MD 530F CAYUSE WARRIOR

SPECIFICATIONS

MD HELICOPTERS™

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Disclosure Statement

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1 HELICOPTER GENERAL

AIRCRAFT OVERVIEW

The MD 530F Cayuse Warrior (Figure 2) is derived from the commercial MD 530F and specifically designed for military applications, meeting extreme requirements in hot, high-altitude operations. MD 530F Cayuse Warrior is a single engine VFR helicopter with seating for two crewmembers. The main rotor is a five-bladed, fully articulated rotor system with anti-torque provided by a two-bladed, semi-rigid type tail rotor. The main and tail rotor blades are all metal construction.

The MD 530F Cayuse Warrior mission enhancements include the weapons system, avionics improvements, armor, and increase power performance. The MD 530F Cayuse Warrior aircraft is equipped with one 650 shaft horsepower (shp) rated Rolls Royce 250-C30 engine de-rated to 425 shp for 30 minutes and 375 shp maximum continuous power (MCP). To support increased takeoff performance there are additional transients of 450 shp for 30 seconds and 500 shp for 10 seconds.

In 2017, MDH added an Electronic Flight Instrument System Upgrades or "Glass Cockpit" with the installation of the Garmin G500TXi and Howell Instruments Inc Engine Indicating and Crew Alerting System. The EICAS uses two independent displays that provide indication of aircraft systems even in the event of single failure. The dual G500 TXi displays serve as a primary flight display (PFD) and the multi-functional display (MFD). Both systems modernized the cockpit while providing redundancy and enhanced safety features.

Figure 1. MD 530F Cayuse Warrior - Features

BASE AIRCRAFT EQUIPMENT

200-Amp Starter Generator
Crashworthy Main Fuel System
AFS Engine Inlet Barrier Filter
Automatic Engine Re-ignition
Avionics: Avionics Master System/Switch
Battery Log Book
Battery Heavy-Duty 17 Amp-Hour
Cabin 28-Volt Utility Outlet
Cabin Convenience Light
Cabin Soundproofing
Carbide Skid Shoes
Cargo Tie-Down Fittings
Cockpit Utility Light
Crew Seats with 4-Point Harness Restraint
ELT ME406HM Emergency Locator Transmitter
Engine and Airframe Log Books
Engine Anti-Ice
Engine Exhaust Cover
Engine Inlet Cover
Engine Maintenance Manual
Engine Wash Kit, MD500-Series
Engine-Out Warning Light
External Power Receptacle
Facet Oil Filter
Fire Extinguisher
First Aid Kit
Flight Manual
Fresh Air Ventilation System
Fuselage Hard Points
Generator-Out Warning Light
Ground Handling Wheels
Weight On Gear (WOG) Switch
Garmin GTX 345R mode A/C & S Transponder
Garmin GTN650H GPS/NAV/COM
Rohde & Schwarz MR 6000R Tactical Radio
Handbook of Maintenance Instructions
Heated Pitot with Cover
Heater Defogger System
Illustrated Parts Catalog
Instrument Lighting
Interior Paint, Black for NVG
Jacking Fittings
Keyed Locks
Landing Gear Extended
Landing Light, Nose Mounted
LED Anti-Collision Lights (2)
LED Position Lights
Main Rotor Blade Tie Downs
Map Case
Meeker Door Hinges
Mesh Seats, Black 2+1
Military Markings (3 custom options)
Passenger Seats with 3-Point Harness Restraint
Passenger Steps
Pilot and Copilot Foot Switches
Rain Gutter Set
RG 500 Concorde Lead Acid Sealed Battery
Right-hand Command (Dual Controls)
Right-hand Rotor Brake
Rolls Royce 250-C30 Engine, 650 SHP
Slant Panel Pedestal
Tail Rotor Transmission Chip Detector Light
Tinted Canopy Panels
Tinted Door/Window Panels

AIRCRAFT CERTIFICATION

The baseline configuration of the MD 530F Cayuse Warrior is the MD 530F Commercial-Off-The-Shelf (COTS) helicopter that is FAA Certified in accordance with Type Certificate number H3WE, Model 369FF. It is delivered with a Standard Airworthiness Certificate (FAA Form 8100-2). MDH is the Original Equipment Manufacturer (OEM) and the MD 530F is manufactured under FAA Production Certificate number 715NM. The MD 530F is certified for single pilot

operations under visual flight rules (VFR)/visual meteorological conditions (VMC) and capable of training instrument flight rules (IFR) in VMC conditions. The MD 530F COTS aircraft is upgraded with the Mission Equipment Package (MEP) that enhances the gross weight and performance suitable for armament as well as an Enhanced Mission Equipment Package (EMEP) that includes the addition of a fixed weapons sight, mark on target, footswitch upgrade, and capability to launch rockets. The upgraded armed aircraft is referred to as the MD 530F Cayuse Warrior for the remainder of this specification.

The MD 530F Cayuse Warrior has received a US Army Airworthiness Release (AWR) for military customers purchased through the Foreign Military Sale process.

MDH HELICOPTERS LLC

MDH understands the complicated decision-making process of determining the most suitable helicopter to increase the capability to protect and defend partner countries. This document is designed to provide up-to-date information about the MD 530F Cayuse Warrior helicopter and MDH services and training.

MDH is proud of our production and fielding experience that includes; design, integration and testing of all necessary subsystems and systems, live-fire testing and development to Federal Aviation Administration (FAA) and host country military/civilian airworthiness standards.

Hundreds of military and commercial customers around the world rely on MDH aircraft for their ease of operation, low operating costs, superior reliability and durability. This is made possible through MDH's extensive experience supporting our global fleet with OEM quality parts and expert technical advice to ensure the highest levels of operational readiness. With world-wide headquarters located in Mesa, Arizona, USA, MDH continues to make significant investments in the development and integration of next generation technologies and capabilities, as well as design and manufacturing processes to maintain impeccable reputation and leadership in the aviation industry.

2 DESIGN

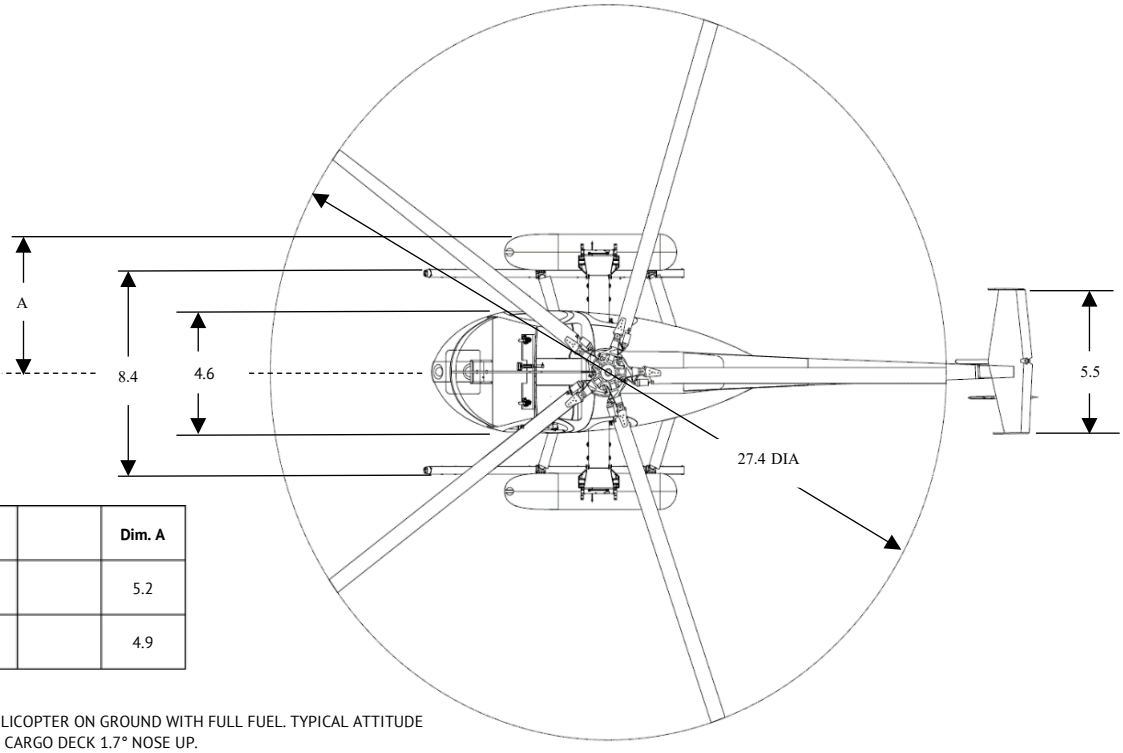
AIRCRAFT FUSELAGE AND DIMENSIONS

The fuselage is a semi-monocoque type construction manufactured primarily of aluminum alloy bulkheads and stringers with the outer skin of aluminum panels. The airframe structure is designed to be energy absorbing and fails progressively in the event of impact. The fuselage is egg-shaped and provides clean aerodynamic lines. The visibility from the pilot and copilot seat is through the large windscreen and side windows, which are made of tinted plexiglass. The tail boom is of similar construction as the fuselage, and supports the tail rotor gearbox and the anti-torque system, which is composed of a two-bladed tail rotor and the vertical and horizontal stabilizers.

The fuselage modifications for MEP include three added components to the base aircraft and present no significant impact to the fuselage structure as follows:

- **MCAS:** The fuselage modification for the Mission Configurable Armament system (MCAS) platform involves creation of four outboard floor mounted clevis fittings attached to underfloor backup fittings that transfer loads to reinforcement ribs within the lower fuselage. The location of the attachment points are similar to the MDH universal floor design.
- **Armor panels:** The armor installation consists of armor panels fastened to the back of the pilot and co-pilots seats and on the exposed floor panels of the cockpit using mechanical fasteners. The floor panel armor is primarily secured with hook and loop tape for ease of installation and removal. The armor installation does not affect the strength of the fuselage in any way.
- **Tactical antennas:** The only loads from the tactical antennas acting on the fuselage are aerodynamic loads. These aerodynamic loads are not significant.

The MD 530F Cayuse Warrior principal dimensions are as illustrated in Figure 3 and Figure 4.



		Dim. A
HMP400/RMP		5.2
M260		4.9

Notes:

1. HELICOPTER ON GROUND WITH FULL FUEL. TYPICAL ATTITUDE OF CARGO DECK 1.7° NOSE UP.

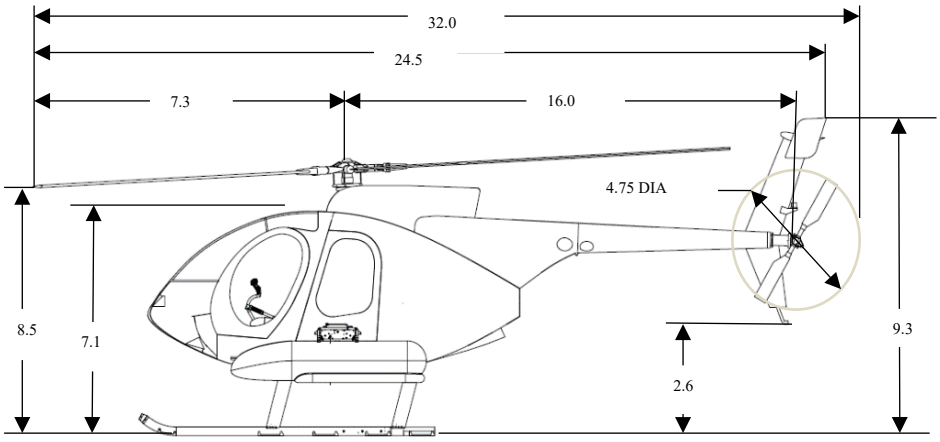


Figure 2. MD 530F Cayuse Warrior Principal Dimensions (Side and Top)

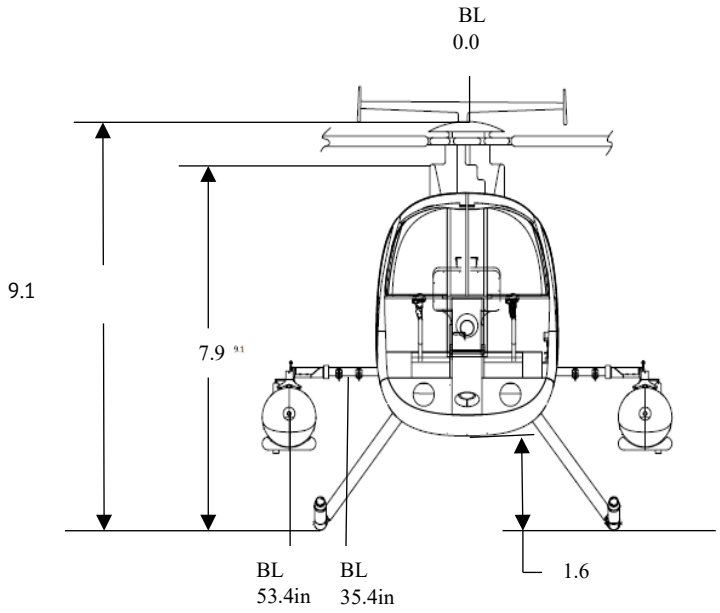


Figure 3. MD 530F Cayuse Warrior Principal Dimensions (Front)

In Figure 5, with removal of the passenger seats, the cabin compartment is converted to include the auxiliary fuel tank and the MCAS weapons plank.

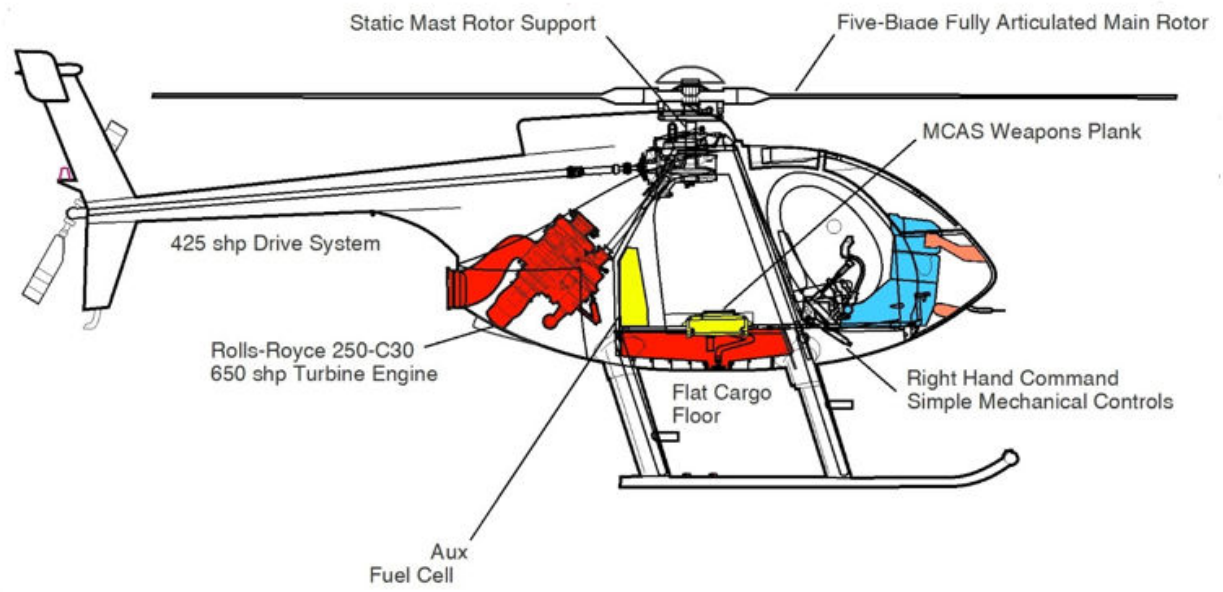


Figure 4. Features of the MD 530F Cayuse Warrior

LANDING GEAR DESIGN

The high-capacity landing gear (Figure 7) replaces the MD 530F standard landing gear allowing for increase takeoff and landing gear weight of 3,750 pounds. The landing gear is a horizontal tubular skid-type gear with replaceable carbide skid shoes and is not retractable. Fore and aft braces, struts, and shock absorbing dampers are attached to the underside of the fuselage center frame section. Skid tubes are attached to contoured fittings at the lower ends of the struts, and provide attachment points for installation of ground handling wheels. Because of this, the aircraft is capable of conducting operations on unprepared surfaces, and slope landings can be safely conducted at gross weights to 3,750 pounds on inclines up to 9.4 degrees. With the high-capacity landing gear installed, the MD 530F Cayuse Warrior has a ground clearance of approximately 1.6 ft. with the main fuel tank full of fuel (Figure 8). MDH can alter the height of the landing gear to accommodate air movement of the helicopter.

