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Whither the Single-Engine IFR Helo?

By By James T. McKenna | June 1, 2015
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A modern Gazelle. *Photo by Davide Olivati*

Forty years ago, Vought Aircraft and Sperry collaborated to produce the SA-341 IFR Gazelle. This first IFR-certified single-engine helicopter was a breakthrough.

"This new world of single-pilot IFR represents the removal of one of the last major barriers to realizing the full potential of commercial helicopters," wrote A.G. Bud DeLucien in the July/August 1975 issue of *Rotor & Wing*.

But new barriers were thrown up in 1999, when the FAA changed its certification guidance to impose stricter reliability requirements on new helicopters and modifications to existing ones. The new guidance stopped the development of single-engine IFR helicopters cold.

Now industry leaders are trying to fix that by persuading the FAA that reversing the 1999 change would substantially improve helicopter safety. Making it easier to equip more single-engine helicopters for IFR flight would have numerous safety benefits, proponents of the reversal argue. Foremost among the benefits would be eliminating the temptation for lone pilots to try to fly under bad weather and risk death by getting disoriented and losing control or colliding with terrain.

"It comes down to evaluating how we improve the overall safety of the product in the field," said Walter Desrossier, vice president of engineering and maintenance for the General Aviation Manufacturers Association (GAMA). "Today, the standard is set at such a high level that we are not delivering IFR-certified Part 27 aircraft at all."

Vought Aircraft and Sperry collaborated in 1975 to produce the SA-341 IFR Gazelle, the first single-engine IFR-certificated helicopter

GAMA is working with AHS International, the Aircraft Electronics Association and the Helicopter Association International to persuade the FAA to rectify that. They plan to present a consensus white paper arguing their case to the FAA this month.

In 1975, DeLucien, a *R&W* contributing editor, saw the IFR Gazelle as the midpoint in a five-step "natural progression to full utilization of helicopters." The first two steps were the introduction of two-pilot IFR in medium/heavy twins and the FAA's adoption of rules—in the form of Special Federal Aviation Regulations (FAR) Part 29—to permit wider use of helicopter IFR.

Following the single-engine IFR certification, he wrote, would come "the widespread implementation of off-airway IFR routings and special airspace for helicopters" and "increased sophistication in equipment and greater aircraft capability."

Things didn't work out that way.

Vought sold "quite a few IFR Gazelles, 25 or 30," said Jake Hart, the flight test pilot who worked on the project. Other manufacturers followed the lead of Vought and Sperry. Some Bell Helicopter 206L LongRangers were modified and certified for IFR flight. In the mid-1980s, Aerospatiale collaborated with the avionics maker Sfim on a one-off IFR AS350 for Black Beauty Coal of Indiana.

But when the successor company Eurocopter went back to the FAA to discuss broadening the supplemental type certificate (STC) for that AS350 to cover more aircraft, the aviation agency said the manufacturer would have to modify the AStar's design to reduce the consequences of component failures in IFR flight, Hart said. Eurocopter opted not to take on the cost of that work.

Certainly, wider adoption of single-engine IFR was stymied by the lack of an IFR route network for helicopters.

But the 1999 change was devastating to single-engine IFR development. The change came in the FAA's revision of Advisory Circular 27-1, its guidance on how to comply with Federal Aviation Regulations Part 27. That part prescribes airworthiness standards for Normal category rotorcraft with maximum weights of 7,000 pounds or less and nine or fewer seats, including most single-engine helicopters.

Cool City Avionics head Jim Irwin (left, with Jeff Kelly of Kelly Aerospace Power Systems) gained an appreciation for IFR at Fort Rucker in the 1960s. *Photo courtesy of Cool City Avionics.*

The agency had previously revised guidance for Part 23, which covers fixed-wing aircraft in the Normal, Utility, Acrobatic and Commuter categories. The FAA reduced the reliability levels, or design assurance levels, that a manufacturer or modification shop had to demonstrate to get a type certificate or STC.

Prior to the change, these smaller airplanes had to demonstrate the same levels as big airliners. But FAA officials concluded that the higher standards didn't correspond to the operating environment or experience of general aviation airplanes and smaller commercial ones. They also concluded that the higher standards were not improving safety, as they explained in the introduction to AC 23.1309-1C (which revised the standards).

"Since most aircraft accidents are caused by something other than equipment failures, increasing the reliability of the installed systems to try to improve safety will have little positive effect on reducing aircraft accidents when compared with reducing accidents due to pilot error," the AC said. "If systems are required to meet safety and reliability parameters much greater than the operational environment, the cost of the improved systems are driven to a level that makes them impractical."

The FAA went in the opposite direction with the AC 27-1 change, setting "numerical means of compliance for the light helicopter systems safety assessment" on par with those for jumbo jets. For example, under the new guidance, to demonstrate that the failure of a system on a light helicopter was "extremely improbable," an applicant for a type certificate or STC had to show that it would not suffer a single failure in one billion flight hours. To achieve that, some systems on an IFR light single would have to be triply redundant. Such an aircraft would be prohibitively expensive to build and operate.

