



Helicopter Training Must Move Into The Future

Statistics may be interpreted to indicate that helicopters may be inherently safer than fixed-wing aircraft, but current pilot training and certification are two decades behind the technology of today's helicopters. Even as the proven utility and technology of the present-day rotary wing vehicle expands, its advanced tilt rotor cousin promises even more versatility. Now is the time, says the author, for regulating agencies and industry to turn their attention to training the pilots who are charged with operating these technologically sophisticated flying machines.

—
by

Joe Mashman

Helicopter safety has been a concern, even a controversial subject, since the helicopter's first flight. The Wright brothers, as early aviation experts, prophesized that the helicopter would never be a practical aircraft because flight was dependent on lifting rotor blades being propelled by an engine; in the event of a power plant failure "the rotor would cease to turn and the aircraft would drop to its destruction."

Engine-Out Landings Offer Safety

Fortunately, their opinion was proven incorrect. Helicopters are far safer in the event of complete loss of power than their fixed-wing counterparts. The helicopter can glide without power while its rotor spins windmill-like and allows landing in a confined area at minimum forward speed.

The helicopter's unusually safe engine-out landing capability was recognized in 1957, when a Bell Model 47-J single-engine helicopter was procured for the personal transportation of U.S. President Dwight D. Eisenhower.

In spite of this outstanding emergency feature, rotary-wing accidents have continued to share the news with those of fixed-wing aircraft. An objective analysis is required to place helicopter safety in its proper perspective. Based upon a statistical review of U.S. National Transportation Safety Board (NTSB) accident records we can arrive at the following conclusions.

- o Pilot error, as in fixed-wing aircraft, is the predominant cause of helicopter accidents and is comparable in percentage of number.
- o Mechanical drive train, rotor and control systems are an insignificant cause of accidents when compared to other causes.
- o In analyzing aircraft accidents per 100,000 flight hours we can discern an interesting comparison with fixed-wing aircraft. The operating environment, flight and maintenance disciplines, appear to be some of the key elements affecting a large variation in ac-

cident rates. An airline type of helicopter operation can achieve a safety level comparable to fixed-wing aircraft operation.

- o Remote area operations at unproven and non-designated heliports increased accident tendency. When the pilot is operating by himself, without the benefit of supervisory oversight and in many cases the availability of maintenance personnel assistance in daily inspections, the accident tendency is also increased.

Operating Envelope Lures Pilots Beyond Limits

One of the helicopter's unique capabilities, being able to remain airborne from hover to maximum airspeed, provides a measure of safety, yet under certain conditions has resulted in accidents. Variable speed capability has been recognized by civil aviation authorities as a factor that permits safe reduced speed flight under restricted visibility conditions considerably less than those permitted for fixed-wing aircraft. This special use flight condition, known as "special VFR", has no lower limit on forward visibility provided that the pilot continues to have a downward surface reference as a visual cue. Flight under these conditions has been responsible for accidents, the most common ones caused by flight into overhead wires and inadvertent flight into IMC conditions when surface reference is lost. Inadvertent IMC can be hazardous even for an instrument qualified pilot. Only a small percentage of helicopter pilots are instrument qualified and current. A recent aviation study determined that inadvertent penetration of IMC is the primary cause of all fatal aircraft accidents. An analysis of those in the helicopter category indicated that more than sixty percent of the helicopter accident pilots in IMC conditions were not instrument-qualified.

Is Helicopter Flight Inherently Safer Than Fixed-Wing?

The phase of flight where accidents are likely to occur is during take-off and landing. The majority of helicopter flights are of shorter stage length than those of fixed-wing aircraft, resulting in approximately four times as many take-off and landing cycles over a comparable number of flight hours. Yet, helicopter accident rates per 100,000 hours are comparable to those of fixed-wing aircraft for comparable types of operation. Based on risk analysis theory one might conclude that helicopter flight is inherently safer than fixed-wing flight.