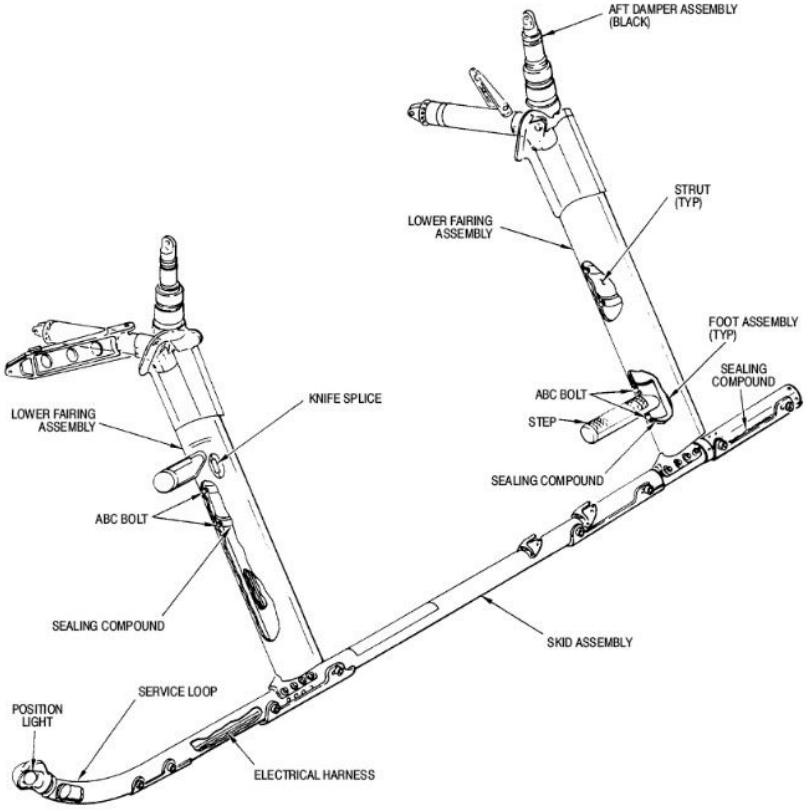


Figure 5. MD 530F Cayuse Warrior Landing Gear

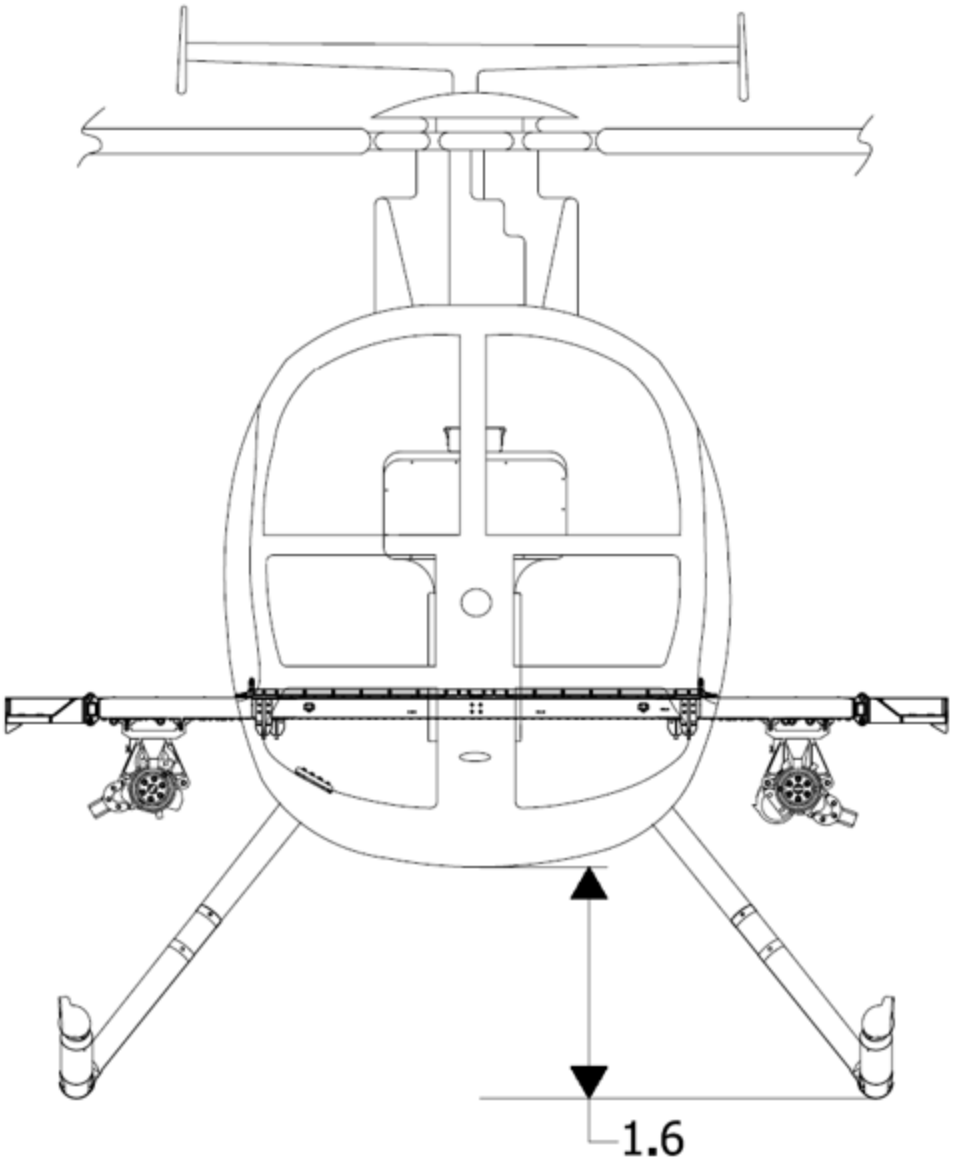


Figure 6. MD 530F Cayuse Warrior Landing Gear Ground Clearance.

FLIGHT CONTROLS

The flight control system (Figure 9) is of the conventional helicopter controls systems design for collective, cyclic, and tail rotor control. Flight control simplicity was achieved because of the design philosophy to keep all systems as uncomplicated as possible. Control forces are light and do not require the complexity of hydraulic boost.

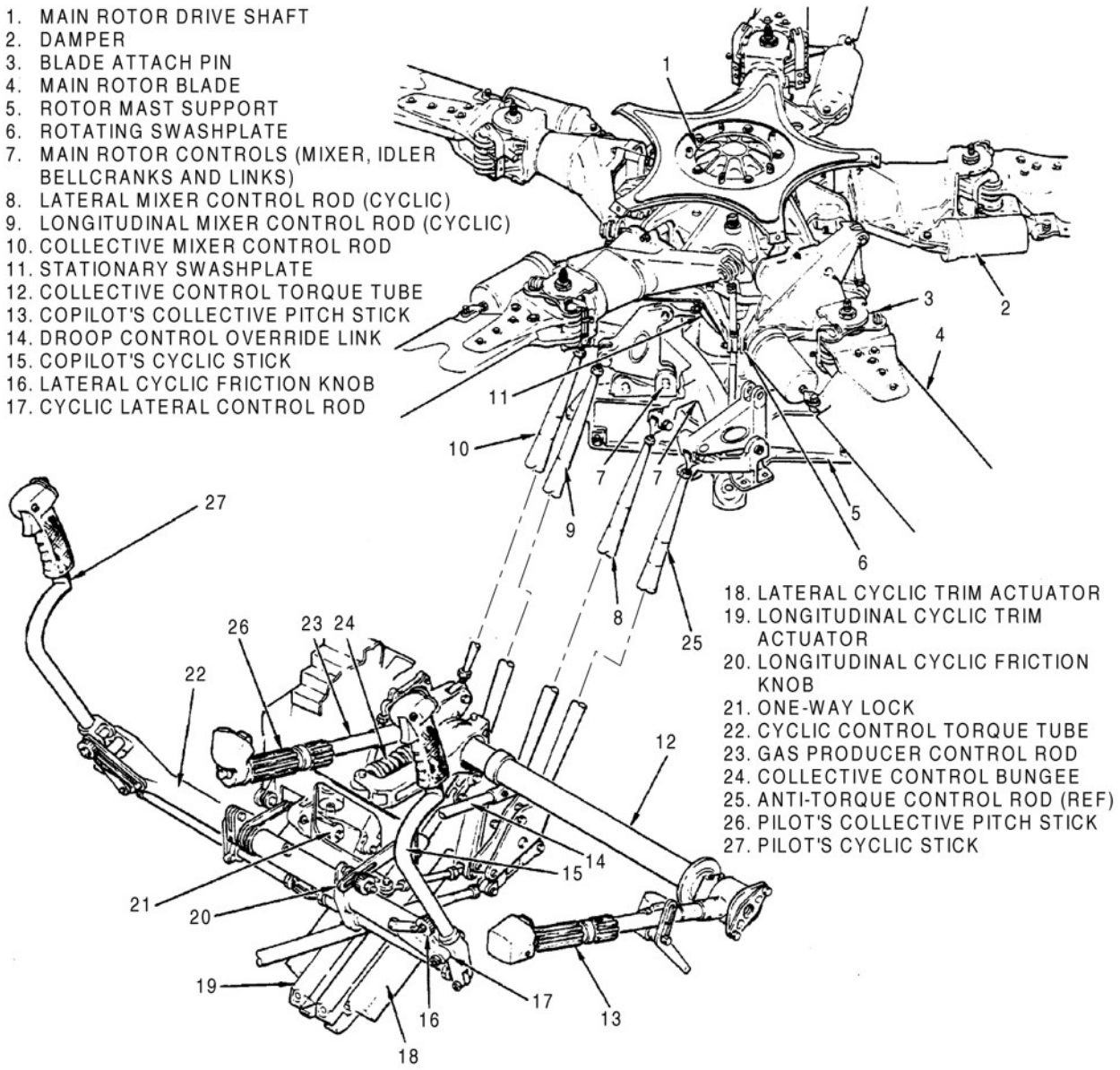


Figure 7. Flight Controls

The flight controls system for the MD 530F Cayuse Warrior preserves the dual pilot controls from the MD 530F. Because, the aircraft have the dual start option, both collective sticks have engine start and landing light switches. With the right-hand command configuration, the left cyclic stick can be removed for flight, but the right cyclic stick is no longer removable. The right-hand command configuration also moves the rotor brake control handle to allow access from the right-hand seat.

Systems Operability

The MD 530F Cayuse Warrior has dual, side-by-side operating stations with all aircraft controls and instruments operable and viewable from both crew stations, with seat

belts/shoulder harnesses fastened. All aircraft fuel controls and critical/essential circuit breakers are accessible from both seats with seat belts/shoulder harnesses fastened. The aircraft is capable of carrying two (2) crew in the armed configuration.

Dual Start Capability

The MD 530F Cayuse Warrior has dual starting capability. The dual start system (Figure 6) provides collective head-mounted engine start button for the copilot position. This allows the copilot to initiate an engine start for training purposes. This modification does not add a throttle twist grip idle detent release collar or throttle twist grip friction control to the copilot's collective stick. The copilot collective head modification also includes the addition of a landing light switch.

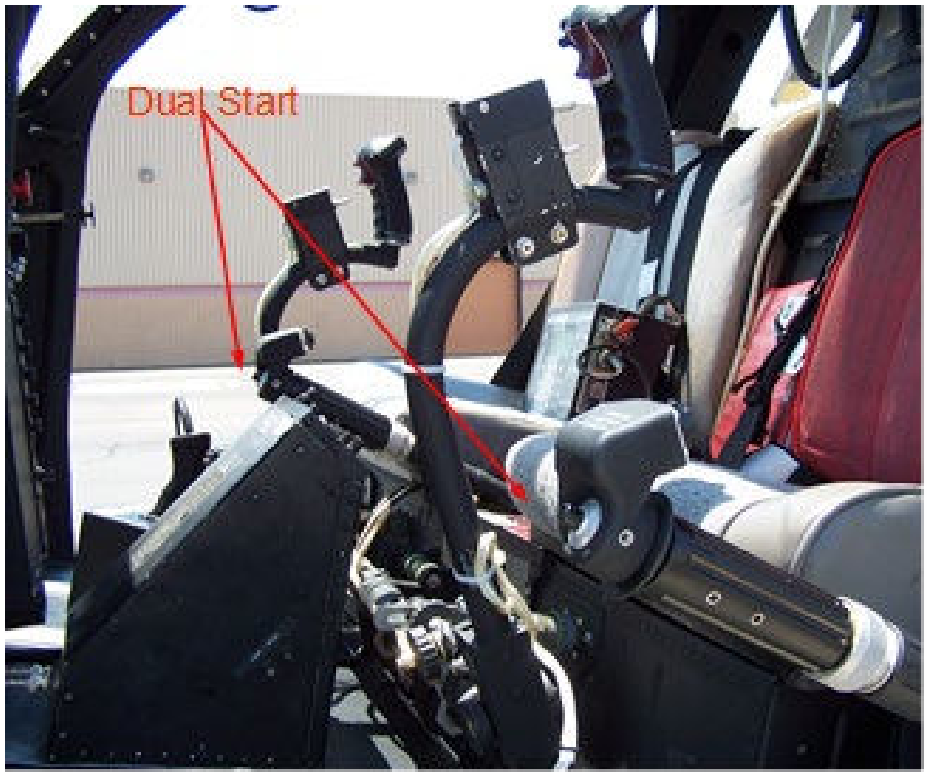


Figure 8 Dual Start System

ELECTRICAL SYSTEM

The MD 530F Cayuse Warrior electrical system is a direct current (DC) system with electrical power supplied by a 24-volt battery and a 28-volt, 200-amp generator driven by the aircraft's power plant.

The electrical system incorporates a generic electrical wire harness that is common with other current production MD500 series aircraft and includes wiring for common optional equipment kits and future growth. Co-location of major power distribution components, increased size and isolation of main feeder lines, and the use of a single generator control unit (GCU) increase the reliability and performance of the helicopter's electrical system.

The electrical system also incorporates an ENGINE OUT/low rotor audio warning disable into the generator switch. The RE-IGN test switch is a two-position, momentary-type switch.

In normal operation, the generator is the primary source of power for the DC bus. In the event that the generator fails, the battery will power the DC bus. Non-essential avionics equipment and non-essential weapons equipment are powered by switchable load shed busses that may be manually shed in the event of a generator failure. Engine starting power is provided by either the battery or an external power source. Power for the jettison system is available at all times when there is power to the battery. The jettison capability cannot be load shed.

3 COCKPIT

The MD 530F Cayuse Warrior aircraft is outfitted with MDH's advanced glass cockpit design which supports maximum visibility for the pilot and co-pilot. Using the latest display technology, the pilot maintains the ability to manage navigation, communication, weapons and aircraft systems. The configuration is certified for day/night operations, and is night vision system compatible in all modes of operation. The design update modernizes the cockpit, and provides added redundancy and enhanced safety features, effectively reducing pilot workload.

Figure 9. Glass Cockpit with Howell Engine Instruments Display & Garmin G500TXi MFD/PFD

HOWELL ENGINE INSTRUMENT AND CREW ALERTING SYSTEM (EICAS)

The EICAS consists of:

- **Two Howell Instruments Display Units (HDUs)**

  The HDUs are high-resolution, portrait-oriented, 7" color LCD displays that contain user controls. Each HDU has a normal display mode and a reversionary (REV) display mode. The normal display mode contains two pages, Primary and Secondary. Warning and caution indicators, located at the top of the Secondary page HDU, provide crew

alerting. The REV display mode combines all the instruments (except the outside air temperature (OAT) digital value) and annunciations on one display. REV mode provides redundancy if one display fails.

