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Sikorsky's S-61s — Pt 1, Naval Sea Kings



The Navy retired the S-61/UH-3H Dec. 11, 2009, making the Sea King the longest-serving helicopter in US Navy history. (Navy photo by Kelly Schindler) [Unless indicated, all images property of Igor I. Sikorsky Historical Archives]

When the twin-turbine S-61 Sea King first flew in 1959, it gave the US Navy a big, fast helicopter to search out and destroy Soviet submarines at night and in bad weather. It also gave Sikorsky Aircraft military and commercial products that dominated medium-size helicopter markets for decades. Naval S-61 Sea Kings assembled in Stratford and their cousins license-built in the United Kingdom, Italy, and Japan ultimately equipped air arms from Argentina to Qatar. Sea Kings spun-off stretched S-61Rs that extended the rescue reach of the US Air Force and Coast Guard and civil S-61L/Ns that hauled passengers on routes the world over. Short-body S-61Vs – White Top VH-3Ds -- still carry the President of the United States, and S-61 technology and lessons-learned shaped Sikorsky's next-generation Seahawks and Naval Hawks.

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Sonar-dipping S-55 and S-58 (Navy HO4S and HSS) helicopters in US Navy antisubmarine warfare (ASW) squadrons of the 1950s were limited by their reciprocating piston engines. Though the HSS-1 Seabat first flown in 1954 had the lifting power to carry sonar and a torpedo for the hunter-killer mission, the weapon came at the cost of fuel and endurance. Sub-hunting hover also shortened piston engine life, and an engine failure put the helicopter in the ocean -- S-58s without floats sank quickly.

Sikorsky general manager Lee Johnson wrote in the January 1958 edition of *Sikorsky News*, "It is the evolutionary transition to turbine power which holds special significance for all of us." Sikorsky designers offered the Marine Corps a turbine option on the big S-56 in 1950. In 1954, the experimental S-59 (Army XH-39) set world speed and altitude records with a 400 shaft-horsepower (shp) French turboshaft. General Electric (GE) in the US received a Navy contract in 1953 for its own lightweight turboshaft. The compact, 1,050 shp XT58 run in April 1955 weighed just 250 lb. By comparison, the 1,500 hp Wright radial engine that filled the nose of the S-58 Seabat weighed five times as much.

Twin turbines in the same space could give helicopters better performance and greater safety. Sikorsky engineers gained experience with twin piston engines on the S-56, but using two constant-speed, variable-torque free turbines to drive one rotorhead posed new challenges. A ground propulsion system testbed at GE in Schenectady, New York integrated turboshaft power

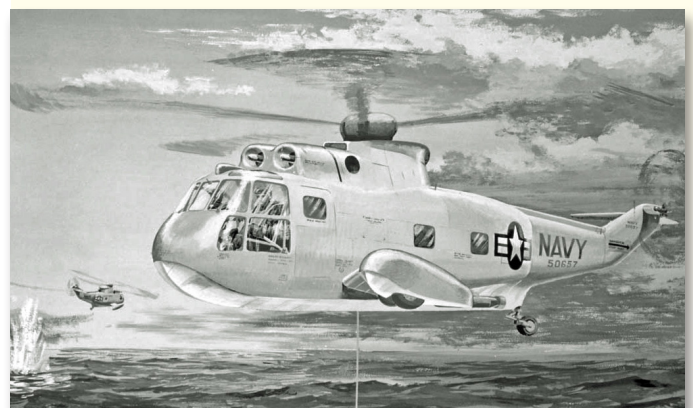


Sikorsky modified two S-58s to HSS-1Fs. Twin T58 turboshafts replaced a single Wright radial piston engine.

with the S-58 controls and transmission. Sikorsky subsequently modified two S-58s to HSS-1Fs with twin prototype XT58-2 engines. One helicopter began flight tests January 30, 1957 while the other underwent tie-down testing. Their success initially led the US Navy to consider turbine power as an engineering change proposal for the 12,000 lb S-58 Seabat.

Sikorsky advanced its own proposal on January 31, 1957 for a new 18,000 lb twin-turbine helicopter with a distinctive boat hull. The company had a history of fixed-wing amphibians, and a boat hull promised the helicopter added overwater safety with little aerodynamic drag and no troublesome inflatable floats. In December 1957 Sikorsky received a Navy contract to develop the S-61 or XHSS-2, the first helicopter ordered as a complete weapon system including the sensors, weapons, and avionics to hunt submarines day or night.

