CDR Frank Lawler Shelly, USCG
The HH-52A Helicopter

On April 14, 2016 Coast Guard helicopter 1426 was dedicated at the National Air and Space Museum, Steven F. Udar Hazy Center in Chantilly, Virginia. The HH-52A helicopter with over 15,000 lives saved in its twenty-five years of service has the honor of having rescued more persons than any other helicopter in the world at the time of its retirement. This little helicopter performed astounding feats in thousands upon thousands occasions. It became the international icon for rescue and proved the worth of the helicopter many times over. It is the helicopter that truly made rotary-wing aviation the backbone of Coast Guard aviation.

The HH-52A became reality because of the outstanding technical and management skills of CDR Frank Lawlor Shelly, USCG, Coast Guard Program Manager, from the time of inception to the full operational deployment of the aircraft.

Procurement

In 1961 a re-evaluation of Aviation requirements was directed in conjunction with a Roles and Mission study. The Coast Guard Aviation Development Master Plan was initiated. Basically the aviation plan determined the requirements to perform the projected operational missions of Coast Guard aviation and the proposed funding to provide almost concurrently for (1) the continued acquisition of aircraft needed to replace over-age aircraft; (2) the acquisition of additional aircraft to enable the Coast Guard to accomplish the mission into the future: (3) the necessary modification of existing facilities; and (4) the establishment of those facilities required to accommodate the aviation program; (5) the personnel to man them. The initial elements of cost were contained within the "Acquisition, Construction, and Improvement" appropriation but emphasis was placed on the continuance of the program into future budget years to assure a truly modern fleet supported by adequate facilities and personnel.

The first six of a scheduled 96 HUS-1G helicopters, recommended in the initial plan, were acquired in 1959. In September 1960 two HUS-1G helicopter were lost within an hour of each other while in hover during an attempted SAR pickup. The cause was not determined. The Coast Guard had not been satisfied with the HUS-1G and as a result of the Tampa Bay incident the Coast Guard decided that they were not going to purchase additional HUS-1G helicopters. The search for a Medium Range Helicopter capable of fulfilling the Coast Guard missions began. Options were limited. The Air Force had limited interest in helicopters at the time; the Army was having multiple development problems with the HU-1 Huey; and the Kaman H-2A Seasprite developed for the Navy was severely underpowered at this stage of development. The thinking at the time was that the Boeing Vertol H-46 and the Sikorsky SH-3 were too large.

Sikorsky had developed the S-62 designed as a commercial passenger helicopter. Because of size the operational cost per seat mile was high resulting in limited sales. Aware that the Coast Guard was not constrained to purchase milspec, Sikorsky approached the Coast Guard offering their S-62. The aircraft was the desired size, it was amphibious, the airframe was modeled on the proven S-61, and on paper, with modification it would meet Coast Guard requirements. The Coast

Guard had an immediate need for a suitable helicopter and Sikorsky wished to sell the S-62. As a result, Sikorsky agreed to finance the test program, fuel, and provide maintenance and logistic support if the Coast Guard would arrange for the use of the Navy's Patuxent River facilities and provide a test pilot. The Coast Guard was to draw up the test procedures and provide Sikorsky an outline of the test program. The Coast Guard accepted the offer.

The Coast Guard Office of Aviation Units requested the then LCDR Frank Shelley, a graduate of the Navy Test Pilots School be assigned as the Coast Guard Program Manager. Upon arrival at Headquarters LCDR Shelly was briefed on the Sikorsky offer and it was explained that an outline of a test program would be needed for forwarding to Sikorsky and time was of the essence. LCDR Shelley consulted with Headquarters personnel in a review of both the needs of the Coast Guard and the capabilities of the S-62 as stated by Sikorsky. Mission requirements were reviewed, updated, and established. It was determined that if the S-62 met the Sikorsky performance claims with several modifications to fit the Coast Guard mission the helicopter should be purchased.

LCDR Shelley reported to the Naval Test Facility at Patuxent River, Maryland in September of 1961. The required tests for the S-62 had to be conducted with two different divisions of the Test Center; Flight Test and Service Test. Flight Test verified contractor performance and control claims and checked them for specifications and contract compliance. Service Test was nuts and bolts. What did it take to maintain the aircraft? How often did aircraft parts break? How easy was it to fix? And did a particular mechanical fix work as intended or not? Rivalry between divisions was bitter and during this same period the Test Center pendulum had swung to an adversarial relationship with all manufactures. Thus Shelley had three entities to deal with and they were not cooperating with each other.

LCDR Shelly's first order of business as the Coast Guard Program Manager displayed his innate leadership ability and persuasive people skills. The challenge: -- how to divide up one aircraft between the two divisions. Since Flight Test's check of handbook data was easier in calm air, it was agreed that they would take the morning period and Service Test would fly the afternoons. Shelley would fly any flights for which the individual divisions could not provide test pilots. On the first "Data Day" Shelley was on the flight line well before 0800. When the Sikorsky crew appeared to get things ready ahead of time, Shelly was leaning on the helicopter looking impatient. When the Flight Test people showed up just before 08:00 everyone was standing around looking impatient. This little exercise continued for several days. It proved to be highly effective. Each time all parties continued to show up earlier until it was finally agreed that "morning" was at 0600 which was as early as the Test Center directives permitted without specific exception.

As a result of the early start hour, after servicing and removal of special test gear, the helicopter became available at Service Test by mid-morning rather than the afternoon. Service Test in turn was on the flight line early so they could give the helicopter to Sikorsky by 1300 and finish their flight reports for the day. The Sikorsky crew then took the helicopter and did whatever progressive maintenance was required. When Sikorsky finished, Shelly would go out and fly max mission profiles and hover transitions which usually got him back after quitting time. It was Shelly's people skills and his work ethic that lit a fire under all parties. The program was one of

the fastest moving ones ever completed at the Test Center and all the previously warring factions took pride in what they were doing. They saw Shelly at first light and saw him when they went home. Initially the hierarchy at Sikorsky was upset about the overtime that they were paying out but after two weeks they realized something good was happening and from that point on overtime was not a problem.