HDU Instruments Indications include:

- Dual Tachometer
- TOT Indicator
- N1 Indicator
- Torque Indicator
- Engine Oil Temperature Indicator
- Engine Oil Pressure Indicator
- Fuel Indicator
- Timer
- Amps, Volts, OAT
- Caution, Warning, and Advisory Messages

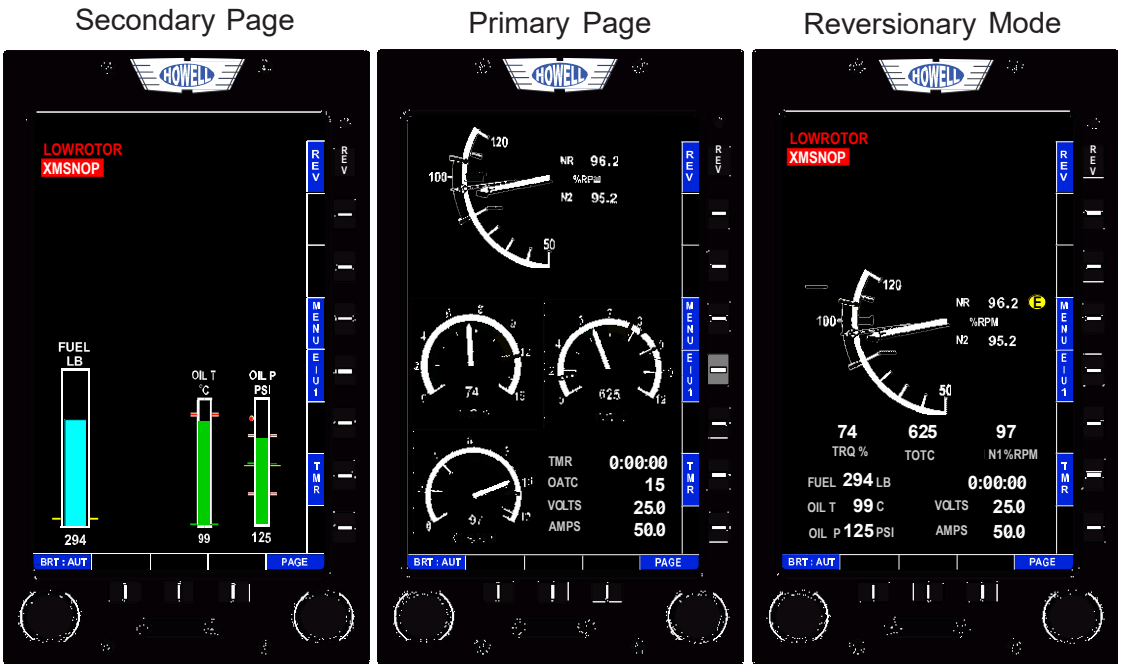


Figure 10 HDU normal display mode (primary and secondary pages) and reversionary display mode.

- **Configuration Module Unit (CMU)**

  The CMU is a personality module, which stores specific installation information for the data acquisition unit (DAU), to determine parametric data such as engine type, aircraft type and optional installed aircraft sensors. The CMU also retains calibration data of the fuel system.

- **Data Acquisition Unit (DAU)**

The DAU contains two processor cards called engine instrument units (EIUs). Each EIU gathers engine and aircraft sensor data for display on the HDU. The EIUs (EIU 1 and EIU 2) are redundant backups to each other, which an operator can select during flight using the hot key on the HDU.

The EICAS eliminates the need to run "wet lines" to the cockpit for engine instrumentation.

GARMIN G500H TXI/ COCKPIT

Major components:

- GDU 700P Primary Function Display / Multifunction Display (PFD / MFD)
- GCU 485 Controller (optional)
- GMA 350H Audio Panel
- GMU 44 Magnetometer (X2)
- UTC 0129G Outside Air Temperature (OAT) Probe
- GTP 59 OAT Probe
- GSU 75 Air Data Attitude and Heading Reference System (ADAHRS) (X2)
- GTN 650 GPS / NAV / COM
- GTX 330 (panel mount) or 345R (remote mount) Mode S Transponder

Figure 11 Garmin GDU 700P Touchscreen Displays PFD/MFD

Other integrated components:

- AVIONICS MASTER Switch
- Emergency Locator Transmitter (ELT) 406 Mhz
- Free Flight RA-4500 Radar Altimeter

L3 Standby Indicator (optional equipment)

L3's Next Generation Electronic Standby Instrument System is one of the most advanced standby instruments designed specifically for helicopters. The compact unit is scalable and comes standard with altitude, attitude, slip/skid, vertical speed and aircraft track. Options are available for the display of navigation information and Synthetic Vision (SynVis), including terrain and obstacles. The ESI-500 is compatible with existing NAV radios and GPS hardware. An internal lithium-ion battery pack automatically powers the system without interruption upon loss of main input power.

COMMUNICATION AND NAVIGATION

The standard Communication/Navigation suite for the Cayuse warrior consists of a Garmin GTN 650 Com/NAV/GPS controlling GTX 345 ADS-B In/Out transponder, Rohde & Schwarz MR 6000R, and a Canyon Aeroconnect N301 Audio controller. The GTN 650 provides civil communications while the Rhode Schwartz provides secure tactical communications.

Garmin GTN 650

The Garmin GTN™ 650Xi GPS/NAV/COMM provides both navigation and communication radio capability with built-in GPS/ILS/VOR/LOC and Glideslope capabilities and a non-tactical VHF-AM communications transceiver with 8.33 or 25 kHz channel spacing with 10 watts of transmit power or an optional 16-watt output. The unit is a compact 2.64 in. tall package. The Touchscreen offers many multi-purpose functions and features, such as high-resolution landscape mapping, graphical flight planning, satellite weather, targeted traffic display and more.

Garmin GTX™ 345R ADS-B In/Out Transponder

The GTX 345R remote-mounted Mode S Extended Squitter (ES) transponder, Garmin provides the ideal upgrade path for aircraft operators looking to satisfy NextGen requirements for ADS-B "Out"—while providing all the weather and traffic benefits of ADS-B "In" with GTN 750/650. The remote mount transponder receives GPS information from and is controlled by the installed GTN650 (or option GTN750). The GTX 345R is also optionally available with a built-in Wide Area Augmentation System (WAAS), so everything needed to meet ADS-B

equipage rules for NextGen airspace can be provided with this all-in-one upgrade package installation.

N301A Audio Controller

The N301A (Figure 11) is an audio controller that is compatible with military and civilian headsets. The N301A controls the audio from multiple receivers, and allows for the transmission of MIC audio to a selected transmitter. Intercom operation is also provided, with two lines for system expansion. Three modes of ICS are available: HOT, PTT, and VOX. The N301A is a Dzus-mounted audio panel with built-in intercom. It provides full headset transmit and receive functions for the user. The front panel controls permit user adjustment of selected audio, such as radio, ICS, and VOX squelch. The user has control of six transceiver positions, six receiver inputs, four direct alerts, and two different ICS tie lines.

Figure 12 N301A Audio Controller

Rohde & Schwarz MR 6000R Tactical Radio

The MD 530F CW is designed to utilize one or two Rohde & Schwarz MR 6000R multi-band tactical radios, with GB0 control head. The MR6000R is a small lightweight VHF/UHF airborne voice and data transceiver offering outstanding reception and transmission performance. The MR6000R operates between 30-400-MHz frequency ranges and can serve as a form, fit and function replacement for legacy AN/ARC-164 radios. Key features include built-in-test-equipment, weight less than 4 kg, and cockpit NVIS compatibility. Its excellent characteristics make it suitable for application in military environments, including helicopter applications. Weight is ≤ 3.8 kg (8.4lb). Dual GB6500 control heads (Figure 40) are mounted in the slant panel. MR6000R remote mount transceiver(s) are mounted in the aft avionics shelf. The RS-485 communicates between the control head and the transceiver.

Other tactical radios are available. The MDH Program team stands is standing by for any additional customer requirements.

NIGHT VISION IMAGING SYSTEM (NVIS) COMPATIBILITY

The MD 530F Cayuse Warrior configuration provides FAA certified Class B NVIS compatible lighting in all modes of operation. The aircraft cockpit, cabin and exterior lighting meets DO-275 requirements, which allow the NVG compatibility of the aircraft to meet FAA certification standards for the aircraft. The MD 530F Cayuse Warrior configuration is also equipped to comply with FAA Order 8900.1, Volume 4, Chapter 7, Section 4, which requires all NVG certified aircraft have a radar altimeter. Exterior lighting consists of IR position lights and an IR adjustable searchlight. The interior cockpit lighting includes two blue/green map lights as well as instrumentation backlighting compatible with NVGs.

4 DRIVE TRAIN

The drive train serves to convey the engine produced torque to the main and tail rotors. The drive train major components (Figure 16), starting at the engine and proceeding toward the main and tail rotors, function as follows:

Overrunning clutch: Acts as a freewheeling unit in the case of engine failure and autorotation.

Main transmission drive shaft: Situated between the overrunning clutch and the main transmission, it transmits engine torque from the output of the overrunning clutch to the input for the main transmission.

Oil cooler blower: Cools the engine oil and main transmission oil. The oil cooler blower supplies air to the heater, defogger, and to the engine compartment.

Main transmission: Acts as speed reducer, changes the angle of drive to the main and tail rotor takeoffs, and drives several accessories.

Main rotor drive shaft: Driven by the main transmission and flanged to, and therefore turns, the main rotor hub.

Tail rotor drive shaft: Connects the main transmission and the tail rotor transmission. A damper located forward of the center of the shaft reduces vibration in the tail rotor drive system.

Tail rotor transmission: Acts as a speed increaser, changes the angle of drive, and serves as the mount for the tail rotor assembly.

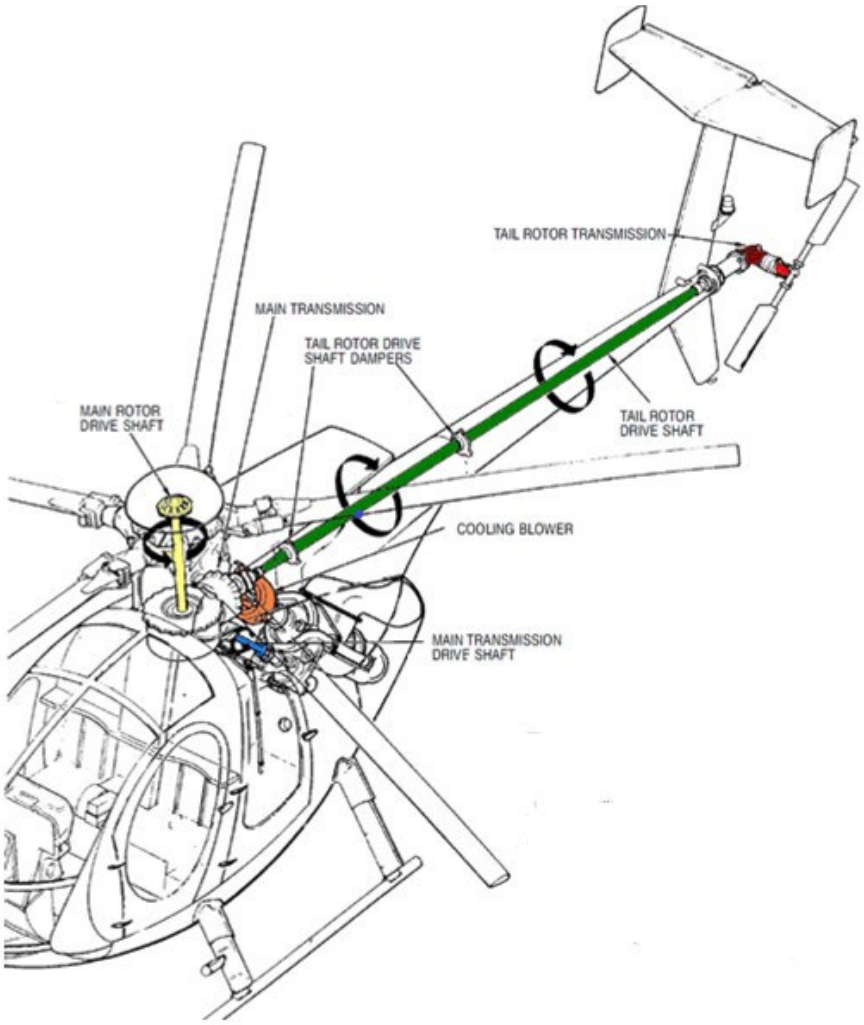


Figure 13. MD 530F Cayuse Warrior Drive Train

POWER PLANT

The MD 530F Cayuse Warrior is equipped with a Rolls Royce 250-C30 Series engine (Figure 15). The engine consists of a single-stage, single-entry centrifugal flow compressor, a single “can" type combustor, a turbine assembly that incorporates a two-stage gas producer turbine, a two-stage power turbine and an exhaust collector, and an accessory gearbox that incorporates a gas producer gear train and power turbine gear train.

Power from the turboshaft engine is coupled to the main and tail rotors by drive shafts and two transmissions. An over running (one-way) clutch in the drive between the engine and main rotor transmission permits free-wheeling of the rotor system in the event of an engine failure.

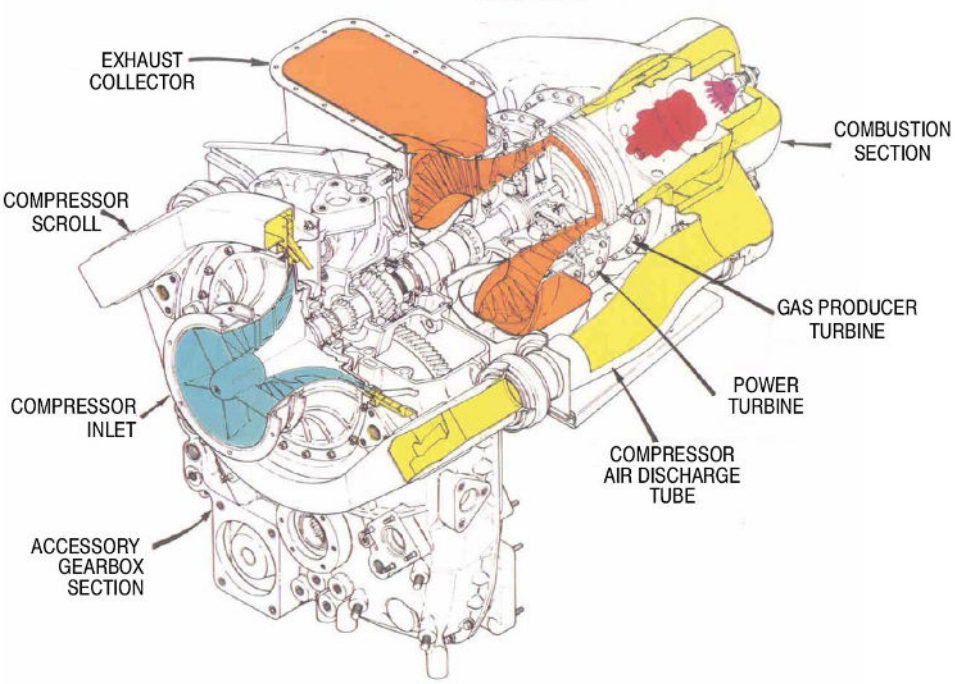


Figure 14. Power Plant Components

Engine Filtration System

The MD 530F Cayuse Warrior is equipped with Aerospace Filtration Systems' (AFS) Inlet Barrier Filter (IBF) system (Figure 11). The AFS design includes an all-new aircraft upper aft engine inlet fairing assembly. The aft fairing conforms to the inlet duct and upper section of the engine inlet plenum chamber. The IBF is comprised of an aerodynamic structural fairing, integral structural frame and deflector, integral bypass system, two barrier filter assemblies (forward and upper), integral seals, plumbing for the existing differential pressure switch, two forward floor plates and a control rod fairing that interfaces with the existing flexible boot and tail rotor control rod to seal the inlet plenum.

The IBF fairing employs a mechanically operated inlet bypass system to permit unfiltered air to enter the engine inlet plenum chamber should the IBF filter media become obstructed. Once the bypass system is rigged during the IBF system installation, no recurring maintenance is required, and the standard MDH MD 530F Cayuse Warrior aircraft inlet differential pressure sensor is used. The sensor provides an indication to the pilot of debris accumulation on the filter elements, glossing over due to ice or snow, and when to activate the bypass system prior to the pressure drop across the filters exceeding operational limits.

Figure 15. Engine Filtration System

MAIN TRANSMISSION

The main rotor transmission (Figure 17), located on the main rotor centerline, is secured to the lower side of the static mast, making it accessible from inside the passenger/cargo compartment. It transmits engine power to the main rotor drive shaft and tail rotor drive shaft at reduced speeds.

The transmission housing assembly consists of the main housing, the output cover, and the tail rotor drive cover, and is made of magnesium alloy. A sight gage is located on the right-hand side of the transmission in the reservoir area. At the rear of the housing, mounted on the tail rotor output cover, there is an oil pressure switch. Two accessory drive pads are located on the tail rotor drive cover. The right-hand pad mounts the transmission lubrication pump and filter. The left-hand pad mounts the tachometer generator for the main rotor rotations per minute (RPM) sensor.