Sikorsky started flight tests of the single-turbine, boat-hull S-62 helicopter in May 1958 with an eye to overwater passenger operations. However, night ASW where pilots had to transition from cruising flight to a 50 ft sonar-dipping hover without visual cues was uniquely dangerous. In May 1958, the HSS-1N demonstrated it could fly the complex maneuver automatically by integrating a radar altimeter, Doppler velocity sensor, and hover coupler, and that it could stabilize itself in hover around the sonar cable angle. That August, Sikorsky engineering manager Michael Gluhareff told *Sikorsky News*, "Success of the HSS-1 piston-engine helicopter as an anti-submarine search and attack vehicle prompted the Navy and Sikorsky to take the next step – development of a turbine-powered HSS type."



Sikorsky proposed the S-61 twin-turbine sub-hunter with a boat hull for added overwater safety.

Sea Dragon/Sea King

The mockup of the big S-61/XHSS-2 unveiled in 1958 packaged twin T58 turboshafts under a five-bladed main rotor that could fold automatically for shipboard operations. Retractable landing gear in stabilizing float-sponsons reduced drag in high-speed flight. Refined automatic stabilization equipment promised more reliable autohover. HSS-2 project engineer Everett Delaney had worked on Corsair and Cutlass fighters and the Regulus I cruise missile at Chance Vought and on the S-56 at Sikorsky. He was responsible for bringing the XHSS-2 weapon system from mockup to flight test.

The first of seven YHSS-2 prototypes flew for 30 minutes on March 11, 1959 with Sikorsky test pilots Robert Decker and Francis 'Yip' Yirrell. The Sea Dragon made its public debut on March 24 with a Stratford flight demonstration including a water landing in the Housatonic River behind the plant. The new sub-hunter could float and taxi in conditions up to Sea State Three with rotors turning. It promised Navy crews power to return to their ship with one engine out or time to escape a helicopter ditched at sea. The Sea Dragon was soon renamed Sea King, and successive prototypes flew structural and avionics tests.

Two YHSS-2s were allocated to Navy Bureau of Inspection and Survey trials at the Naval Air Test Center, Patuxent River, Maryland. The powerful HSS-2 was clearly a record breaker, but on 23 April 1960 while preparing at Stratford for a world helicopter speed record, the first prototype crashed. Sikorsky pilot Yip Yirrell, co-pilot Gordon Hazel, and test engineer Harvey Hochman were



The XHSS-2 made its public debut in March 1959 with a water landing in the Housatonic River behind the Stratford plant.

lost when the tail pylon horizontal stabilizer failed and destroyed the tail rotor. Sikorsky delayed HSS-2 production to design and test a stronger stabilizer. Later models of the S-61 introduced a bigger horizontal tail with an external brace.

In an interview decades after he made the first Pax River flight in the HSS-2, Navy Captain Bill Wirt recalled his first impressions. "The performance was awesome. The flying qualities were delightful. The control harmonies, control power were all ideal. It flew like the classic Sikorsky helicopter, and it was a pleasure to experience that excess power."

The Sea King's first operational mission happened in September 1960 when Sikorsky pilot Bob Warren and his test crew were summoned from sonar trials in Key West, Florida to survey damage after Hurricane Donna. The HSS-2 passed early acceptance trials at Pax River in February 1961. With a combined Sikorsky and GE support contingent, two HSS-2s deployed aboard the carrier *USS Lake Champlain* for sea trials that April. Responding to an unexpected emergency, the test helicopters delivered medical oxygen tanks to a cruise ship 200 miles away. By mid-1961, the Sea King Fleet Introduction Program was underway at Key West. Pax River cleared the new helicopter for fleet antisubmarine duty in September 1961, and the Federal Aviation Administration civil-certified the S-61A in November 1961.

