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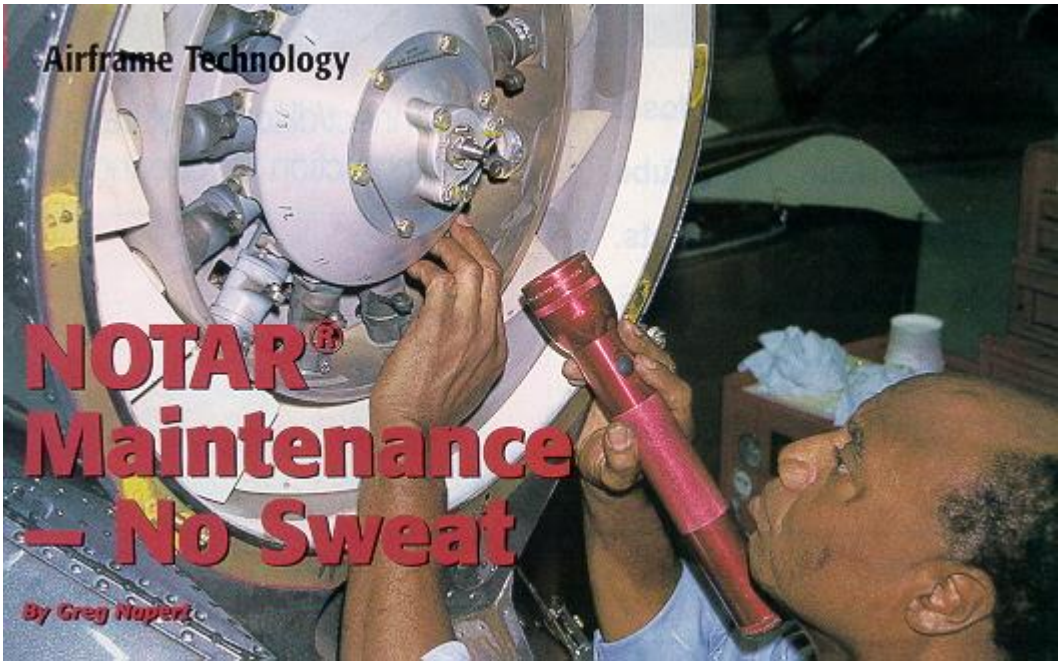
NOTAR Maintenance - No Sweat

By Greg Napert



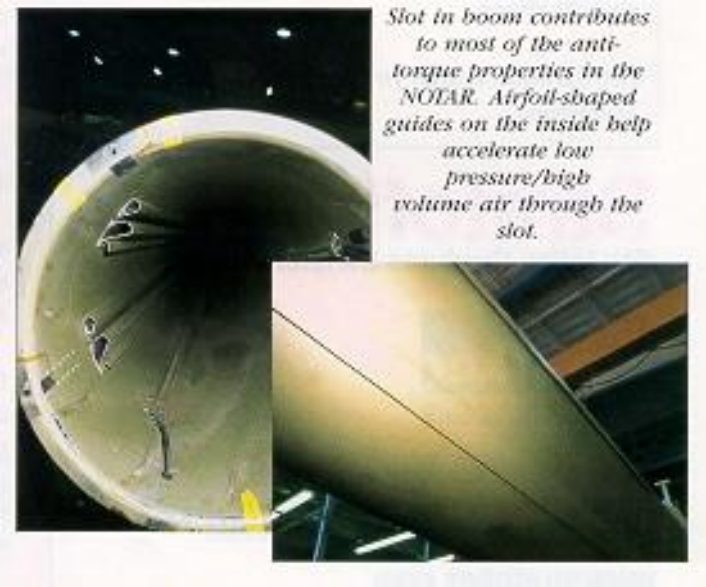
NOTAR (No Tail Rotor) helicopters were introduced in 1991 as a revolutionary way to provide anti-torque to helicopters while reducing noise and vibration associated with conventional tail rotors. Three models have been introduced commercially since 1991: the MD500 Series, MD600 Series, and MD900 Explorer.

Although the new systems appear to have fewer moving parts, NOTAR helicopters actually still have nearly as many similar components including a fan, tail rotor gearbox, and driveshaft. These components, which produce high volume/low pressure air for the NOTAR system still require inspection and maintenance.

The inspection and maintenance requirements, however, are significantly reduced when compared to conventional tail rotors. This is mostly due to the use of revolutionary new materials and designs which have reduced the number of friction bearings and vibration characteristics of the rotating components.

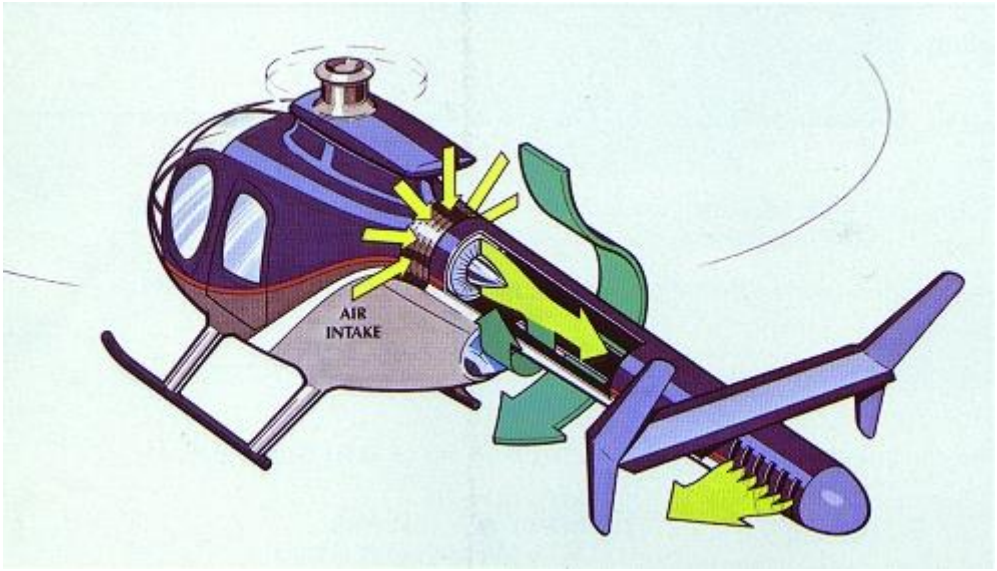
The result is a fan gearbox which is essentially “on condition,” and a fan assembly and tail boom which is warranteed for 3,000 hours.