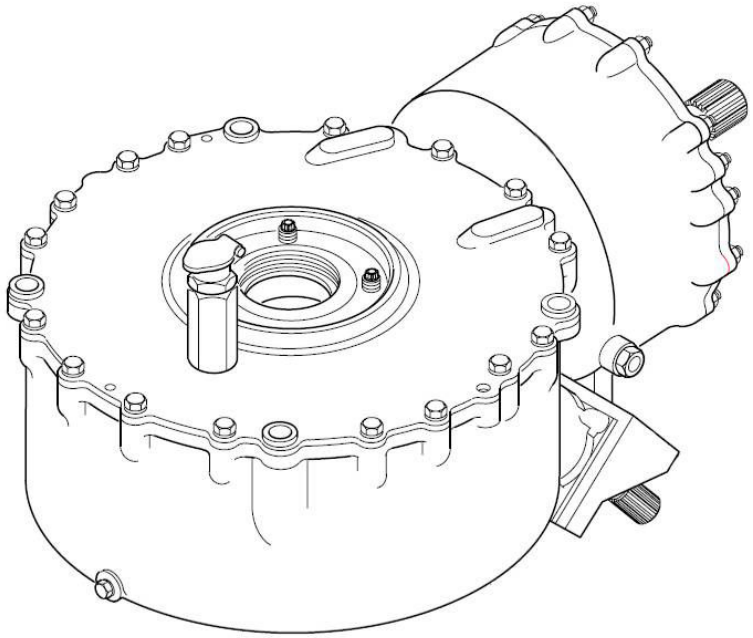


Figure 16. Main Transmission

TAIL ROTOR DRIVE SHAFT

The tail rotor drive shaft (Figure 18) is installed between the main rotor transmission and the tail rotor transmission. The drive shaft is a dynamically balanced aluminum alloy tube with bonded and riveted aluminum flange couplings at each end. A chrome plated steel sleeve is bonded 77.07 inches from the forward end of the tube and is used as the bearing surface for the drive shaft damper. The sleeve is not centered midway on the tube; it is slightly forward of center.

Balancing is accomplished by means of brass weights bonded to the shaft at the proper azimuth location at three shaft stations, which are 1/4 the length in from each end, and 1/2 to 1 inch from the damper sleeve. A shaft may be acceptable without applying balance weights. Each shaft is stenciled with the word 'AFT' near the coupling flange end that is to be installed at the tail rotor transmission.

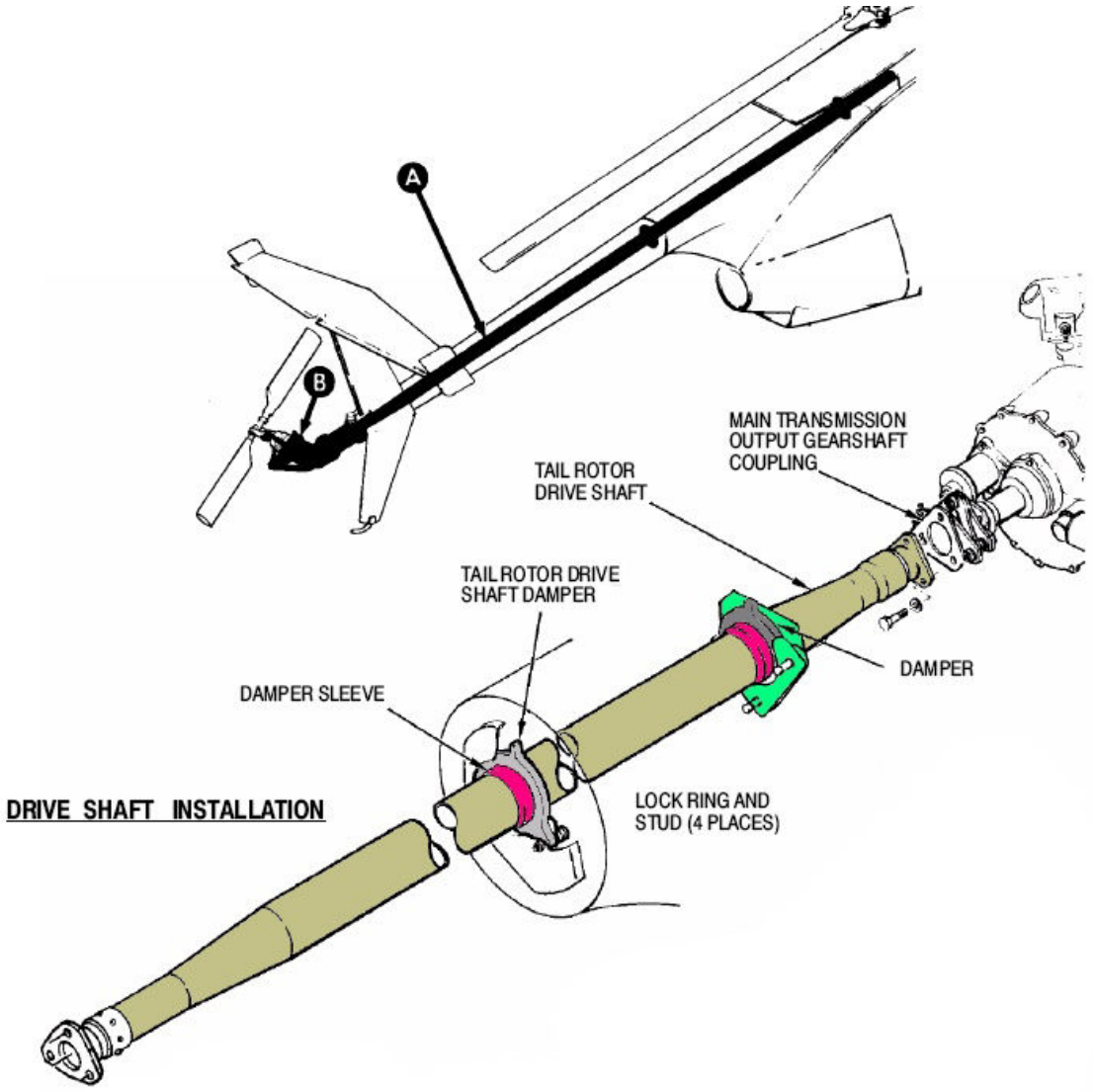


Figure 17. Tail Rotor Drive Shaft

TAIL ROTOR TRANSMISSION

The tail rotor transmission (Figure 19), mounted on the aft end of the tail boom, serves as the attach point for the tail rotor, changes the direction of drive 90 degrees, and increases shaft speed from 2140 to 2933 RPM. The output shaft has a roller bearing on the inboard end and a duplex bearing set on the outboard end.

The transmission has an integral lubrication system and uses the splash method to lubricate the gears and bearing. It is designed so not all oil is depleted in the event the rotating shaft seals fail. The oil level sight gage is located on the aft end of the gearbox and the filler breather is located on top.

In the drain port at the rear of the transmission, a self-closing electrical chip detector is installed. It is wired to an amber caution light on the instrument panel marked TR XMSN CHIPS. The instrument is magnetic and any ferrous metal particles that come in contact with it close the electrical circuit and illuminate the lamp.

Figure 18. Tail Rotor Transmission

5 MISSION EQUIPMENT

The MD 530F Cayuse Warrior is an evolution of the OH-6A Cayuse light observation helicopter, and widely recognized for speed, safety, agility and ability to operate in confined spaces, urban environments and at high altitudes. This next generation scout attack helicopter adds mission-specific tactical equipment including; MCAS, M260 7-shot rocket pod, ballistic armor crew protection, and self-sealing fuel tanks. The MD 530F Cayuse Warrior delivers increased operational capabilities, greater mission versatility, and superior performance executing a broad range of mission profiles.

MISSION CONFIGURABLE ARMAMENT SYSTEM (MCAS)

The MCAS is a removable weapons platform mounted to the cargo floor of the MD 530F Cayuse Warrior helicopter. The MCAS structural design, comprised of the structural (A-kit) and removable (B-kit) weapons plank, is metal with composite fairings. The B-kit mounts to four attachment points that are part of the outside edges of the cargo floor (Figure 24). It has two ALKAN Electromechanical Release Units (ERU) connected to the outside edges holding the user-selected weapons and allow them to be command jettisoned if needed. The leading and trailing coves of the MCAS enable cables to run securely from the helicopter fuselage to the ERU and the user-selected weapons.

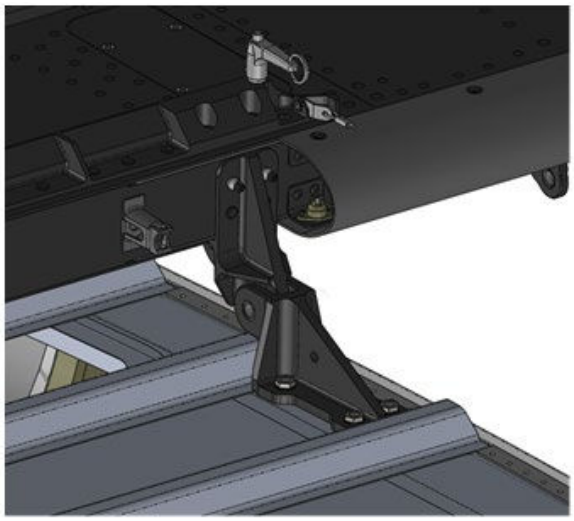


Figure 19. MCAS "A-kit" and "B-kit" Attachment Point

Door Fairing Equipment

The aircraft can be equipped with door fairings and a closeout fairing as part of a special mission kit when the MCAS weapons plank is installed (Figure 25). The main door fairing picks

up the mounting points for the existing cabin doors and adds an additional mounting location for the door latch on the aft portion of the cabin door opening. All attachment points are held in place through a Meeker ball lock pin assembly. The fairing includes a lower silicone wiper that flexes to allow for full plank clearance when opening and closing the fairing. In addition to the door fairing, there is a lower closeout fairing to provide increased environmental protection when needed. The lower closeout fairing attaches to the MCAS weapons plank and does not require any modification to the airframe.

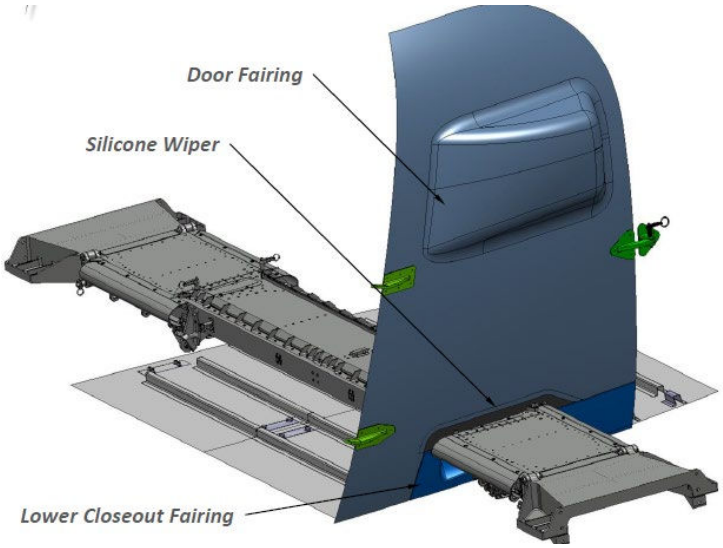


Figure 20. Weapons Plank Door Fairings

Jettison System

The ALKAN ERU is a COTS helicopter jettison system that allows carriage and release of stores. The system is equipped with MIL-STD-8591 lugs and is capable of carrying up to 1,000 lb. stores. The ALKAN ERU (Figure 26) contains a patented balanced hook-lifting system. This internal mechanism is operated by a single control point that simultaneously lifts the two hooks until the specified preset loading is applied to the store. The hooks are linked together by means of a crossbeam that provides a balancing effect. This equalizes both the static pre-loads and the in-flight loads on the hooks. Additionally, this system ensures that boresight is maintained automatically after unloading and reloading a weapon. There is no requirement to re-harmonize the weapon load. The safety interlock is provided by a manually inserted safety pin that may be introduced from the outboard side of the ERU. This interlock physically blocks the hook latching mechanism, preventing any inadvertent release during ground operations.

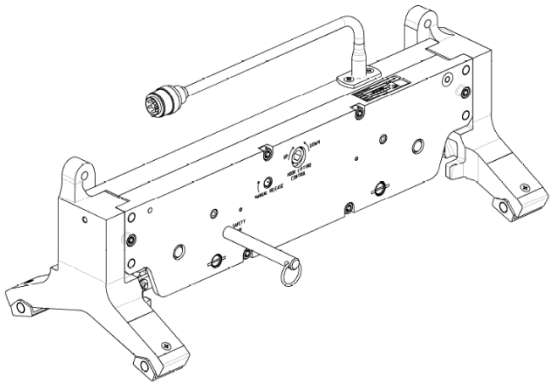


Figure 21. ALKAN Electromechanical Release Unit

Mission Configurable Aircraft System MH (MCAS-MH) – External Personnel System

The MCAS-MH provides an exceptional solution for the MD 500 series of helicopters. Years of direct, hands-on experience coupled with exceptional engineering have produced a platform that is lighter, more capable, and easier to support than other systems currently available.

The External Personnel System is rated for 1,000 lbs. per side while weighing only 86 lbs. for the entire base system. Hard-points on the top and bottom of the MCAS-MH provide users with multiple configuration options to suit any mission profile. The system can easily be configured to attach a machine gun, mount, and pintle-arm, caving ladder, FLIR System Electronics Unit (SEU), and ground handling wheel mount.

The MCAS-MH stows to reduce the lateral dimension, resulting in easier transport and a reduced hangar footprint. The lightweight plank is interchangeable between aircraft; with complete interchangeability between airframes, there is no need for aircraft tail number specific hardware.

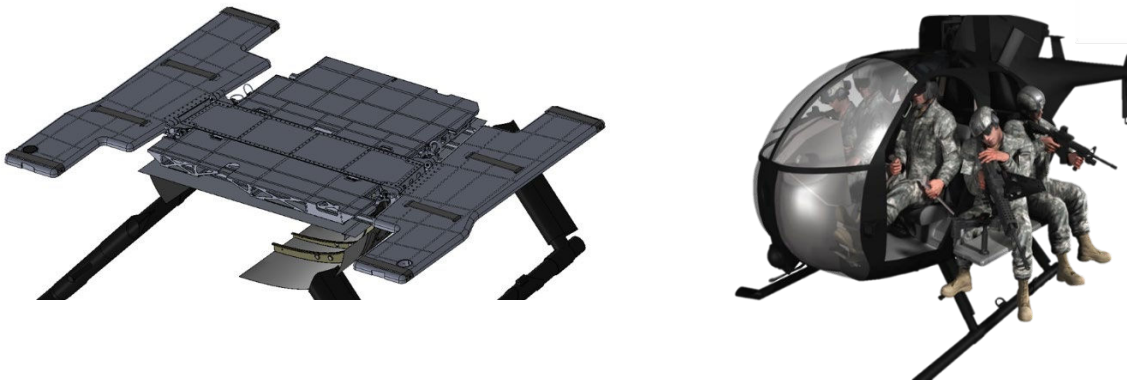


Figure 22. External Personnel System

Electro-optical/Infrared (EO/IR) Turret Imaging System

The MX-10/10D Electro-optical/Infrared (EO/IR) Turret Sensor (Figure 28) is optimized for low-altitude tactical surveillance and target designation missions requiring a low-weight installation suitable for the MD 530F Cayuse Warrior. The MX-10/10D has a rugged aerospace grade cast aluminum structure with built-in vibration isolation that protects all internal payload components for best-in-class image stability. The high performance Inertial Measurement Unit (IMU) and MX-GEO (geo-pointing) software suite provide for accurate target locations by automatically aligning the sight to the aircraft location. The unit is sealed completely against the environment, passing rigorous environmental stress screening to meet MIL-STD-461E and MIL-STD-810F for Electromagnetic Control (EMC) and Environmental qualifications. Much like the MD 530F Cayuse Warrior, the MX-10/10D was designed to minimize maintenance requirements and simplify any necessary repair.

Figure 23. MX-10/10D EO/IR Turret Imaging System

The MX-10/10D in the MD 530F Cayuse Warrior includes all six sensors available for the turret to support a wide array of mission requirements. The sensors are as follows:

- **Thermal Imager:** The thermal imager features a custom three-field-of-view lens and the latest generation 640x480, 15-micrometer pixel pitch mid-wave infrared (IR) camera. The widest field of view is 30 degrees horizontal to provide scene context in low altitude applications. Unlike some other designs that implement an IR narrow field of view (FOV) that lacks thermal sensitivity, the MX-10/10D maintain their 0.039K maximum (0.028K typical) noise equivalent temperature difference at its narrow FOV

of 1.8 degrees horizontal. This provides excellent identification capability in real world environments where target thermal contrast may be poor.

