MD 600N®
SYSTEM DESCRIPTION

3.0 OVERVIEW.

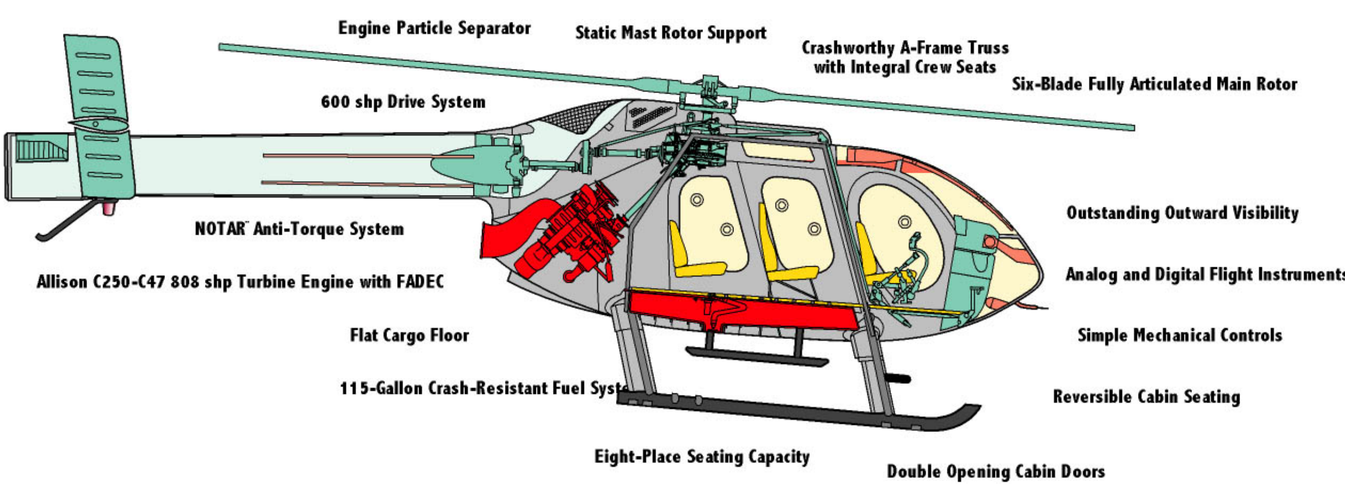
The MD Helicopters MD 600N® is a single turbine-engine, rotary-wing aircraft. The fuselage is constructed primarily of aluminum alloy while the NOTAR® anti-torque system components are primarily carbon epoxy composite structure.

Simplicity, low operating cost and maximum commonality with MD 500® Series helicopters were the primary design criteria for the MD 600N® development.

The main rotor is a fully articulated six-blade system with excellent control and maneuverability characteristics. It shares many rotor system components with other MD 500® Series helicopters. The small diameter of the main rotor also gives the MD 600N® the ability to land safely in confined areas.

Power from the 808 shp Rolls-Royce 250-C47M turboshaft engine is transmitted through the engine drive shaft to the main rotor transmission. The main rotor transmission, through a second drive shaft, drives a gearbox for the NOTAR® system fan. An overrunning clutch between the engine and the main rotor transmission permits freewheeling of the rotor system during autorotation. All drive shafts are fitted with fail-safe couplings at both ends.

The airframe consists of faired sections which provide clean aerodynamic lines. This contributes to good handling qualities, low vibration levels and high-speed flight capability. The air frame structure is designed to be energy-absorbing while maintaining rotor hub integrity. A rigid, three-dimensional truss-type structure increases crew and passenger safety by means of its roll- over structure design.



3.1. Performance Statistics.

The MD 600N® has a cruising speed of 134 knots (248 kph/154 mph). Useful internal load, at maximum gross weight, is 907 kg (2,000 lb) or a mix of internal and external useful loads up to 1179 kg (2,600 lb). Hover Out of Ground Effect (HOGE) at ISA is 1829 m (6,000 ft) and Hover In Ground Effect (HIGE) at ISA is 3383 m (11,100 ft). The rate of climb, at maximum gross weight, is 6.9 m/sec (1,350 feet per minute).

The helicopter has a maximum operating altitude of 6097 m (20,000 ft) and a temperature operating range of -40 degrees C to +52 degrees C. Slope landings of up to 10 degrees are possible, due to the articulated rotor system and landing gear design.

3.2. Airframe.

The MD 600N® fuselage is a semi-monocoque aluminum structure. The crew and passenger compartments are protected by an “A-frame” truss that also acts as an integral seat structure. The aircraft forward belly is a double-walled keel beam that supports the front landing gear struts and provides energy absorption in the event of a hard landing.