In order to properly maintain the NOTAR system, it is important to first understand how it works.



How NOTAR Works

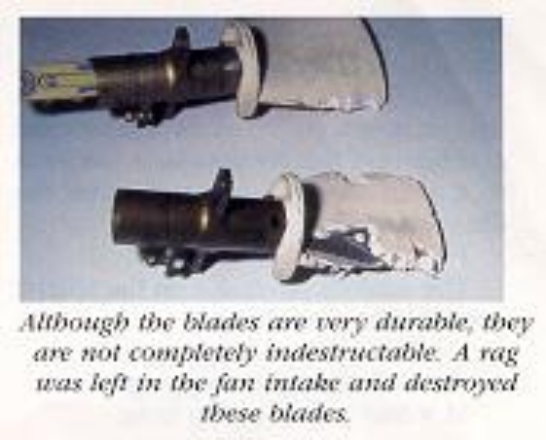
According to MD Helicopters, the NOTAR system uses a fan-driven air circulation system within the tail boom to control the directional heading of the helicopter. The tail boom functions as an anti-torque device.



The directional control pedals in the pilot compartment control the blade angle of the fan assembly, the vertical stabilizers and the thruster. Air flow from the fan assembly through the horizontal slots in the circulation control tailboom blends with the downwash from the main rotor and “hugs” the contour of the boom. This provides the majority of the anti-torque force required in a hover by creating lateral lift that is referred to as “Coanda” effect.

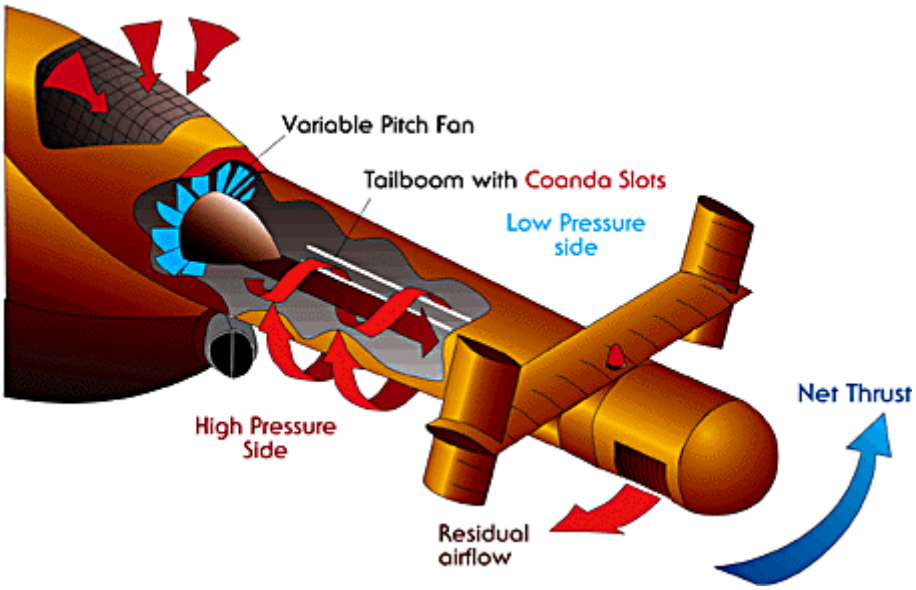
Notice the beige colored torsion/tension straps towards the center of the hub. These substantially simplify the assembly and reduce the number of bearings required. At right, an etched scale allows the technician to properly rig the fan blade angle.

Directional control is then provided by a variable thruster assembly and moveable vertical stabilizers. The variable thruster assembly consists of a stationary thruster cone with two opposing openings, over which is fitted a rotating thruster cone, with a single opening on one side. The rotating thruster cone can be rotated around the stationary thruster cone allowing varying amounts of fan produced air to exit either side – thus providing directional control, particularly in a hover.



Although the blades are very durable, they are not completely indestructable. A rag was left in the fan intake and destroyed these blades.

Moveable vertical stabilizers (called stabilators), whose position is relative to pilot pedal input, provide directional control in forward flight. This enables the fan to be off-loaded and reduces overall power demands.



According to Tom Strocks, customer support representative for MD Helicopters, “The tailrotor output portion of the main transmission normally would drive the tail rotor, but on the NOTAR, it drives a gearbox, which in turn, drives the NOTAR fan. This fan runs at a steady rpm and the pitch of the blades is changed depending on how much air you want it to move.”

The fan gearbox is essentially maintenance free and requires only routine oil changes and inspection for metal in the oil. It is considered “on condition.”

The fan contains thirteen blades, and its pitch is controlled through input from the pilot’s pedals. Strocks explaines that the fan is actually similar to the Fenestron design that Eurocopter incorporates in their shrouded fan tailrotor. However, instead of being mounted in the tail, it is mounted in the rear of the cabin and pushes air aft.

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