- **Daylight Color & Low Light Cameras:** The color and low light cameras both rely on a high performance 18x zoom lens, ruggedized by L-3 WESCAM, whose anomalous dispersion glasses and special wide band anti-reflection coatings enable operation throughout the visible and near infrared wavelengths (Figure 29). The color camera's 5-megapixel class image sensor is capable of both 720p and 1080p operation. In 720p operation, a special 'Wide' mode is available that increases field of view by combining four adjacent color pixels into one output pixel. Through use of both the Wide and Normal modes of operation, the MX-10/10D are able to achieve a 36x effective optical zoom range in the color camera.

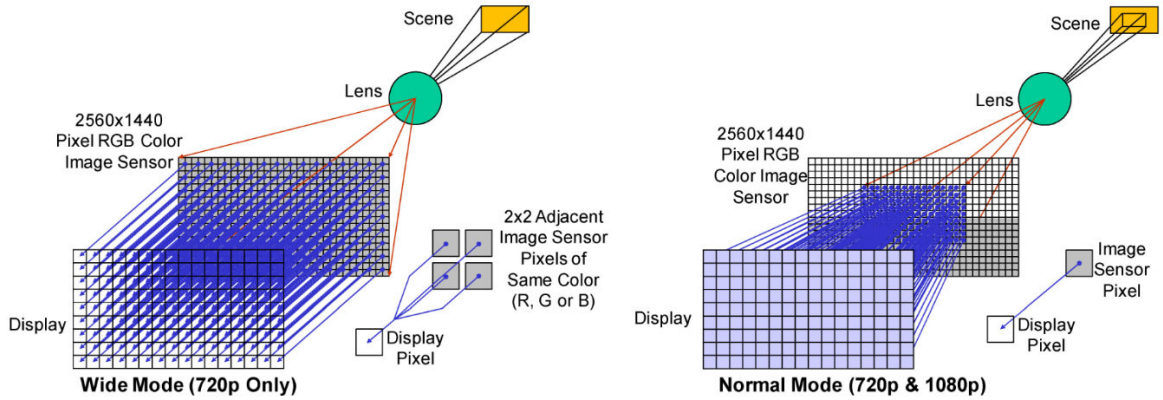


Figure 24. MX-10/10D Wide Mode Comparison

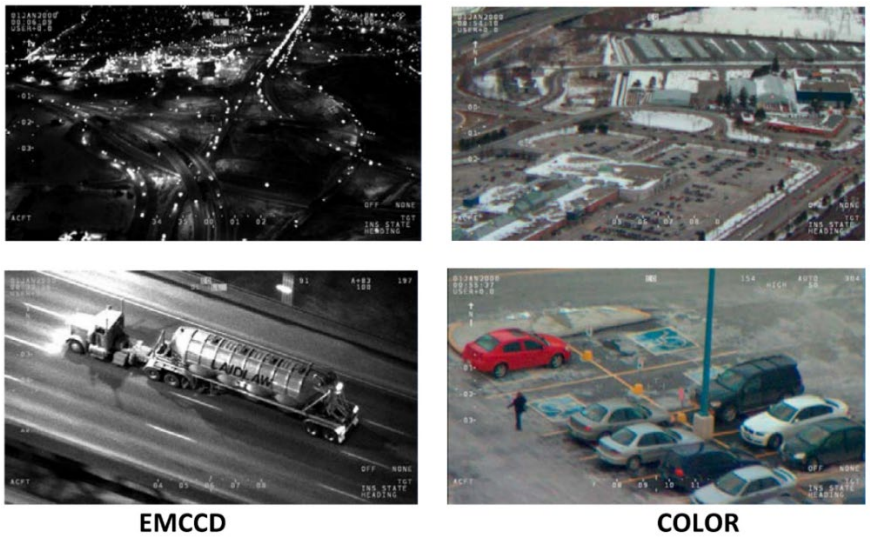


Figure 25. Low-Light Camera Images

The low light camera uses a 640x480-pixel Electron Multiplying Charged Coupled Device (EMCCD) image sensor. This solid-state night vision device is immune to image

burn-in, provides high gain to achieve excellent low light sensitivity, has built-in thermoelectric cooling to maintain performance at high temperature, and is sensitive to near infrared radiation for detection of laser illuminators and personnel marker beacons. Figure 30 shows low-light camera images.

- **AutoFocus:** All three imaging sensors feature the proven MX-series automatic focus. Lens mechanism focus is automatically set using MX-GEO's calculated range to target. This approach is more robust than image-based autofocus techniques that are susceptible to image contrast conditions and variation in scene content.
- **Eye Safe Laser Rangefinder:** The Class I eye safe laser rangefinder (LRF) measures slant range to target. It improves target location accuracy of the MX-GEO function at shallow viewing geometries. The eye safe LRF is essential to MX-GEO performance that provides digital terrain elevation data. It uses reliable, diode pumped, erbium glass technology operating at 1.54 micrometers and has sufficient performance to achieve 10 - 20km ranges under typical atmospheric conditions.
- **Laser Illuminator:** The MX-10D is configured with a narrow beam Class 3B laser illuminator that provides a precision spot (2 ft. diameter @ 3000 ft., 0.6 m diameter @ 1000 m). There is a selectable pulse mode to improve visibility in the presence of ambient lighting. The 852 nm wavelength improves atmospheric haze penetration in comparison with 830 nm devices.
- **Laser Designator:** The MX-10D uses a diode pumped laser designator for efficiency, reliability and small size. The laser features very high beam quality and low pulse-to-pulse jitter. Fully stabilized by the MX-10D, the laser spot jitter on target is very low and presents no risk to weapon control system tracking performance. In other systems, narrower beam divergences are sometimes used to try to overcome the lack of stabilization of the beam (e.g., 50-µrad rms or greater total beam jitter). However, once stabilization and other effects are taken into account, the effective total designator beam divergence can be greater than that of our system. Furthermore, in such systems there is a greater risk that the low frequency component of the laser spot jitter will couple into the weapon's control system, potentially affecting weapon accuracy.

Table 3 shows the features and performance parameters of the MX-10D EO/IR Turret Sensor.

Table 1. MX-10D EO/IR Turret Sensor Performance Parameters

Feature	Specifications
Thermal Zoom Ratio	Continuous zoom, 30.0^0 to 1.8^0
Thermal Imagine Resolution	640 horizontal x 480 vertical

HD Day/Night Zoom Ratio	Continuous zoom, 36.3^0 to 1.0^0
HD Day/Night Imagine Resolution	5 Megapixel Color HD
Low-Light Camera Imagine Resolution	640 horizontal x 480 vertical
Max Range Class 1 Eye-safe Laser	20 km
System Weight	43 lbs.

WEAPONS SYSTEMS

The MD 530F Cayuse Warrior has fully integrated armament, targeting, and survivability solutions designed around commonly employed weapons.

M134D-H Gatling Gun

The M134D is a 7.62mm, 6-barreled Gatling-style machine gun with a 3,000 rounds-per-minute rate of fire. The ammunition magazine has a 3,000-round capacity and provides a simple design to reduce magazine-induced jams.

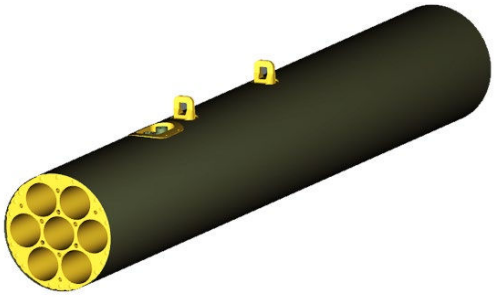
Figure 26. M134D-H Gatling Gun

Rocket Launcher

The MD 530F Cayuse Warrior features the addition of the Hydra M260 Rocket Launcher system to the armament outfit (Figure 32). The M260 Launcher carries up to seven 2.75-inch (70mm) diameter M151 high explosive point detonating warheads, or M274 smoke-signature training rockets. Rockets are launched in a single-fire sequence (one rocket per trigger actuation).

The M260 Launcher pod is 9.75 inches in diameter, and 65.25 inches long. The M260 is attached to the helicopter by a set of North Atlantic Treaty Organization (NATO) standard 14" suspension lugs on the top of the pod.

Figure 27. M260 Launcher



DAP 6 POD

The Dillon Aero Gun Pod is a self-contained M134D-H weapon system that mounts to the MD 530F Cayuse Warrior MCAS. It utilizes 7.62x51mm NATO ammunition with M13 links, with a 3,000-round magazine capacity and a rate of fire of 3,000 rounds per minute. Features include:

- Self-contained system
  - Dillon M134D-H Minigun
  - Rapidly removable nose and tail cone for easy gun or magazine access
  - Trickle charge capable from aircraft power
  - Quick Change Ammunition Magazine
  - Last Round Switch (approx. 100 rounds remaining) with pilot override interrupt
  - Integral bore sight adjustment +/- 2.5°
  - Mounts to 14" Standard NATO bomb rack
- Weight
  - 162 lb (73.5 kg) empty
  - 350 lb (158.8 kg) estimated when loaded
- Dimensions
  - Height: 15.4" (39.1 cm)
  - Width: 13.1" (33.3 cm)
  - Length: 92.9" (236 cm) with long barrels

Figure 28. DAP 6 POD

Weapons Configurations

The MD 530F Cayuse Warrior aircraft is reconfigured quickly from one weapons system to another allowing for combat flexibility and mission effectiveness. Typical combinations for the MD 530F Cayuse Warrior weapons systems are shown in Table 4 with Configuration #2 shown in Figure 34. Other configurations are available as needed, please contact MDH for further information.

Table 2. MD 530F Cayuse Warrior Weapons Configurations

Config #	Left	Right
1	M134	M134
2	DAP 6 POD	DAP 6 POD

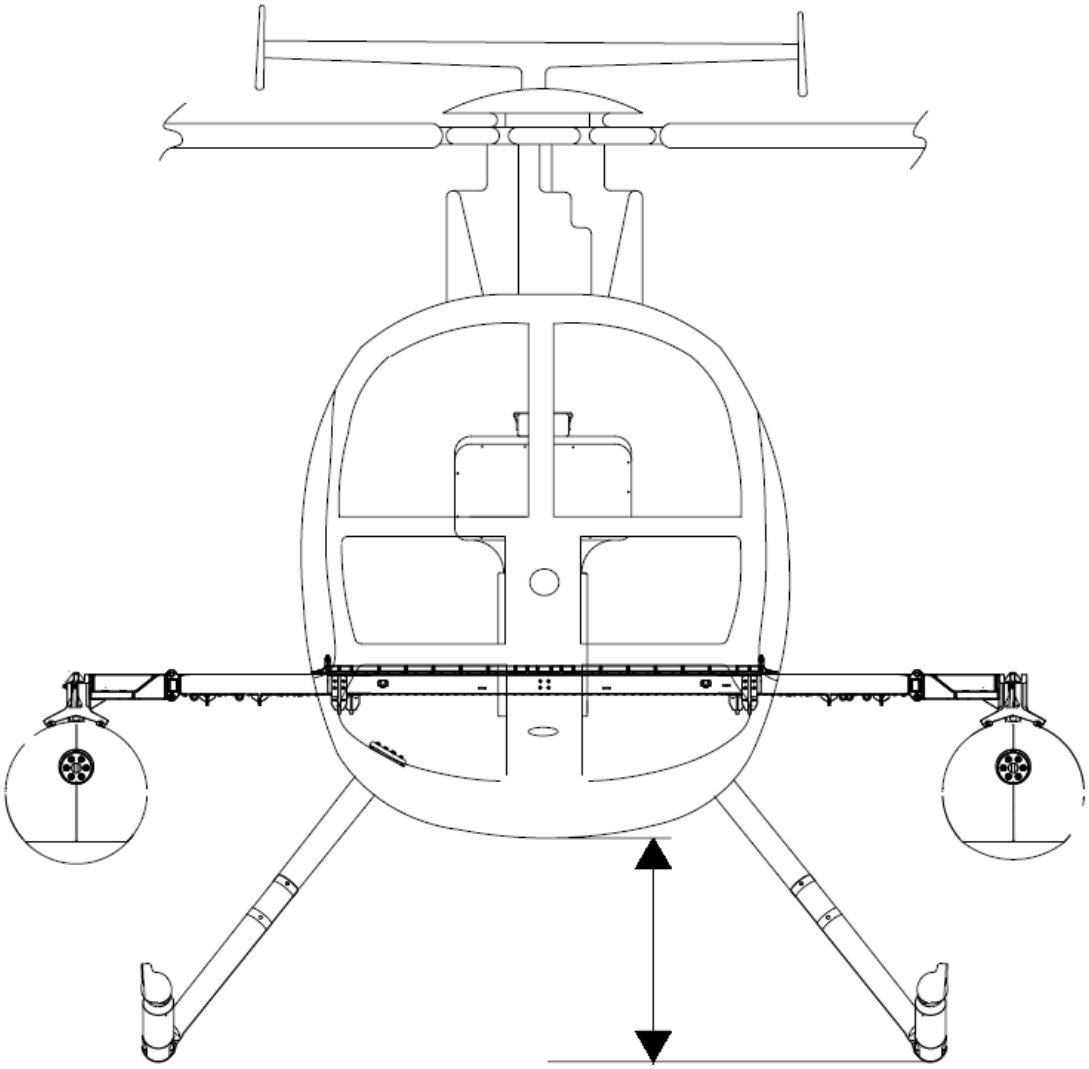


Figure 29. MD 530F Cayuse Warrior Weapons Configuration #2.

Weapons System Control

The aircraft weapons system control is composed of the BT 14-2, the PC-17 and a weight on gear (WOG) interlock. Aircraft equipment power is provided from the weapons bus and battery bus, and is detailed in section 2.1.5. To provide on ground safety interlocks, a WOG detection circuit relay is used to detect on ground condition and perform a master arm power interruption. A remote WOG override switch for ground test functions is also provided.

The BT 14-2 weapon selector panel (Figure 35) is the command and control switching dedicated to managing master arm, emergency jettison, and the two weapon stations. This weapon selector panel permits either gun or rocket firing depending on the actual weapons loaded and the station(s) selected. If guns are selected on the BT 14-2, the integrated additional PC-17 gun control panel is enabled to arm the guns, fire a preset number of rounds,

display remaining rounds, and re-cock the guns, if necessary. If rockets are selected, the BT 14-2 enables the IB19ST intervalometer to fire rockets from the attached rocket pod(s). Descriptions of the indicators, A through F, follow the figure.

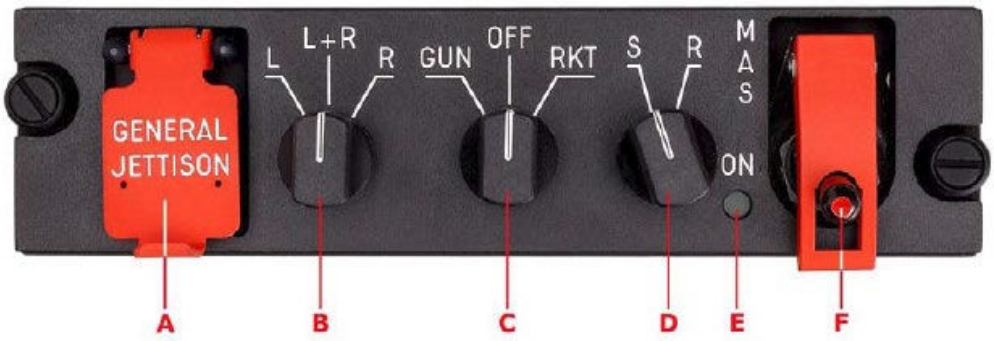


Figure 30. BT 14-2 Weapons Selector Panel

Indicator	Description
A	Jettison button (powered via battery bus and is not interrupted by WOG circuits or electrical power bus load shed functions)
B	Station selector
C	Weapon selector
D	Firing mode selector (single or ripple - rocket only)
E	Power light
F	Master armament switch: Provides master arm switch (MAS) discrete signal to the PC-17 Gun Pod control panel (Master arm power to the BT 14-2 is provided via WOG relay or WOG override switch interrupts.)