The aft cabin belly is also a double- wall design, providing space for a newly-designed, two-cell, crash- resistant fuel system.

The MD 600N® floor is rated at 1350 pounds (not to exceed 115 pounds per square foot) and offers cargo tie down points for virtually any shape of cargo.

The NOTAR® tailboom is carbon composite structure with a horizontal stabilizer constructed of carbon composite and Kevlar. The vertical stabilizers are made of fiberglass.

The forward canopy transparencies are secured with screws, easing removal for maintenance and access to the aft side of the instrument panel.

3.3. Engine.

The engine used in the MD 600N® is the Rolls-Royce 250-C47M gas turbine engine. The 250-C47M produces 808 shaft horsepower, derated in the MD 600N® to 600 shaft horsepower for takeoff and 530 horsepower at maximum continuous operation. Derating the engine extends its service life and reduces maintenance while offering increased performance at higher-density altitudes.

The 250-C47M engine is equipped with a full authority digital engine control (FADEC) unit. This system greatly enhances engine control and provides several features and benefits that reduce pilot workload, improve flight safety and decrease maintenance requirements. A separate hydro-pneumatic fuel control system is provided for manual backup.

The engine control unit records all important engine parameters and provides maintenance information to the customer through a system of maintenance lights. Also available is an optional maintenance package that includes software and hardware to allow downloading of the recorded parameters from the ECU onto a standard personal computer.

Pilot workload is simplified with automatic starting and turbine temperature limiting. Provisions for main rotor and NOTAR® fan load anticipation provides stable rotor speed throughout the flight envelope.

Maintainability is enhanced by removing the requirement for PTG rigging, and by eliminating pneumatic control lines, accumulators and connections. No field authorized adjustments are required. Control system features allow temperature limiting, further reducing the potential for engine damage. The standard analog/digital TOT gauge records one-time exceedances.

The engine compartment is located aft of the mid-compartment, separated by a firewall. Access to the engine compartment is through two doors contoured to the aerodynamic lines of the fuselage. The engine arrangement provides access for inspection and maintenance without the need for ladders or work platforms. An engine compartment fire detection system is standard on the MD 600N®.

3.4. Drive System.

The main transmission in the MD 600N® is a new design based on the proven concepts of the MD 500® Series transmissions. The transmission power limit is 600 shaft horsepower for takeoff and 530 shaft horsepower continuous. It has been designed to achieve a life of 3,000 hours before overhaul, and can be removed from the aircraft without removing any of the main rotor components.

An overrunning clutch transmits power from the engine to the engine drive shaft. The clutch has no external controls and disengages automatically during autorotation and engine shutdown. The engine oil cooler blower is belt-driven off the main drive shaft and draws its cooling air from the air inlet fairing to supply ambient air to the engine and transmission oil coolers and to the engine compartment.

This transmission is common with the MD 600N® and all other new MD 500® Series helicopters.

3.5. Main Rotor System.

Unique to MD Helicopters products is the static mast-hub support system. This hub support system uses a static mast, rigidly attached to the fuselage. All dynamic loads are transmitted through this mast, rather than through the transmission. A separate, inner drive shaft transmits engine torque to the main rotor hub.

This feature offers improved flight control integrity and helps retain rotor system components in the event of a main rotor blade strike. Additionally, this approach allows for the design of a main transmission that is lighter in weight, and can be removed without disturbing the hub or control systems.

The MD 600N® features a six-blade, fully articulated main rotor assembly. The blade retention system is a unique “strap pack” design which provides restraint and allows all three degrees of freedom for rotor blade travel. The system has redundant load paths for an added measure of safety.

Elastomeric lead/lag dampers are standard in the MD 600N® main rotor system. The blades are of all metal construction and utilize nickel abrasion strips to minimize the effects of erosion from airborne particulate matter. The blades are secured to the hub with quick-release lever-type pins that facilitate rapid blade removal.

The main rotor system of the MD 600N® provides handling qualities with direct control responses. In addition, the six-blade design reduces vibrations, providing an exceptionally smooth ride. Transient positive load factors of 3.5 g’s and negative load factors of 0.0 g’s are attainable in the MD 600N®.

