) certified by MLTM.
- 2014 Merged into Hanwha Corporation
- 2014 AS9110 Aerospace Quality Management Standard for MRO organization certified
- 2014 National Defense Quality Management Award

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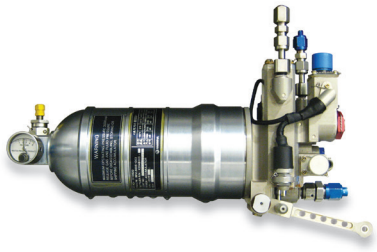
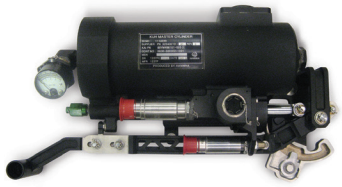
# Hydraulic System

Hanwha Aerospace Division is the only qualified company throughout South Korea in terms of its technology and development capability in the areas of aerospace Hydraulic system. Hanwha successfully developed the key components of Surion, KT-1 and T-50 such as Power Package, Pressure Accumulator, Main Rotor Actuator, and Speed Brake Actuator. Hanwha is yet to take part in a major role in the Next Generation Fighter Development Program.



## KUH Accumulator

- Designed in accordance with SAE-ARP 4379 and MIL-DTL-5498
- Filter screen at Inlet/ Outlet pressure port
- Emergency Mode : 1,350~1,710 psi @ Supply 3,000 psi
- Parking Mode : Above 1,700 psi @ Supply 3,000 psi
- Constant pressure supply to brake system

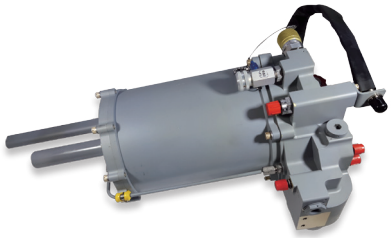


## KUH Rotor Brake System_Master Cylinder

- Dynamic Braking : Max. 15 sec @Rotor 50% RPM after engine off
- Static Braking : Withstand Rotor Rotation @2 Engine IDLE
- Emergency Braking : Max. 25sec @Rotor 70% RPM after engine off
- Parking Brake : Withstand rotor rotation for 24 hr @ Wind effect

## KUH Hydraulic Power Control Module

- Distribute and supply the hydraulic power, filter and store the hydraulic fluids
- Hydraulic System Monitoring/Warning : System pressure, temperature, Pump case drain condition, Filter clogging condition, hydraulic fluid level condition and low level warning
- In case emergency condition : Shut off hydraulic fluid line
- System pressure relief function



## UAV Power Package

- Delivers oil from hydraulic oil pump to selector valve and hydraulic control system, also functions as a storage tank

## UAV Select Manifold

- Open and close hydraulic oil pressure lines for nose landing gear door actuator, nose/main landing gear actuators, emergency accumulator, and brake control module.

## UAV Emergency Accumulator

- During the emergency situation, provides accumulated hydraulic pressure with landing gear and brake system.

# Fuel System

Derived from the technical ability accumulated by consistent development in the Fuel system, Hanwha Aerospace Division localized the production of vital components of the Fuel system, and currently is in the process the production as well as the participation in the unmanned flight control fuel supply system development business.

Fuel Indicator

Tank Unit

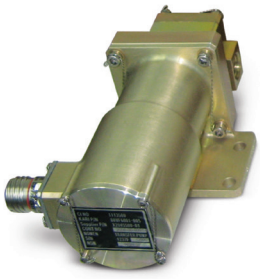
Signal Conditioning Unit

## KUH Fuel Tanks

- Self-sealing : 12.7mm AP / 14.5mm AP(FT1, 2 Tank partially)
- Crash worthiness : 19.8m(65ft) height and 85% water filled condition
- Capacity : 1,400 liters
- Development spec. : MIL-DTL-27422 + DEF STAN 15-2

## KUH Fuel Quantity Measurement System

- Compensate fuel height measurement for different fuel types
- Compensate for flight attitudes
- Automatic fuel balancing function
- Self BIT(Built In Test) function
- Provide processed data to mission computer and fuel Indicator via MIL-BUS and CAN
- Low/high level caution, LH/RH/total group fuel quantity display



## KUH Fuel Boost Pump

- Centrifugal, submerged, motor driven pump
- Motor type : BLDC motor
- Constant flow and power consumption

## KUH Fuel Transfer Pump

- Gear, In-line, motor driven(bidirectional) pump
- Motor type : BLDC motor
- Constant flow and power consumption

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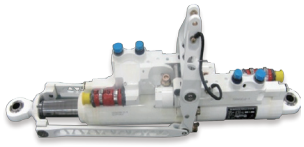
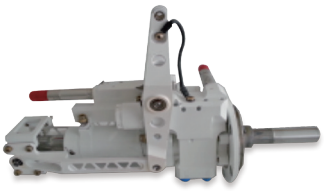
# Flight Control System

Hanwha proudly represents its abilities in the production capability of the Flap Actuator(KT-1 Basic jet trainer), Flight Control Integrated Servo Actuator/Leading Edge Flap Actuation System(T-50 advanced jet trainer), and Main Rotor Actuator/Tail Rotor Actuator(Surion). These Certified Safety Items are the most crucial unit of which directly connects to the safety of the flight system, thus it proves Hanwha's highly qualified development skills and expertise in the flight systems.



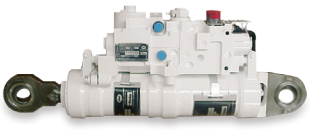
### KUH Main Rotor Actuator

- Non-symmetry dual tandem actuator
- Mounted on main gear box and non-rotating swash plate
- Perform cyclic control and collective control of the helicopter
- Rated pressure : 3,000 psi
- Out force : extension 56,000 N, retraction 40,000 N
- No load rate : 200 mm/s max.