The PC-17 Gun Pod controls two HMP400 machine gun pods that have a fast re-cocking device and are designed to be installed on helicopters or subsonic aircraft. The PC-17 is dedicated to manage two machine gun pods simultaneously. The panel (Figure 36) is divided symmetrically for left-hand and right-hand gun control and status displays. Descriptions of the indicators, A through D, follow the figure.

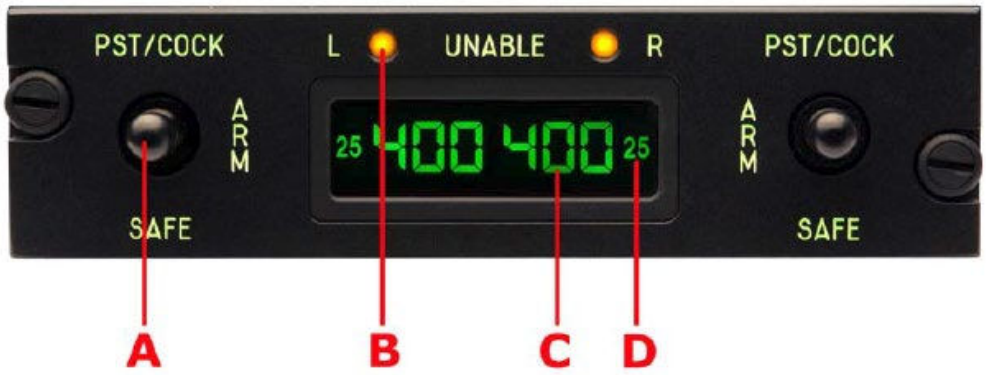


Figure 31. PC-17 Gun Pod Panel

Indicator	Description
A	Main switch
B	Status enable light
C	Remaining ammunition quantity
D	Selected burst limitation

Weapons Override

A weapons override guarded switch is provided in the passenger/cargo compartment to support maintenance activities (Figure 37). This switch bypasses the weight on ground circuit and provides power to the BT 14-2 MAS function, rendering the rocket systems live (if installed).

Figure 32. WOG Override Switch

Weapons Sight

To improve accuracy and effectiveness of the weapons system, the MD 530F Cayuse Warrior aircraft is equipped with two fixed 195B-001 weapons sights (Figure 38). Each sight will affix to a mounting bar in front of the pilot and co-pilot per 170300ND (Figure 39). The 195B-001 is a reflex-type gun sight, which reflects a pre-installed light emitting diode (LED) powered targeting pattern to the operator using an angled flat clear lens. The weapons sight contains no laser, and no significant amount of light is emitted forward toward the target. An easy to access knob on the bottom of each sight unit allows for brightness adjustment.

The gun sight design is consistent with MIL-STD-3009 2 Feb, 2001, Lighting, Aircraft, Night Vision Imaging System (NVIS) Compatible. The gun sight's targeting-reticle light-emitting intensity adjustability allows system employment across a wide range of lighting conditions—from mid-day full sun conditions (desert environment), to very low/limited ambient illumination levels (e.g., moonless night).

The reticle consists of a central aim point (pipper) and two concentric rings (inner/outer). Linear and angular dimensions follow:

- Central aim point (pipper): Linear Dia. = 0.14mm; Angular Dia. = 0.207mrad = 0.0119 degrees.
- Inner Ring: Linear Center Dia. = 2.72mm; Angular Dia. = 40.3mrad = 2.309 degrees.
- Outer Ring: Linear Center Dia. = 5.44mm; Angular Dia. = 80.7mrad = 4.624 degrees.

Note: Measurements are to the center of the diameter of the inner and outer rings.

Figure 33. 195B-001 Weapons Sight

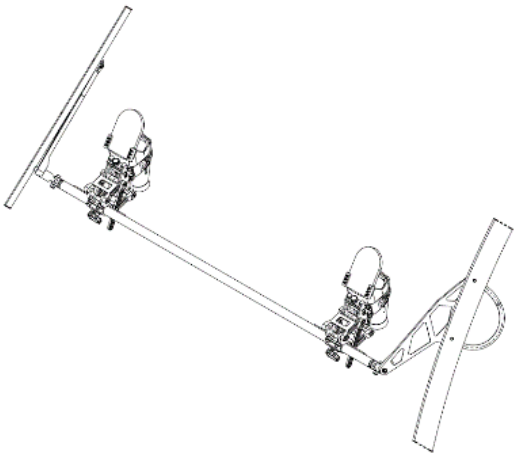


Figure 34. MD 530F Cayuse Warrior Weapons Sight Mount Assembly

6 PERFORMANCE SPECIFICATIONS

Table 1. MD 530F Cayuse Warrior Performance Specifications			
Characteristics at Design Gross Weight		**Imperial 3,750 lbs.**	**Metric 1700 kg**
Characteristic	**Condition**	**Imperial**	**Metric**
Maximum Cruise Speed	Sea Level	110 kt (127 mph)	204 km/hr.
	5,000 ft. (1,524 m)	103 kt (119 mph)	191 km/hr.
Speed for Best Range	5,000 ft. (1,524 m)	98 kt (113 mph)	182 km/hr.
Maximum Permitted Speed	V_{NE} at Sea Level	130 kt (150 mph)	241km/hr.
Maximum Range	Sea Level	263 NM (303 mi.)	487 km
	5,000 ft. (1,524 m)	265 NM (305 mi.)	491 km
Maximum Endurance	Sea Level	3 hrs	3 hrs
Maximum Rate of Climb	Sea Level, Standard Day	1,070 fpm	5.4 m/sec
Maximum Operating Altitude	Density Altitude	16,000 ft.	4,876 m
Hovering Performance (No wind)			
Characteristic	**Condition**	**Imperial**	**Metric**
In-ground effect	Standard Day	7,000 ft.	2,133 m
	ISA +20°C Day	4,700 ft.	1,432 m
Out-of-Ground effect	Standard Day	4,500 ft.	1372 m
	ISA +20°C Day	2,900 ft.	884 m
Weights			
Characteristic	**Condition**	**Imperial**	**Metric**
Maximum Gross Weight	Internal Capacity	3,350 lbs.	1,520 kg
	External Load Operations	3,750 lbs.	1,701 kg
Empty Weight	Standard Configuration	2151 lbs.	976 kg
Useful Load	Internal Load	1199 lbs.	544 kg
	External Load	1599 lbs.	725 kg
Main Ballistic Tolerant Fuel System	59.3 gal (224.4 liter)	403.2 lbs.	182.9 kg
Little Bird Auxiliary Tank System (LBATS)	38.2 gal. (144.6 liter)	259.7 lbs.	117.8 kg
Power Plant			
Characteristics	**Condition**	**Imperial**	**Metric**
Rolls Royce 250-C30 gas turbine	Rated Power	650 shp	485 kW
Airframe Power Limitations:	10 sec. Transient	500 shp	373 kW
	30 sec. Transient	450 shp	336 kW
	Max Takeoff	425 shp	317 kW

Table 1. MD 530F Cayuse Warrior Performance Specifications			
	Max Continuous	375 shp	280 kW

HOVER OUT OF GROUND EFFECT

Due to the autorotation requirements of the helicopter, all external stores above 3,350 lbs. must be jettisonable. When the helicopter is operating with the weapons plank installed, but without weapons, its Hover Out of Ground Effect (HOGE) is based on the 3,350 lb. weight limit. As illustrated in Figure 20, with the helicopter using 30-minute transient power at 20°C, HOGE is limited to 6,000 ft. pressure altitude.

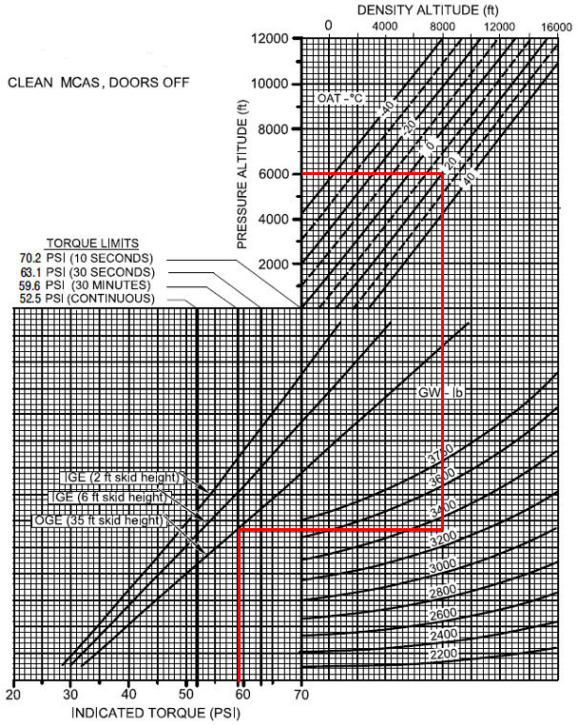


Figure 35. Torque Required to Hover Chart

HOVER CAPABILITY

There is no crosswind limitation for the MD 530F Cayuse Warrior in hover conditions, however the MD 530F Cayuse Warrior Rotorcraft Flight Manual states the performance information for hover in crosswinds. Based on Power Fix testing and validation testing, the MD 530F Cayuse Warrior meets the 17 knots low-speed controllability requirement. The MD 530F Cayuse Warrior has a lateral hover capability up to 25 knots and rearward up to 20 knots. The lateral and rearward hover capability varies with gross weight, altitude, and temperature.

POWER FIX OPTION

Born from Special Operations Aviation requirements of the 1980's, MDH completed extensive engineering and testing to increase the usable engine output of the Roll Royce C30 turbine engine. Effectively, the MD 530F commercial helicopter uses engine torque ratings equivalent to 350 shp maximum continuous power (MCP) and 425 shp 5-minute takeoff power (TOP) limitations, which is significantly lower than the maximum engine output capabilities. Additionally, there is no transient torque rating for the MD 530F commercial variant helicopter. The MD 530F Cayuse Warrior implements "Power Fix", which capitalizes on engine capabilities to apply torque ratings equivalent to 375 shp MCP, 425 shp for 30 minutes, 450 shp for 30 seconds, and 500 shp for 10 seconds. Other engine ratings, including turbine outlet temperature, are the same for all. This added engine performance provides improved aircraft operating weight, takeoff, cruise, and greater altitude performance.

AUTOROTATION

The MD 530F Cayuse Warrior has increased autorotation capability and follows the FAA-approved MD 530F Cayuse Warrior flight manual for auto rotation up to 3,100 lbs. For autorotation gross weights above 3,100 lbs. and up to 3,350 lbs. V_{NE} is limited to 100 knots in accordance with the below Rotorcraft Flight Manual airspeed limits chart from Power Fix (Figure 21).

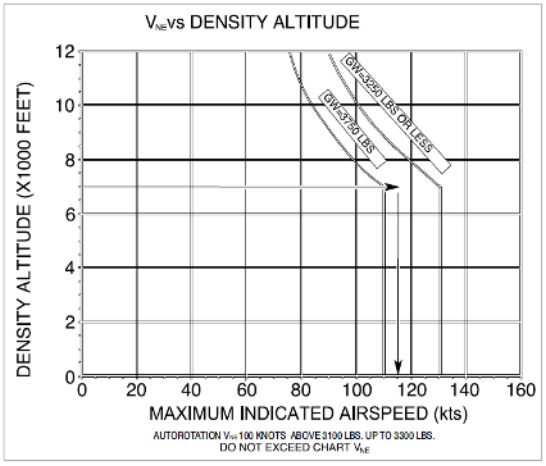


Figure 36. MD 530F Cayuse Warrior Autorotation Airspeed Limits

FUEL AND OIL CAPACITY AND COMPATIBILITY

The MD 530F Cayuse Warrior aircraft is fitted with two bladder fuel tanks having a total usable capacity of 56 U.S. gallons. For longer range, auxiliary fuel tanks are available and described in section 4.2, Fuel Systems. Table 2 shows oil and fuel system requirements and capacities.

Table 3. Fuel and Oil System Requirements

1. Tail Rotor Transmission - Capacity 0.5 U.S. pt. (0.23 liters)
Use Mobil Aviation Gear Lubricant (AGL) only.

2. Main Transmission - Capacity: 14.0 U.S. pt. (6.62 liters)
Use Mobil AGL only.

3. Engine - Capacity: 3.0 U.S. Qt. (2.84 liters)

Ambient Temperature	**Oil Type**
0°C (32°F) and above	MIL-PRF-23699C or subsequent preferred
0°C (32°F) to -40°C (-40°F)	MIL-PRF-23699C or subsequent preferred or MIL-PRF-7808G or subsequent
-40°C (-40°F) and below	MIL-PRF-7808G or subsequent only

Refer to Rolls Royce 250 Series Operation and Maintenance Manual for approved oil manufacturers.

4. Fuel Cells – Optional self-sealing, Capacity: 56 U.S. gal. (212 liters), 448 lbs.
Refer to Rolls Royce 250 Series Operation and Maintenance Manual for complete fuel specifications.

MIL-DTL-5624 JP-4	MIL-DTL-5624 JP-5	ASTM D 1655 Jet A
ASTM D 1655 Jet A-1 Peoples Republic of China RP-3.	ASTM D 1655 Jet B ASTM D 6615 Jet B	JP-1 conforming to ASTM D 1655, Jet A or Jet A-1
Arctic Diesel Fuel DF-A (W-F-800B) conforming to ASTM D 1655, Jet A or Jet A-1	Diesel No. 1 conforming to ASTM D 1655, Jet A or Jet A-1	MIL-DTL-83133, grade JP-8

CAUTION: At 4.4°C (40°F) and below, fuel must contain anti-icing additive that meets MIL-I-27686 requirements. For blending information and authorized fuels, refer to the appropriate Rolls Royce Operation and Maintenance Manual.

5. Overrunning Clutch - Capacity: 3.64 U.S. oz. Use Mobil AGL only.

7 SURVIVABILITY

AIRCRAFT CRASHWORTHINESS

The MD 530F Cayuse Warrior provides important fail-safe characteristics concerning crashworthiness (Figure 10). Shoulder and seat belts are attached to the primary structure rather than to the seats. A deep fuselage base structure, including a center beam, in combination with an integral energy absorbing seat base structure provides sufficient yielding depth for maximum energy absorption during a crash impact. This provision for yielding collapse of the fuselage substructure during a crash and without sudden failure of rigid members provides exceptional crash safety to the crew long after initial structural failures that may result from a severe impact. The basic structure also forms a rugged truss protecting the crew from rotor and transmission collapse, or in the event of roll over. The fuel cells are protected by the double wall belly structure with closely spaced supporting structure and by the deep center beam. The engine is mounted low and to the rear of the passenger and fuel compartments, thus presenting no crash hazard.