3.6. Flight Controls

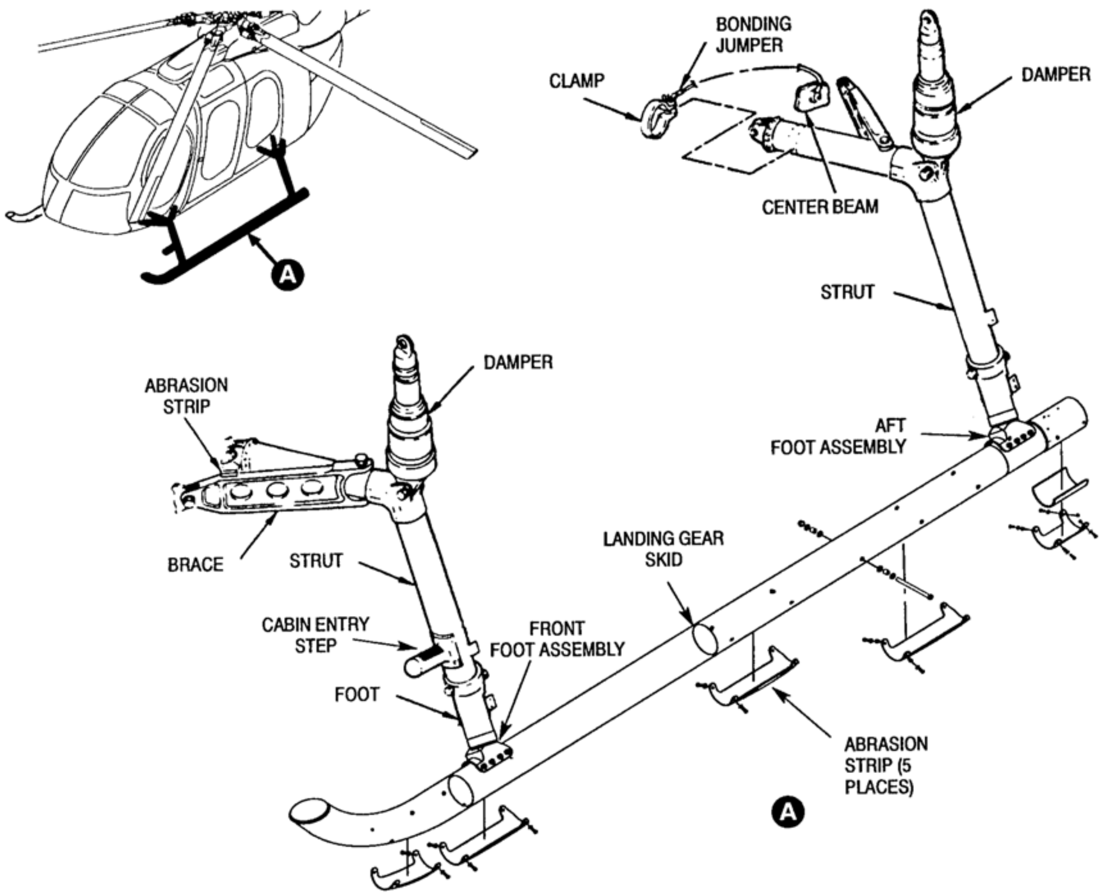
Primary flight controls in the MD 600N® are designed to be lightweight, simple to use and easy to maintain. Equally important, they are designed to eliminate the need for hydraulic controls. All main rotor controls in the MD 600N® are of the push tube type. There are no grease fittings in the controls and required maintenance is minimized.

The anti-torque pedals control vertical stabilizer and rotating thruster motion using a combination of push rods and push-pull cables. The anti-torque pedals are adjustable, fore and aft, through approximately 4 inches of travel to accommodate the fifth through 95th percentile aviator.

Adjustable friction devices are incorporated in the cyclic, collective and throttle controls. In addition, electrical cyclic trim actuators allow flight loads to be trimmed out.

3.7. Landing Gear System.

The landing gear on the MD 600N® is of the skid type with replaceable shoes. The gear is fixed to the fuselage and is not retractable. Aerodynamic fairings cover the struts. Heavy duty, nitrogen-charged landing gear dampers, with a larger piston diameter, are embedded in the fuselage belly section. These act as shock absorbers and provide ground resonance stability. Provisions for ground handling wheels are incorporated on the skid tubes



3.8. Electrical System.

The standard system consists of a 28 volt DC system powered by the aircraft's 200 amp. heavy duty starter generator. The system is rated for 150 amps at maximum continuous power, thus providing the capability to power virtually any kind of configuration. A 28 volt,17 amp., NICAD heavy duty battery is standard equipment. An auxiliary power receptacle inside the right crew door, is also provided for ground APU operations.