The S-62, except for the aluminum fuselage/hull modeled on the S-61/H3, was primarily made up of previously proven parts. All dynamic components were S-55/HO4S. The final three planetary stages in the reduction gear box were from this source. An upgraded engine, the GE-CT-58 engine was installed to increase performance. This was the same as the pairs in the S-61/H-3 and had proven to be reliable. The rotor assembly was design limited to 730 shaft horsepower so the engine was de-rated. This gave the helicopter an extra 500 HP worth of air capacity on the front end which enhanced operations considerably. The Coast Guard HH-52A also differed from the commercial S-62A in that a three channel Automatic Stabilization Equipment (ASE) was installed. The ASE was a 60 percent scale model of the one in the S-61/H3, The proposed night hover system that was used in the HSS-1 did not prove to be satisfactory. An electromechanical hover/transition to hover system was substituted for evaluation. This also proved to be unsatisfactory. LCDR Shelly, utilizing his extensive knowledge of helicopter aerodynamics developed a manual input program which allowed the pilot to transition from flight to hover at a desired altitude and location without reference to the water or terrain. CDR Shelley referred to this program as the "Beep to Hover." This maneuver alone enabled the HH-52A to save many lives.

There were difficulties encountered and corrections which were made. The Test Program was satisfactorily completed in December. The final Test Reports were made up and the NATC chain of command signed off on it. Enclosed was a list of additional items that should be corrected before it was purchased. A relationship between LCDR Shelly and Sikorsky had developed to the point that all items, some major, were corrected without objection and a contract for 99 HH-52 was initiated in January of 1962. The test program from initiation to contract was less than three months. It was CDR Shelley's show from start to finish. One only has to compare this to the time required for future Test and Procurement Programs to recognize the extraordinary leadership, management, and technical skills of LCDR Shelley.

Originally designated the HU2S-1G it became the HH-52A. It had a rotor diameter of 53 feet, a range of 474 miles and a top speed of 109 mph. It was an extremely flexible rescue aircraft that could fully perform missions with a minimum crew. The helicopter was well suited for night and all-weather flight. The HH-52 had a hydraulic hoist and carried a rescue basket. The cabin could accommodate up to ten passengers or six litters. It was fully amphibious and was equipped with a removable foldout rescue platform that looked like a large extended step.

During 1962 LCDR Shelley was given periodic assignments at Sikorsky during which he monitored progress and made inputs as to cockpit configuration, rescue equipment and electronics installation. During one of these assignments LCDR Shelley and Opie Blanchard, a Sikorsky test pilot, put together a 10 flight transition syllabus that would be used to provide a standardized transition of Coast Guard aviators into the HH-52A.

In January of 1963 Shelley flew the first four acceptance tests 1352 to 1355. Remarkably the period between inception and operational assignment was only 16 months.

On 16 January LCDR Shelley, Opie Blanchard from Sikorsky and Bill Kime, also from Sikorsky, proceeded to the Salem air station and transitioned all of the assigned helicopter pilots using the 10 flight syllabus that Shelly and Blanchard had developed. Salem went operational in the HH-52 on the 29th. On 12 February, Shelley and Blanchard proceeded to New Orleans and transitioned all pilots using the 10 flight transition syllabus. New Orleans went operational in the HH-52 on 22 February. On the first of April Shelley and Blanchard and Win Corley transitioned the St. Petersburg air station into the HH-52. I have included this sequence of events because, with the benefit of time and research, it is clear that the syllabus developed and executed by Shelley and Blanchard was the beginning of a new training/transition policy in the Coast Guard. The training/transition was both standard and efficient, provided by a highly qualified team, and transition and training no longer varied by Air Station. On the basis of the early results a formal transition program was set up. This was placed under the direction of Win Corley, an excellent choice, with many helicopter hours coupled with both instructor and management skills. The success of this program led to the establishment of the BOTU at Air Station Savannah 1964 and transferred ATC Mobile when it became operational in 1966.

Note: "Beep to Hover" is a term often used when speaking of a rescue performed by the HH-52A: This is a simplified explanation of "Beep to Hover"

> LCDR Shelly developed a procedure that utilized constant engine RPM in conjunction with translational lift. At cruising speed, translational lift, generated from the rotor "disc", is a significant portion of the lift holding the helicopter up. If the rotor disc is tilted slightly back during cruise you lose some of the forward thrust vector and the helicopter slows and as a result you lose some of the translational lift. The turbine governor keeps the rotor turning at the same speed and the rotational part of the lift remains constant. You do however have a decrease in overall lift and the helicopter starts to descend. By setting up an approach pattern such as a teardrop approach and predetermine desired altitude and airspeed at specific points in the approach to arrive at a desired location, the approach was begun. Putting a little "beep" of back trim on the electric trim button in level flight would start the deceleration/descent. Then as each check point "window" was reached, another "beep" kept the maneuver going. It was a pretty much hands off, feet on the floor with maybe a withheld "beep" or a power tweak to hit each window. The maneuver was used at night and in Instrument conditions. With any reasonable weather conditions, whatever it was that you wanted to look at was in front of you when you got to a 20 foot radar altitude and zero airspeed.
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> With a modern electronics suite and automatic flight control systems this procedure is both primitive and not necessary. At the time, however, it greatly expanded the operational capabilities of the aircraft and resulted in the rescue and saving of many lives that otherwise would have been lost.

John "Bear" Moseley

CGAA Historian