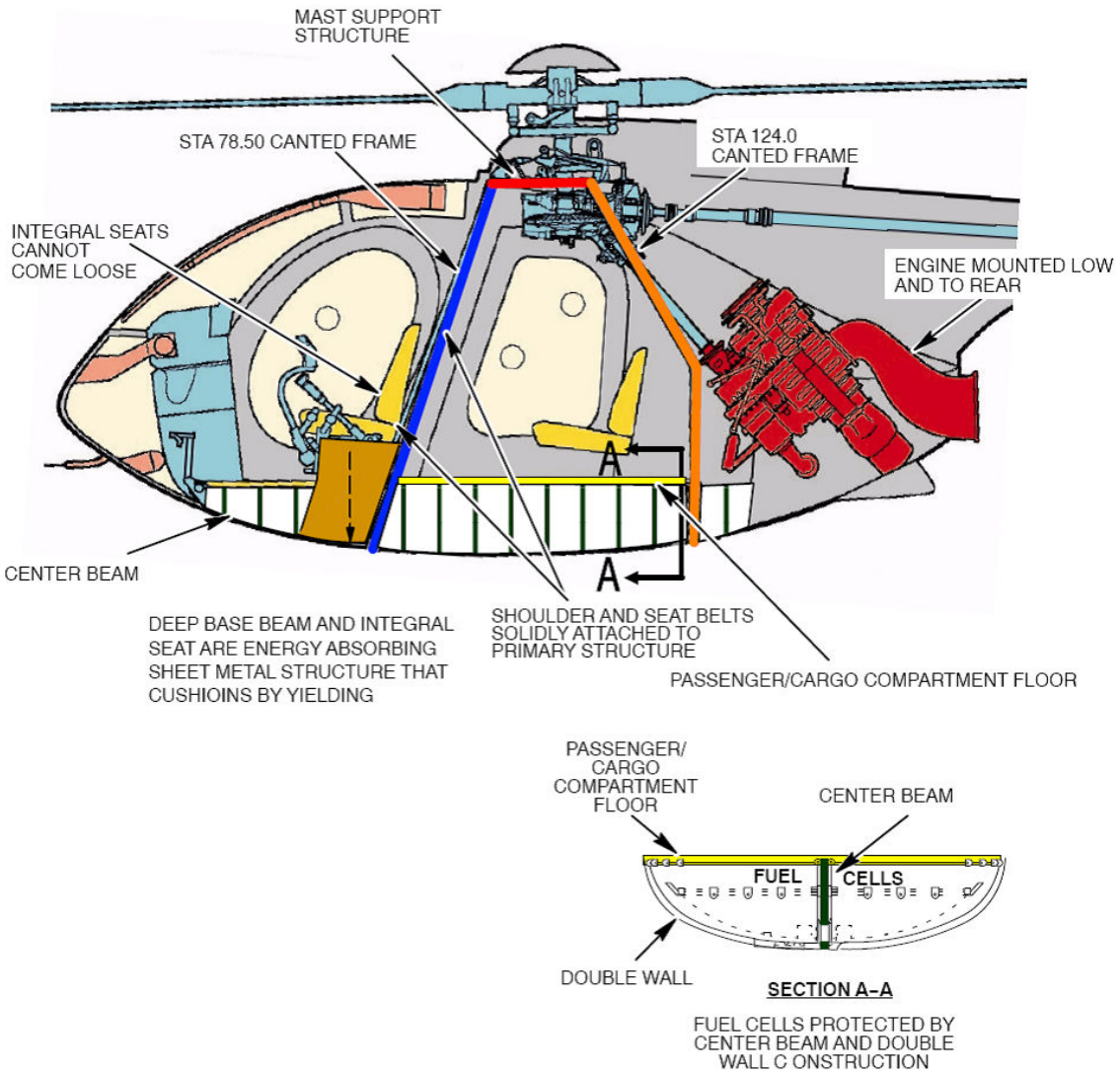


Figure 37. Crashworthy Design

The MCAS weapons plank is the primary load-carrying member for the weapons installed by the EMEP. The MCAS is designed to withstand the load requirements defined in FAA FAR 27.561 Emergency Landing Ultimate Inertial Load Factors. The structure inside the cabin as well as the weapons and attachments outside the cabin will remain intact during a crash landing and will give occupants every reasonable chance of escaping serious injury in the event of an impact.

Additionally, the MD 530F Cayuse Warrior is equipped with high-capacity landing gear to support the enhanced gross weight of the aircraft. The high-capacity landing gear is certified to the applicable U.S. Federal Aviation Administration 14 CFR Part 27 regulations for crashworthiness.

FUEL SYSTEMS

The MD 530F Cayuse Warrior is fitted with a ballistic tolerant crashworthy main fuel system and the Little Bird Auxiliary Tank System (LBATS) ballistic tolerant crashworthy auxiliary fuel system. Both systems provide U.S. Military MIL-DTL-27422, Type 1, Protection Level A, capable of self-sealing protection for small arms fire up to .50 caliber.

The main fuel system is composed of crashworthy self-sealing fuel bladders under the cabin floor with new internal fuel system components that includes hoses, capacitance fuel quantity probe and signal conditioner, low level fuel quantity switch, and vent valve with roll-over protection. The system also includes new engine feed fuel line with integral breakaway fitting.

The LBATS is composed of a 38 gallon ballistic tolerant crashworthy fuel bladder approximately 45 x 20 x 15.5 inches in size mounted in aft cabin. The system incorporates a self-sealing fuel transfer line and breakaway valve connected to the crashworthy main fuel system metal filler neck. The system includes a new molded filler neck cover, a three-way fuel transfer shut-off valve with mounts, and fuel transfer shut-off control cable with cockpit mounted overhead control handle.

ARMOR PANELS

Ballistic armor panels protect the cockpit crew. The armor provides multi-hit ballistic protection from small arm threats up to 7.62 x 39 full metal jacket (FMJ) pointed bullet with mil-steel core. Armor panels are installed on the cockpit floor, underneath and adjacent to the cockpit seats and behind the seat bulkhead (Figure 22). The armor panel has a maximum thickness of 1 inch with a back face deflection of 1.5 inches and is interchangeable with other fielded MD 530F Cayuse Warrior armor panels.

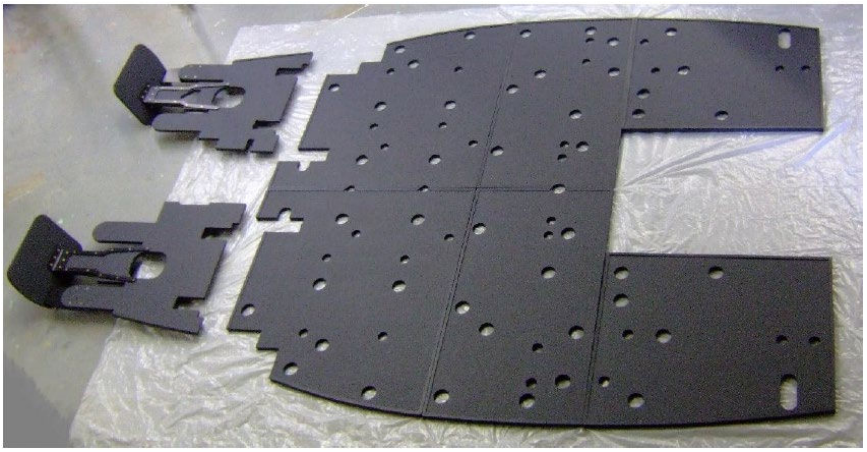


Figure 38. Defense Armor Panels

The seat and floor armor panels are installed with multiple strips of hook and loop fasteners. The floor panels are also mounted with mechanical fasteners. The bulkhead panels behind the seat are mounted with mechanical fasteners. The armor panels have cutouts for M4 provisions, fuel flow control, intercommunication system (ICS) foot switch, and all control mechanisms to provide maximum range of motion (Figure 23).

Figure 39. Installation of Armor Panels

EGRESS

The helicopter is capable of cockpit crew egress from an upright helicopter through a single door with the weapons plank and gun pods installed in less than 30 seconds. Egress can be performed for crewmembers representing the 5th percentile female to 95th percentile male while wearing full mission gear.

8 SUSTAINABILITY

The MD 530F Cayuse Warrior is based on the legendary MD 530F known for its reliability, ease of maintenance, and low direct operating costs. Throughout the installed fleet of approximately 2,500 MD 500 series aircraft, the operational availability is consistently above 80%. This type of performance is consistent with information received from current operators in the field. Additionally, the current MD 530F Cayuse Warrior fleet maintains a 96% mission availability while deployed to hot and high austere environments. Operators can expect a mission availability of above 85% based on this historical information from both the commercial MD 530F and the military fielded MD 530F Cayuse Warrior fleets.

PUBLICATIONS

With each purchase of the MD 530F Cayuse Warrior, MDH will provide the following publications in printed hardcopy and electronically in searchable-pdf format:

Rotorcraft Flight Manual

Rotorcraft Maintenance Manual

Illustrated Parts Catalog

Each manual is a stand-alone document and conforms to MIL-STD-38784A specification. The Rotorcraft Flight Manual is in a format commonly known as "-10." The Rotorcraft Maintenance Manual is in a format commonly known as "-23." The Illustrated Parts Catalog is a landscape oriented manual similar to industry parts manuals, known as "-23p."

A two-year revision service is included for future General Revisions and Temporary Revisions. All manuals and revisions are internally reviewed through MDH Technical Publications, Engineering, and Quality Assurance to ensure the accuracy of technical information and operational safety.

TIME BETWEEN OVERHAUL (LIMITED LIFETIME PARTS)

Table 5 shows manufacturer recommended Time Between Overhaul (TBO) for the MD 530F Cayuse Warrior.

Table 4. Time Between Overhaul

Component	QTY	Hours
Accessory Gearbox	1	on-condition
Blower Belt	1	1,200
Blower Bearings	1	1,200
Starter Generator Overhaul	1	1,200
Bleed Valve Overhaul	1	1,500
Engine Hot Section	1	2,000
Overrun Clutch Overhaul	1	1,800
Governor - Honeywell Overhaul	1	2,000
Fuel Nozzle Overhaul	1	2,000
Fuel Control - Bendix Overhaul	1	2,500

Table 4. Time Between Overhaul		
Component	**QTY**	**Hours**
M/R Retention Strap	5	2,770
M/R Swashplate Overhaul	1	2,770
T/R Transmission Input Shaft	1	3,365
T/R Transmission Overhaul	1	3,365
Vertical Stabilizer	1	3,388
Main Rotor Blade	5	3,430
T/R Hub	1	3,450
Fuel Pump	1	3,500
Turbine Overhaul	1	4,000
M/R Transmission Overhaul	1	5,000
T/R Retention Strap	1	5,100
T/R Blade	2	5,140
Bolt - Lead Lag M/R	5	6,120
T/R Transmission output shaft	1	7,290
Blade Pin	10	7,600
Horizontal Stabilizer	1	7,700
Main Rotor Hub Sub Assy	1	8,900
Pitch Housing M/R	5	9,100
Compressor Overhaul	1	10,000
Tail Boom Assembly	1	10,300
Mast Assembly Main Rotor	1	10,450
Lead Lag Link M/R	10	11,080
T/R Drive Shaft	1	14,610
Tail Boom Bolts	4	21,950
Drive Shaft Main Rotor	1	28,500

NOTE: Airframe is not a Life Limited Component.

SCHEDULED INSPECTION INTERVALS

Table 6 shows the scheduled inspection intervals for the MD 530F.

Table 5. Scheduled Inspection Intervals

Inspection	Items	Time
100 HR	General, Exterior, Landing Gear, Cabin, Main Rotor, Drive Train, Tail Rotor System, Electrical, Engine Compartment, After Inspection, Post Inspection Run	22 Man Hours
300 HR	Exterior, Landing Gear, Main Rotor, Drive Train, Tail Rotor System, Electrical, Engine Compartment	32 Man Hours
Annually	Exterior, Landing Gear, Cabin, Flight Controls, Electrical, Engine Compartment	10 Man Hours

MEAN TIME TO REPAIR (MTTR)

The MD 530F base aircraft is a very simple and easy to maintain platform and this ease of maintenance is represented in a low average MTTR. MTTR is a basic measure of the maintainability of repairable items and represents the average time required to repair a failed component or device. In short, lower MTTR results in increase operational availability. MDH completed a study of its training fleet of MD 500 series aircraft and over a 12-month period, MDH has had an MTTR of **1.9 hours.** The study was based on aircraft maintained in accordance with OEM standards and documentation procedures. The MD 530F Cayuse Warrior will meet the requirement of a mean time to repair of less than 2 hours.

GROUND SUPPORT EQUIPMENT

The MD 530F Cayuse Warrior aircraft will be delivered with the same ground support equipment delivered with the commercial MD 530F aircraft with one exception. The ground handling equipment is different for the high-capacity landing gear. New ground handling equipment for towing is shipped with each aircraft. This will include the hydraulic ground handling wheels and the additional caster wheels set. The ground handling wheels will first be installed to lift the aircraft, then the ground-handling caster wheels will be attached to provide enhanced stability (Figure 40). It is recommended that one pair be installed before the other. It will take two people to move the aircraft under this configuration. In this configuration, the optional tow bar can still be attached to move the aircraft.

Figure 40. Ground Handling Wheels

MOORING AND LIFTING

The aircraft has provisions for mooring, jacking and aircraft recovery. Mooring rings are provided that attach in the sockets that normally hold the steps. Blade socks are used to prevent the blades from moving. A hoisting adapter is installed on the rotor hub to provide a means to lift the aircraft as shown in Figure 41.

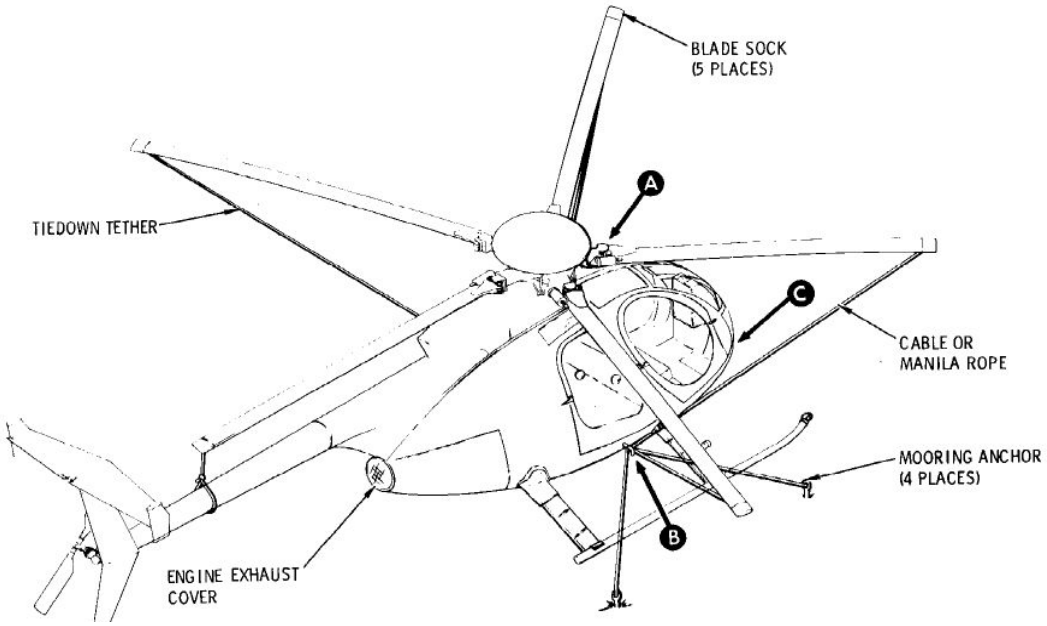


Figure 41. Mooring Schematic

A hoisting adapter and three ball-lock pins are installed on the rotor hub to provide a means to lift the aircraft as shown in Figure 42.

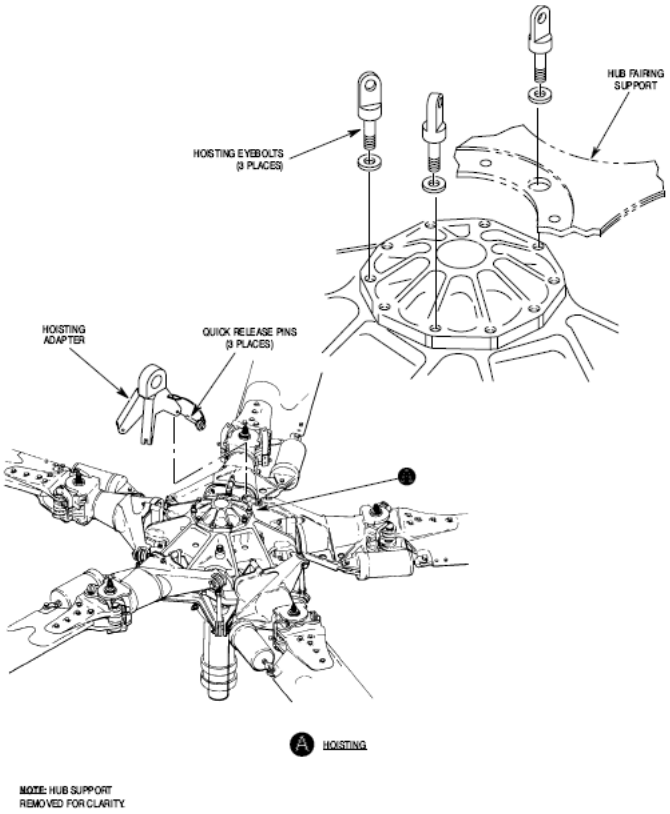


Figure 42. Lifting Schematic

The helicopter parking procedures are modified to allow for the blade socks tie-downs (Figure 43) for the four blades remaining, after the aft blade is secured to the tail boom, to be tied to the forward two holes of the weapons plank. Helicopter mooring to the ground will be modified to attach restraining lines to the forward steps, or to loop it through the two holes on the aft side of the weapons plank whiles avoiding the harness.

