Sand and Distance Strained Copters

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Federal and civilian aviation experts agreed yesterday that the attempt to rescue the U.S. hostages from Iran had a reasonable chance of success from an aviation point of view, but that it pushed the margins.

The experts, emphasizing they had no more information than anyone else, said the mission as described by White House and Defense Department officials was within the technical capabilities of the Sikorsky RH53D helicopters used, but apparently was flown under conditions that would stretch the reliability of the machines.

Further, they found no technical problem with Defense Secretary Harold Brown's statement that a repeat mission of the same type would be unlikely for at least six months, partly because of a reduced ability for helicopters to operate in a high-temperature summertime desert.

"A helicopter is a marginal performer anyway," a federal expert with substantial knowledge of the RH53D said. "It makes up for its lack of performance with agility"—the ability to land or take off on a dime.

However, he and others familiar with the RH53D agreed, agility is purchased with a high price in reliability and performance and a substantially reduced payload from that of ordinary airplanes driven with similarly powerful engines.

Two RH53D helicopters were crippled with mechanical failures and a third, suffering instrument failure, had to turn back during the aborted rescue mission. That left the commander with five helicopters, one less than the Defense Department said was needed to successfully complete the mission.

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The helicopters had flown 500 miles from the aircraft carrier Nimitz to a landing zone in the Iranian desert. The published range of the RH53D is 596 nautical miles (about 686 miles).

Nonetheless, 500 miles is a long trip in a helicopter, as Secretary Brown said. Experts looking at the report of the mission found two factors quite apart from normal wear and tear on a long flight that could have increased mechanical stress on the helicopters.

The particularly significant facto was sand. The pilot of the helicopter that turned back, it was reported, became disoriented in a sandstorm. Assuming all the helicopters went through that sandstorm, it could have created substantial mechanical difficulty.

The RH53D is equipped with two General Electric T64 turboshaft engines. Turbine engines do not like sand. If it gets into compressors or other moving parts it substantially reduces efficiency and performance. The RH53D is equipped with air cleaning devices, but the best of those devices could encounter trouble in a major desert sandstorm.

Two helicopters were forced out of the mission by hydraulic problems. It could not be learned whether sand was a factor, but the hydraulic systems operate off the turbines.

Te second factor, considered less significant, is the assumption that the helicopters were operated close to the ground to avoid detection by radar. Helicopters are somewhat less efficient, and thus more subject to wear and tear, at sea level than at 5,000 feet, the experts said.

A helicopter's rotor is simply a moving wing. For a helicopter to stay aloft, the wing must change its angle of attack into the air as it rotates. While it is moving toward the rear—the right side of a forward-moving craft—the rotor blade has to be relatively level. As it moves to the front and left of the ship, it must offer a much blunter edge to the air to maintain lift. Thus the rotor is not only going around, but its blades are also constantly changing pitch.

That necessitates a complex, heavy gearbox and a transmission.

Further, to prevent the body of the helicopter from spinning along with the rotor, side forces have to be applied through a tail rotor, which has to be geared and coordinated with the main rotor. More complicated heavy gears and transmissions are needed.

The controls for all this include multiple cranks and pulleys, which also are heavy, plus hydraulic systems to move some of those cranks and pul-

United Press International

This is a Sikorsky CH53 helicopter, similar to the Navy version that took part in the Iran rescue attempt.

leys. Thus, when a helicopter develops hydraulic trouble on the ground, it is out of business.

"Helicopters," an expert said, "are expensive to operate because they are heavy; they have high maintenance requirements and they have to spend a lot of time on the ground." Many helicopter parts have relatively short lives because they are constantly subject to rotation and vibration. All the experts contacted said they assumed that the eight RH53Ds dispatched had received first-rate maintenance, and they praised military maintenance programs generally.

But most agreed it is simply not possible to guarantee trouble-free operations for that long a flight in those conditions.

The question of whether the helicopters could be used in summertime desert heat "is just another version of aviation's old density-altitude problem" said C. O. Miller, aviation expert and former chief investigator for the National Transportation Safety Board.

All aircraft fly more efficiently in cool weather, because the cold compresses air molecules, which means that a wing (or rotor blade) encounters more air per square inch than in warm weather. Thus, the cooler the air, the more "lift" an aircraft receives per square inch. Engines are also more efficient at cool temperatures.

Regular airplanes can simply use longer runways in summer than in winter and take longer to gain altitude. With helicopters, the problem is more critical because they lift straight up.

According to manufacturer Sikorsky the Navy has 30 RH53Ds, the last purchased in 1975. The Marine Corp and the Air Force use other versions of the H53, and various other models have been sold to Germany, Australia, Israel and Iran.

The RH53D delivered to the Navy was equipped for minesweeping, fitted for a pilot, co-pilot and minesweeping team of two, plus tons of equipment. In a normal troop-carrying configuration the H53 seats 37 people. A maximum configuration permits seats for 56.