3.9. Fuel System.

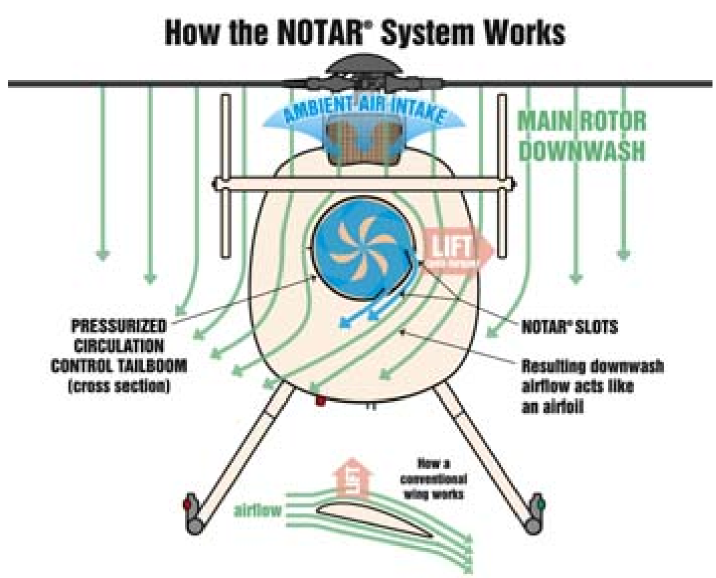
The fuel system for the MD 600N® includes 115 US gallons (435 lb) of fuel in two baffled fuel bladders, located in compartments in the belly section. The fuel system does not require boost fuel pumps, and is designed to FAR part 27 criteria for crash-resistance. Puncture-resistant bladders and frangible, breakaway connections are incorporated to prevent fuel spillage in the event of a hard landing.

An engine suction-type fuel pump is used for fuel transfer to the engine. The suction pump increases system safety by eliminating pressurized fuel lines. In the forward tank area is an ejector-type scavenge pump that transfers fuel to the aft fuel pick-up area. All common turbine fuels are approved for use in the 250-C47M engine.

3.10. NOTAR® anti-torque system description.

The NOTAR® system used in the MD 600N® is derived from an already-proven system used in the MD 520N® helicopter. Total NOTAR® fleet time for all MD Helicopters exceeds 750,000 hours. The concepts, hardware and system operation for the MD 600N® utilize these proven concepts and components.

The function of the NOTAR® system is simpler than it appears. It consists of an enclosed fan driven by the main rotor transmission; a circulation control tailboom; a direct thruster and horizontal stabilizer with two vertical stabilizers.



The NOTAR® system fan, shown here is a 13-blade variable pitch, ducted fan driven by the main rotor transmission through a step-up gear box. Pitch on the fan blades is controlled by the pilot's anti-torque pedals. The NOTAR® system fan pressurizes the circulation control tailboom with low pressure air, part of which is ducted out the slots and part of which exits through the thruster to provide differential anti-torque control as well as directional control.

The circulation control boom, though round in cross section, acts as a vertical airfoil. Lift on the right (anti-torque) side of the boom is created by main rotor downwash which adheres to the boom through the use of two circulation control slots.

This system is self-compensating: When the rotor system is producing higher torque it is also producing higher downwash with resultant lift (anti-torque). At low torque, less down- wash is present and the tailboom produces less lift at a time when less anti-torque is required.

The horizontal stabilizer on the MD 600N® is set at a fixed angle of incidence and attaches atop the tail-boom just forward of the thruster. At each end of the horizontal stabilizer is a vertical stabilizer.

The left and right vertical stabilizers are connected to the pilot's anti-torque pedals (rudder pedals). These stabilizers move through approximately 29 degrees of motion and provide sufficient control power for autorotation. They serve the additional purpose of unloading the thruster during forward flight which permits optimum cruise performance.

In hover flight, the circulation control tailboom provides the majority of the required main rotor anti-torque. During forward flight, the vertical stabilizer, in conjunction with the thruster, provides the required anti-torque and directional control.

The direct jet thruster is located at the aft end of the circulation control tailboom and consists of an exterior cylinder with an open cutaway section which rotates over an interior cylinder. The interior cylinder contains ducts that, when aligned with the cutaway in the exterior cylinder, vary the volume and direction of ducted air from the boom's interior. The resulting variable thrust provides additional anti-torque effect and assists in directional control.

3.11. Interior.

The forward cabin provides space for the pilot and co-pilot in either a right or left-hand command configuration. In the left hand command configuration, with single pilot controls installed, space for two passengers is provided.