### KUH Tail Rotor Actuator

- Symmetry dual tandem actuator
- Mounted on tail gear box
- Perform yaw control and collective control of the helicopter
- Rated pressure : 3,000 psi
- Out force : extension / retraction 20,000 N
- No load rate : 130 mm/s max.



### T-50 Flight Control Integrated Servo Actuator

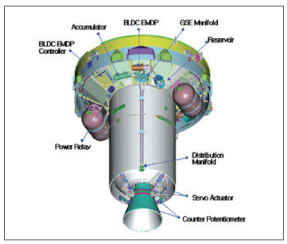
- Dual tandem actuator (dual hydraulic source)
- Triplex redundant electrical command signal (by FLCC)
- Fly-by-wire actuation
- Fail-operation / fail-safe mode operation
- Application : flaperon, horizontal tail, rudder actuator

# KSLV (Korean Space Launch Vehicle)

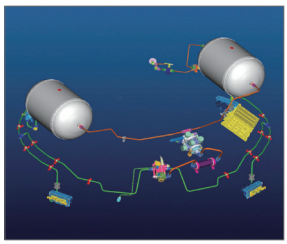
Beginning from the Gimbal Engine Actuator development of Korean Sounding Rocket(KSR-III) in 1999, Hanwha successfully delivered the development of Propulsion and Reaction control system, Thrust Vector Actuation system, Propellant Feeding system of the Korean Space Launch Vehicle(KSLV-II). Hanwha is also involved in the Test Facility and Equipments business such as Combustion Chamber Hot-Firing Test Facility and High Altitude Rocket Engine Test Facility.

KSLV- KM (Korean Space Launch Vehicle - Kick Motor)


## Launch Vehicle & Components




KSLV-I TVC Actuation System



KSLV - I Thrust System

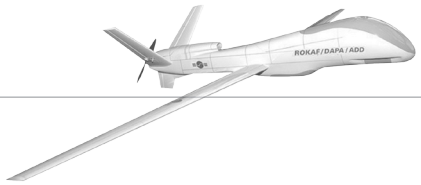
- Propulsion & reaction control system
- Thrust vector control actuation system
- Propellant feeding system of space Launcher
- Satellite propulsion system
- Explosive bolt
- Actuator controller
- Flow control valve(fuel / oxidizer)
- Oxidizer shut-off Valve
- Pressure regulator
- Gimbal engine actuation system

## Test Facility & Equipments

Combustion Chamber Hot-firing Test Facility

High Altitude Rocket Engine Test Facility

- Combustion chamber hot-firing test facility
- Turbo pump rear propellant test facility
- Ground rocket engine test facility
- High altitude rocket engine test facility
- High altitude rocket aircraft engine test facility
- Solid rocket engine test facility



# Landing Gear System

Accelerated by the technical skills built throughout the years of developing Hydraulic Control system, Hanwha successfully launched the Landing Gear system assignment, and supplied landing gear for UAV. Hanwha is focusing in the KF-X landing gear system to become the number one company in South Korea.

### VLJ(Very Light Jet) Landing Gear System

- Landing gear system for class of MTOW 10,000 lbs
- Total multi functional system for MLG / NLG including LVDT and RVDT

### KAORI-X Unmanned Landing system and Brake system

- Brake actuator system(Control valve) for separate control of left / right brake
- Operated by brake pressure and self-controls during emergency

### Landing gear and major components for BOEING and AIRBUS

- F-15 arresting hook damper assembly
- Boeing 747 down lock Actuator
- Airbus 340, Airbus 350 landing gear structure, steering actuator, retract actuator

Landing Gear Door Actuator

Speed - Brake Actuator

Brake Control Module

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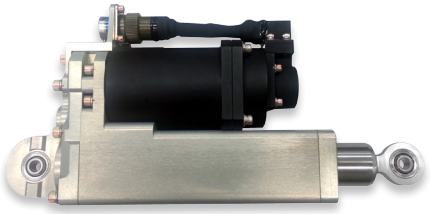
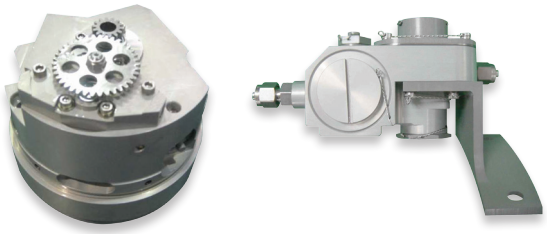
# Guided Missile System

Hanwha is consistently designing and manufacturing the vital components of guided missile such as Electro-Mechanical Actuator and Fuel supply system.





### Control / Electro-Mechanical Actuation System

- Electro-mechanical actuation system (actuator, controller, cable assembly, etc)
- Actuator assembly(linear type / rotary type)
- Actuation controller
- Valve actuation system(flow control)
- Cable assembly
- Performance test equipment

### Fuel / engine systems

- Fuel pump assembly
- Aircell assembly
- Hydraulic block assembly
- Servo valve assembly
- Fittings and valves
- Heat exchanger / accumulator

# Avionics System


### KT-1 Automatic Rudder Trim System

- Consists of 2 devices (TCP, TCU)
- Self BIT(Built In Test) function
- Night vision imaging system

### KT-1 Central Warning Set

- Consists of 2 types (for front and rear seat)
- For the front seat have 4 modules (power supply, signal transduction, logical combination, driving lamp) for the rear seat have 4 modules (power supply, signal transduction, AOA circuit, voice production)
- Self BIT(Built In Test) function