Accident Analysis Loosely Defined

In the effort to improve flight safety, there are areas that warrant further study. One of these areas is the need for an in-depth analysis of accidents attributed to pilot error - unlike failures

such as power plant, rotor and drive systems, that can be accurately verified under accident laboratory conditions, pilot error has become a broad, loosely defined category. Some persons believe accident investigators have a tendency to use this accident cause category when no other can be established.

A recent U.S. Federal Aviation Administration (FAA) administrator initiated a safety policy built on a "back to basics" concept. Such an approach is particularly applicable to helicopter pilot training and certification requirements. Current U.S. training and certification requirements date back to 1946 when the first U.S. civil helicopter was certified.

At that time, three pilots, two from the helicopter manufacturer's flight test staff and the U.S. government certification agency's engineering test pilot, sat down together and over a period of three days established the training and certification requirements for this new type of aircraft. The task of developing these criteria was truly a guess in the dark, considering that no civil experience information and accident cause/ factor data existed. The task was further complicated by an unclear picture of who would purchase the helicopter and how it would be used.

Training Lags Behind Technical Progress

Comparison of the original pilot training and certification requirements to current ones shows that there have been no significant changes. What small changes that were made did not go through the NPRM process that would have provided inputs from operators, manufacturers and other interested parties. However, in reviewing NTSB helicopter accident statistics compiled over a number of years, it is apparent that a significant percentage of accidents attributed to pilot error may be the result of inadequate FAA training and certification requirements, since between 50 percent and 60 percent of all helicopter accidents are so designated. U.S. military services, not immune to high pilot-error accidents, have continually updated their pilot training programs in response to accident statistical data.

Between the mid-1950s and early-1960s civilian operators and helicopter manufacturers recognized the problem and began supplementing FAA's requirements with additional training. In addition, operator organizations such as Helicopter Association International began providing updated training facts in safety manuals along with periodic advisory notices from information obtained from experienced operators and manufacturers.

In reviewing NTSB's accident data, it becomes apparent that a substantial number of accidents directly attributable to pilot error continues to occur. Closer examination of these accidents seems to indicate that lack of training is a prime suspect. These accidents continue to occur at approximately the same percent

age rate over the past decade as shown in the following NTSB published data.

Pilot error constituted 53 percent of all accidents by cause/factor. Of these, the following percentages apply:

<u>Type of accidents</u>	
Rollover	17.8 percent
Collisions with ground	
controlled	15.2 percent
uncontrolled	14.2 percent
Hard landings	14.2 percent
Collisions with wires and poles	3.7 percent
	75.1 percent

Training to prevent the above types of accidents has been included in manufacturers' and experienced operators' training programs.

Also included in these training programs are procedures for coping with system malfunctions. Recent knowledge of how to cope with meteorological conditions - turbulence, windshear, downbursts, and the effect of heavy precipitation on rotor lift and profile drag - are vital pieces of information to helicopter pilots and should be considered mandatory knowledge prior to certification.

Introduction of tilt rotor aircraft, along with a new generation of helicopters, demands that FAA and its counterparts in other

countries work with industry and users to address the need to update pilot training and certification to meet the technical demands of these advanced aircraft. The potential exists for these two categories of aircraft to become a symbol of aviation safety.

Early aviation pioneer and founder of Bell Aircraft, Lawrence D. Bell, prophesized upon the receipt of certification for the first civil helicopter in 1946, "Man wants to fly like a bird and not like a bat out of Hell." The helicopter makes this possible. -

About the Author

Joe Mashman earned his pilot certificate in 1938, and in 1943 he joined Bell Aircraft as a test pilot for military aircraft, including the Aircomet P-59, the first U.S. jet.

Mashman made the change to rotary wing in 1945, after the company developed its experimental helicopter. He was one of two test pilots involved in the certification of the first civilian helicopter, Bell Model 47.

Before retiring in 1983 as vice president of special projects, the rotorcraft pioneer had accumulated 21,000 flight hours, 16,000 of them in rotorcraft. His rotary time includes experience in helicopters manufactured in several countries, including the Soviet Union. He has flown the heads-of-state of several nations and U.S. cabinet members. He served as personal pilot and special advisor to U.S. President Lyndon B. Johnson.

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