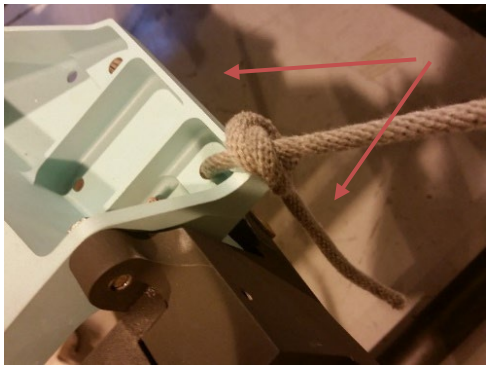


Figure 43. Blade Tie-down Holes

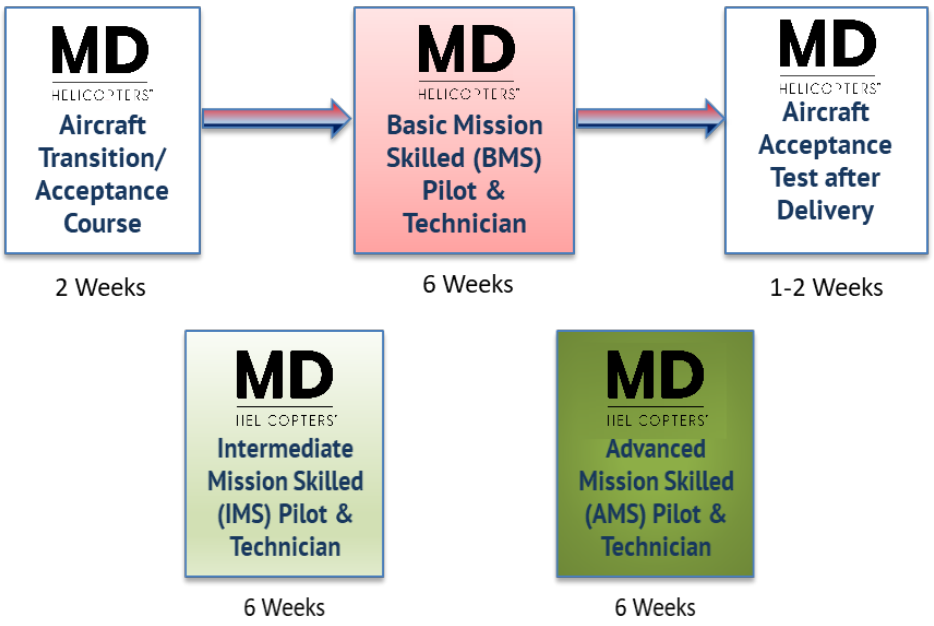
9 MD HELICOPTERS MILITARY PILOT & TECHNICIAN TRAINING

MDH understands a comprehensive and well-executed training plan is the key to mission accomplishment. Once the decision is made and orders are issued, regardless of the state of training, the unit is on its way. That is the time to truly appreciate the importance of a well-planned and executed initial training program. Using US military standards of excellence, students will receive pilot and technician training developed to create proficient aircrew and maintenance personnel to enhance your organization's aviation capability, readiness, and safety.

MDH offers three levels of training for pilots and technicians customized and tailored to the customer's configured helicopter:

- Basic Mission Skills (BMS)
- Intermediate Mission Skills (IMS)
- Advanced Mission Skills (AMS)

The skill levels allow the customer the ability to advance students' ability in flying, maintaining aircraft, and accomplishing the mission. While each of the three levels of training are purchased items, Transition/Acceptance and Final Acceptance/Test Instruction are included with aircraft purchase. A notional timeline of Basic Level Training is depicted below:



As a result, your organization will have well-trained personnel, organizational procedures, and maintenance programs based on US aviation training methodologies, and a strengthened partnership with MDH. Ultimately, such helicopter training and support will dramatically increase the country's ability to protect its borders, infrastructure and deter and counter internal and external threats.

BMS PILOT COURSE

MDH proposes a robust training plan for previously qualified rotary-wing pilots conducted in Mesa, Arizona. The pilots must have a minimum of 250 hours of total time in rotary-wing aircraft. The schedule consists of a six-week, three-phase plan conducted by qualified MDH academic and flight Instructor Pilots. Daily activities include; morning briefing, 1.2 hours of flight instruction followed by four hours of academic instruction. Students will learn the fundamentals of the MD 530F airframe, systems, mission equipment, and weaponeering/ballistics, coupled with tactical employment. Students will graduate with a foundational knowledge of the safe and effective operation and employment of the MD 530F and its weapon systems.

Table 15 provides basic course details. Each phase consists of flight and academic training with end of phase evaluations and daily proficiency checks conducted by qualified MDH Instructor Pilots.

Table 6. BMS Pilot Course

Course	Flight Hours Total	Academic Instruction	Time Line
Transition	12	40	Weeks 1-2
Mission	12	40	Weeks 3-4
Pre-Gunnery/Gunnery	12	40	Weeks 5-6

Pilot training objectives are:

- Transition: Ground instruction, crew briefing, pre-flight, start-up and shutdown, emergency procedures, contact, instruments, basic aircraft handling.
- Mission Training: Basic combat skills, high & hot operations, environmental flight, brownout, mountain flying, mission equipment proficiency, terrain flight procedures, multi- aircraft operations, navigation.
- Pre-Gunnery: Weapons familiarization, range safety, ballistics, loading and unloading of weapon systems, clearing procedures, capabilities and limitation of weapons systems.

- Gunnery: Live-fire training, principles of helicopter gunnery, target handover procedures, crew fire commands, fire distribution and target attack techniques, target acquisition, switchology.

INSTRUCTOR PILOT TRAINING

Instructor Pilot training uses the existing Pilot Training plan as the basis for MD 530F Instructor Flight training course. The program of instruction incorporates bestpractices from the US Federal Aviation Administration (FAA) flight instruction techniques as well as US Military Method of Instruction (MOI) training standards to teach instructors the MD 530F flight and mission tasks. The course objective is for qualified Instructor Pilots to understand and apply the knowledge and skills of the MD 530F toeffectively develop and operate home-country training activities.

BMS TECHNICIAN COURSE

The Technician training is also taught at the MDH Mesa, Arizona facility and includes a six-week, all-inclusive course as detailed in Table 16. Students will receive hands-on instruction on basic aircraft maintenance techniques, scheduled inspection procedures, and weapons familiarization. Students will also receive academic instruction on aircraft systems, including airframe, engine, drivetrain, electrical and fuel systems.

Table 7. BMS Technician Course

Course	Hours/Day	Total Hours	Time Line
Airframe	6	60	Weeks 1-2
Mission Options	6	30	Week 3
Engine (Rolls Royce)	6	30	Week 4
Avionics / Armament	6	60	Weeks 5-6

Technician training objectives are:

- Airframe: Manufacturer BMS training consists of daily and 100-hour/annual inspections on fuselage, landing gear, power train, tail rotor, main rotor, flight controls, engine intro and controls.
- Mission Equipment: Manufacturer training consists of description/operation, form, fit, function, on optional equipment unique to customer overall final configuration.
- Engine: Rolls Royce manufacturer trained maintenance course provides detailed description and operation information applicable to field maintenance activities.
- Avionics: Manufacturer training consists of description/operation, form, fit, function, on the avionics equipment unique to the customer's overall final configuration.

- Armament: Manufacturer training consists of detailed description and operation, form, fit, function, on the armament equipment unique to the customer's overall weapons package.

TRAINING LOCATION

Training is planned to occur in or around the Mesa/Phoenix, AZ area throughout the first five weeks of Pilot Training. Week six flight training occurs at a live-fire range. The specific location is dependent upon available range access. Maintenance Technician Training is conducted at the MDH facility in Mesa, Arizona. Following this training regimen, MDH offers our Basic Mission Skills (BMS) certificate of completion to all students who successfully complete the training.

INTERMEDIATE MISSION SKILLS

IMS Pilot Course

6 Weeks

MDH offers intermediate-level training in our host country for pilots who are BMS complete. Intermediate-level pilot training consists of a night vision goggle (NVG) qualification course, a primary flight environments qualification course, and rockets/missile gunnery training.

Pilot NVG training is two weeks in duration and consists of academic training and ten flight hours. The pilot environment training is one week in duration (per environment) with academics and five hours of flight training (per environment). Finally, the pilot rocket/missile gunnery training is also one-week of live fire training with 10-flight hours and 15 hours of academic training.

IMS Technician Course

The Technician training is taught in country and includes a six-week, all-inclusive course as detailed in Table 17. Students will receive hands-on instruction on intermediate aircraft maintenance techniques, detailed inspection procedures, and weapons proficiency. Students will also receive academic instruction on aircraft systems, including airframe, engine, drivetrain, electrical and fuel systems.

Table 8. IMS Technician Course

Course	Hours/Day	Total Hours	Time Line
Airframe	6	60	Weeks 1-2
Mission Options	6	30	Week 3
Engine (Rolls Royce)	6	30	Week 4

Avionics / Armament	6*	60*	Week 5-6*

Technician training objectives are:

- Airframe: Manufacturer IMS training consists of completion of 100-hour/annual inspections, additional 300-hour inspections, special inspection, conditional inspections on fuselage, landing gear, power train, tail rotor, main rotor, flight controls, engine introduction and controls.
- Mission Equipment: Manufacturer training consists of all inspections on optional equipment unique to customer overall final configuration.
- Engine: Rolls Royce manufacturer trained heavy maintenance course provides extensive information applicable to the 100-hour or 150-hour and 300-hour maintenance activities.
- Avionics: Manufacturer training consists of annual required ELT, Transponder, Pitot and overall avionics updates on the equipment unique to the customer's overall final configuration.
- Armament: Manufacturer training consists of detailed cycle count use maintenance intervals on the armament equipment unique to the customer's overall weapons package.

* NOTE: Due to variation in customer configuration IMS Armament training is 1 week. Additional weeks may be required based on customer final weapon configuration.

Armament training per weapon. - i.e.: FN M3P 1 week, M-134D/H 1 week, M260 rocket pod 1 week. Total IMS Armament training (4 week course).

Following the customer in-country training regimen, MDH offers the Intermediate Mission Skills (IMS) certificate of completion to pilots and technicians who successfully complete the training.

ADVANCED MISSION SKILLS

MDH also offers an advanced-level training opportunity to both pilots and maintenance technicians. Advanced level training consists of NVG gunnery tasks (gunnery conducted under night vision goggles), additional environments (if desired based on mission requirements), and finally our advanced tactics course.

6 Weeks

Maintenance technician training is tailored to support the advanced pilot training and gunnery tasks. It also incorporates advanced maintenance manager training as well as quality control training. Following the customer in-country advanced training regimen, MDH offers our Advanced Mission Skills (AMS) certificate of completion to pilots and maintenance technicians who successfully complete the training.

ADDITIONAL - ARMAMENT TECHNICIAN COURSE (PER WEAPON SYSTEM)

The Weapons Technician training includes handling and maintenance of armament systems, weapons and equipment as part of flight line operations or at the workshop level. Students will learn aircraft flight line operations and replenishment; inspection, removal and installation of weapons from aircraft, disassembly and reassembly of weapon systems, preparation and useof aircraft weapons support equipment. During week 2, students will receive hand-on weapons loading/unloading training, arming safety and troubleshooting procedures during the pilot training live-fire event. MDH academic instructors will supervise and provide hands-on training to correlate classroom instruction with an actual live-fire capstone event as outlined in Table 18.

The Weapons Technician training objectives are:

- Weapons safety
- Loading and unloading procedures
- Identification and inspection of ammunition
- Clearing of weapon systems
- Operational checks
- Aircrew-level maintenance of subsystems
- Care and handling of ammunition

Table 9. Armament Technician Course

Instruction	Hours/Day	Total Hours	Time Line
Basic Weapons	6	30	Week 1
Mission / Gunnery Phase	6	30	Week 2

WEAPONS TECHNICIAN COURSE

The Weapons Technician training includes handling and maintenance of armament systems, weapons and equipment as part of flight line operations or at the workshop level. Students will learn aircraft flight line handling and replenishment; inspection, removal and installation of weapons from aircraft, disassembly and reassembly of weapon systems, preparation and use of aircraft weapons support equipment. During week two, students will receive hands-on weapons loading/unloading training, arming safety and troubleshooting procedures during the pilot training live-fire event. MDH academic instructors will supervise and provide real-time coaching to correlate classroom instruction with an actual live-fire capstone event as outlined in Table 11.

The Weapons Technician training objectives are:

- Weapons safety
- Loading and unloading procedures
- Identification and inspection of ammunition
- Clearing of weapon systems
- Operational checks
- Aircrew-level maintenance of subsystems
- Care and handling of ammunition

Table 10. Weapons Technician Course

Instruction	Hours/Day	Total Hours	Time Line
Basic Weapons	7	30	1st Week
Live Fire Event	7	40	2nd Week

FLIGHT TRAINING DEVICE - FTD (MDH STANDARD OFFERING)

To supplement localized flight training between live missions, MDH proposes a non-flyable Flight Training Device (FTD). This device (Figure 44) will feature the appropriate instrument mission systems panels/consoles, and will enable MD 530F pilots to conduct cockpit familiarization and procedural training:

- The cockpit structure replicates the physical layout of the MD 530F aircraft.
- Cockpit flight controls replicates those of the aircraft, and includes correct grips and switches and functionality.
- Cockpit flight controls actuators is a simplified spring loaded system providing the crew basic control of the aerodynamic model.

- Engine controls and switches are set/pictured in a fixed position representing normal engine on conditions.
- Engine instrumentation for Torque, etc. is provided on a simulated flat-screen display with photorealistic representations of the aircraft instruments.
- The Multifunction Display (MFD) replicates the actual aircraft component in form fit and function.
- The standby instrument system is non-functional and represented by a two-dimensional (2D) decal representative of the actual instrument.
- The cockpit circuit breaker panel is represented by photorealistic representations displayed on flat panel touchscreen displays.
- The FTD cockpit is modular in design and construction capable of being installed in a facility through a 36 inch wide and 80 inch tall doorway.

Figure 44. MD 530G Flight Simulator

APPENDIX A. ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Abbreviations, Acronyms, and Symbols	
°	degree (symbol)
AFS	Aerospace Filtration Systems
aft	towards the rear of the aircraft
AGL	Aviation Gear Lubricant
Alt.	Altitude
amp	ampere
C	Centigrade or Celsius
CFR	Code of Federal Regulations
CG	Center of Gravity
COM	Communication
COTS	Commercial Off The-Shelf
Dia.	Diameter
DC	Direct Current
EMEP	Enhanced Mission Equipment Package
ELT	Emergency Locator Transmitter
ERU	Electromechanical Release Unit
et seq.	“and the following” (Latin)
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FMJ	Full Metal Jacket
FMV	Full Motion Video
fpm	feet per minute
FSR	Field Support Representatives
ft.	foot / feet (unit of measure)
FWD	Forward
gal.	gallon
GCU	Generator Control Unit
GPS	Global Positioning System
GPS/NAV/COM	global positioning system / navigation / communication system
GPU	Ground Power Unit
GSE	Ground Support Equipment

Abbreviations, Acronyms, and Symbols	
HOGE	Hover Out of Ground Effect
hrs	hours
IBF	Inlet Barrier Filter
ICS	Intercommunication System
IFR	Instrument Flight Rules
ISA	International Standard Atmosphere
kg	kilogram
kHz	kilohertz
km/h	**kilometer** per hour
kt	knot
kW	kilowatt
Lat.	Latitude
lb. / lbs.	pound / pounds
LBATS	Little Bird Auxiliary Tank System
LED	Light Emitting Diode
m	meter
m/sec	meter per second
MAS	Master Arm Switch
MCAS	Mission Configurable Armament System
MCP	Maximum Continuous Power
MDH	MD Helicopters LLC.
MEP	Mission Equipment Package
MHz	Megahertz
mi	mile
MIL	Military Standard
MOI	Method of Instruction
mph	mile per hour
mrad	milliradian
MTTR	Mean Time to Repair
N1	Low-Pressure Spool Speed
N2	High-Pressure Spool Speed
NATO	North Atlantic Treaty Organization

Abbreviations, Acronyms, and Symbols	
NAV	Navigation
NM	Nautical Mile
NOTAR®	No Tail Rotor
NR	Main Rotor Speed
NRE	Non-recurring expense
NVG	Night Vision Goggle
NVIS	Night Vision Imaging System
OEM	Original Equipment Manufacturer
oz.	ounce
pt.	pint
qt.	quart
QTY	Quantity
ROM	Rough Order of Magnitude
RPM	Rotations Per Minute
sec.	second
shp	shaft horsepower
Temp	Temperature
TOP	Takeoff Power
UHF	Ultra High Frequency
U.S.	United States
USD	U.S. Dollar
VFR	Visual Flight Rules
VHF	Very High Frequency
V_{NE}	Never Exceed Speed
WOG	Weight on Gear
wt.	weight
$	Dollar, U.S.

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