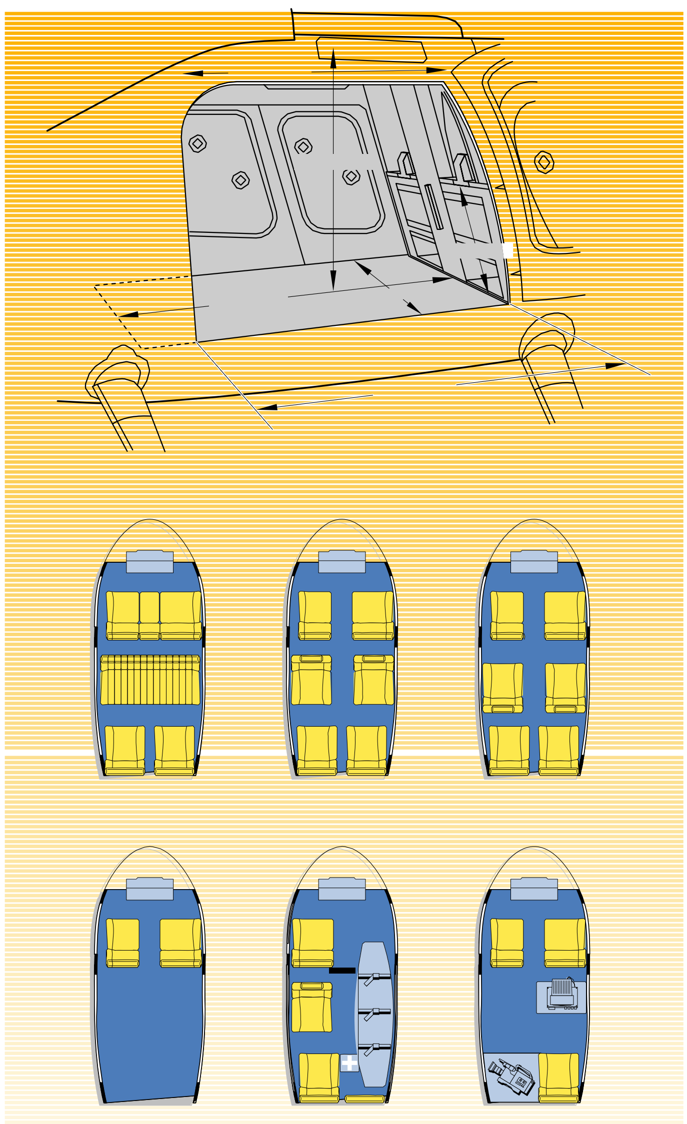
Crew seats are either the cushion type or optionally, a tubular structure with mesh-type covering. Both attach to the energy-absorbing airframe structure. The standard crew and passenger seats have been redesigned to provide improved comfort and more headroom.

The MD 600N® instrument panel, is a “T” configuration providing space for engine and flight instruments in the upper portion and for avionics/communications in the lower portion. This instrument panel incorporates internally-lighted instruments for easier reading. A slant panel that provides additional space for avionics is available as an option, and custom avionics arrangements are also available.

- Digital engine oil temperature/oil pressure
- Slip indicator
- Analog engine torque/turbine outlet temperature
- Fuel quantity indicator
- Digital engine torque/outside air temperature
- Digital volt/ampere meter
- Digital turbine outlet temperature/N1 tachometer
- Digital chronometer
- Airspeed indicator
- Dual tachometer, NR and N2
- Barometric altimeter
- Magnetic compass

3.12. Cabin Doors.

Four removable doors provide access to the aft cabin. The doors, two on either side, are center opening and contain transparent acrylic windows. The mid- door overlaps the aft door for greater safety. The aft door contains a second set of fuselage closing pins. The doors open to provide 157 cm (62 in) of room for loading cargo or passengers. Flight with doors on or off is approved. When the seats are removed, the aft cabin provides 1.83 m (6 ft) of flat floor space. Cargo, passengers or a combination of cargo and passengers may be carried in the aft cabin. Five passengers can be seated in the cabin, and a variety of seating configurations are possible, as illustrated on the facing page. The quick-release, reversible-center seating provides for either club seating or all forward-facing seating.



3.13. Yaw Stability Augmentation System (Yaw-SAS).

MD Helicopters, Inc. has developed and installed as standard MD 600N® yaw stability augmentation system (Yaw-SAS). The system significantly reduces pilot workload throughout the flight envelope, especially in gusty/turbulent weather conditions.

The Yaw-SAS is based on the proven MD 520N® configuration. Yaw rate data drives the right-side vertical stabilizer, which corrects out-of-trim flight. Pilot inputs during maneuvers and level flight a significantly reduced. The left-side vertical stabilizer is not connected to the Yaw-SAS.