The impact of the AC change would not become clear for decades to innovators like Jim Irwin, president and CEO of Cool City Avionics of Mineral Wells, Texas. He has been working on developing autopilots—key components of an IFR kit—since he went to work for Mitchell Industries in Mineral Wells in 1967. He has worked with Hart on a number of occasions.


Equipping the IFR helicopter keep it simple

In 1973, this magazine saw great promise in bringing IFR capabilities to helicopters, as Barney Green testifies.

Irwin acquired his commitment to instrument flight when he was in the U.S. Army serving as an instructor pilot at Fort Rucker in what the Army called the Tactical Instruments course. "We did a lot of instrument flying in Alabama and up to Georgia," he said. "It was clear back then that instruments was a good, safe way to go."

In 2004, Irwin formed Cool City to pursue development of low-cost avionics, including an IFR-capable helicopter system. Last year, Cool City received an STC for the installation of its family of six autopilots in Robinson Helicopter R44s. But Irwin said he was surprised to discover how hard it was to get IFR certification for a single-engine helicopter.

"I didn't realize how serious the changes were," he said. "I was still thinking the biggest impediment was cost."

FAA officials discussing the matter with representatives of the joint association effort say they want to see a clear safety case for changing AC 27-1 back. The proponents think they have.

Today, major contributing causes to helicopter accidents include inadvertent flight into instrument meteorological conditions (IIMC) or controlled flight into terrain (CFIT) while attempting to fly under weather conditions remain. This is especially true for accidents involving single-engine rotorcraft.

From 2001 to 2013, data gathered by the International Helicopter Safety Team shows, there were 194 accidents worldwide involving single-engine helicopters, IIMC or CFIT and low-level flight to avoid weather. (Fifty-seven occurred in the U.S.) Of the worldwide total, 133 were fatal accidents that killed 326 people. None of the accident helicopters were IFR-equipped.

For multi-engine Part 27 helicopters and larger (Part 29) rotorcraft in the same period, there were 54 accidents worldwide related to IFR-certified aircraft with IIMC or CFIT while flying low due to bad weather. Only seven involved flights under IFR rules; 40 involved helicopters flying VFR. Eighty-five percent (46) were fatal. Twelve of the total occurred in the U.S.

In most cases the multi-engine rotorcraft were IFR-equipped, the proponents said, but often the pilot had no instrument rating, was not current or had minimal instrument experience and was not confident in IFR procedures. In addition, most of the accident rotorcraft were models with older, "steam gauge"-style IFR instrumentation. These require a much greater degree of skill to interpret than modern displays, and therefore require a greater degree of practice in order to remain proficient.

Flight test pilot Jake Hart, who worked on the IFR Gazelle, says IFR's safety benefits are "pretty clear."

That data only shows a portion of the problem, the proponents said. It does not capture the near misses of obstacles and terrain that occurred trying to avoid weather, or the near losses of control that occurred attempting to exit IIMC.

Hart said he believes the safety case is evident.

“If people look at it intelligently, and look at the hazards, it’s pretty clear that IFR would be a major safety advantage,” he said.

Another reason to revisit the AC now, the proponents said, is that systems and safety equipment that were unavailable in 1999 “are now readily available at reasonable cost, thanks largely to the strength of the small airplane market.”

“These systems are mature, highly reliable and dramatically reduce pilot workload while markedly increasing a pilot’s situational awareness,” they said in the draft white paper.

Airbus’s AS350 was a relatively early implementer of single-engine IFR in the mid-1980s. *Photo by Ernie Stephens, Editor-at-Large*

The trade associations don’t want to stop at changing the AC back. Their draft white paper outlines other steps for the agency to take.

They urge the FAA to “harness advances in technology to enable a practical certification of safety-enhancing IFR type certificate or STC kits for new and existing Part 27 single-pilot, single-engine helicopters."

They want to the agency to “continue advocating for the development of low-level IFR helicopter infrastructure and Point-in-Space (PinS) approaches to areas of helicopter interest by leveraging ADS-B technology and advanced aircraft system.”

They also want it to advocate for “continued government and private investments in improved and expanded weather reporting and on-board detection technology.”

Lastly, they call for “an industry-wide campaign to increase the regular and routine use of the IFR infrastructure with the goal of reducing the overall risk of helicopter flight operations.”

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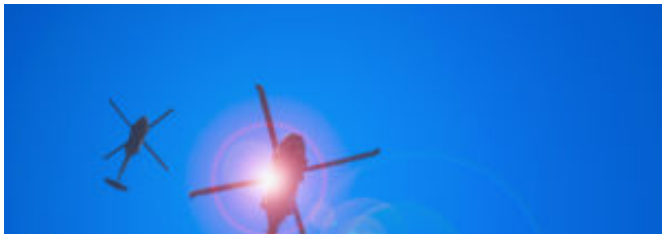

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