The S-61 was meanwhile setting records. On 17 May, 1961, mercy mission pilots Cdr Patrick Sullivan and Lt BW Witherspoon flew their HSS-2 to 192.7 mph over a 3 km course. Navy deliveries began to Helicopter Antisubmarine Squadron 1 (HS-1) that June, and on December 1, 1961, Capt Bruce Lloyd and Cdr DJ Roulstone set three world helicopter speed records: 182.8



An S-58/HSS-1 and the S-61/HSS-2 mockup provided a dramatic size comparison in 1958.

mph over a 100 km course, 179.5 mph over 500 km, and 175.3 mph over 1,000 km. In February 1962, an HSS-2 topped 210.6 mph over 20 km.

Sea King deliveries to Atlantic and Pacific ASW squadrons HS-3 and HS-10 began in September 1961. The US Army conducted an informal flight evaluation of the HSS-2 in 1962 and concluded the Sea King with one right-side cargo door and a main rotor spinning close to the tailboom would be unsuitable for air assaults. Navy Sea Kings nevertheless quickly retired Seabats from ASW squadrons. In March 1965, the *Dawdling Dromedary*, an operational Sea King flown by HS-11 executive officer Cdr James Williford, set a non-stop helicopter distance record flying 2,105.49 miles from the deck of the *USS Hornet* off San Diego California to the *USS Franklin D. Roosevelt* off Jacksonville, Florida in 15 hours, 51 minutes.

To Sikorsky Aircraft, early production HSS-2s (Hiss-2s in Navy parlance) were S-61As. In 1962, the Department of Defense standardized aircraft designations, and the Navy HSS-2 became the SH-3A – Sikorsky's S-61B with 1,250 shp T58-GE-8 engines and cleared to 19,100 lb gross weight. The new helicopters initially deployed aboard dedicated ASW carriers – CVSs to work with destroyers and fixed-wing patrol aircraft. In Vietnam, they flew Combat Search and Rescue from carriers and small-deck ships. On August 31, 1966, Cdr. Robert Vermilya flew his Sea King into Haiphong harbor to rescue a downed Crusader pilot. US Navy Sea Kings were the astronaut recovery helicopters used throughout the Gemini and Apollo space programs.

Stratford ultimately built 255 SH-3As for the US Navy,



Prototype XHSS-2s passed their Navy trials at Patuxent River and set new helicopter speed records.

and the big, powerful sub-hunter spun-off versions for new missions. In January, 1962, the joint Marine Corps-Army Executive Flight Detachment announced plans for eight HSS-2Zs (VH-3As) to transport the President of the United States. The VH-3As were replaced in 1975 by 11 new VH-3Ds, and Marine helicopter test squadron HMX-1 assumed responsibility for all Presidential helicopters in 1976. A 1964 contract converted nine SH-3As to minesweeping RH-3As and started the Navy's airborne mine countermeasures (AMCM) community. The need for armed and armored Combat Search-And-Rescue (CSAR) aircraft in Vietnam gave Helicopter Combat Support Squadron HC-7 10 armored HH-3A *Big Mothers* in 1967. Quick-change SH-3Gs converted by the Navy from 1970 to 1972 filled Helicopter Combat Support (HC) squadrons on ships and naval air stations. US Navy Sea Kings inserted SEALs during Operation Desert Storm in 1991.

The first international customer for the Sea King was the Royal Canadian Navy. The first four CHSS-2s were completed in Connecticut and flown to Canada in May 1963. Thirty-seven more helicopters were assembled from Sikorsky kits by United Aircraft of Canada Ltd (now Pratt & Whitney Canada) at Longueuil, Quebec. Canada's Sea Kings with deck landing probes, ice shields, and sponson floats became CH124s. Later upgraded with search radars and thermal imagers for night surface surveillance, they served faithfully until December 2018.

The first European order for the Sikorsky Sea King came from Royal Danish Air Force looking to replace its S-55 search and rescue helicopters. Eight S-61A-1s were delivered beginning in the summer of 1965. The



Stratford delivered the first production S-61 to the Navy in 1961, and kept the naval Sea King line open for 20 years.



The Sea King automated the sonar-dipping hover for anti-submarine warfare at night and in adverse weather.

US Navy's next sub-hunter -- the SH-3D -- flew on July 15, 1965 with a better sonar, more fuel, 1,400 shp T58-GE-10 engines and an uprated main gearbox for gross weights to 20,500 lb. Spain became the first international customer for the improved SH-3D in June 1966 and bought the last Sea King off the Stratford line in 1981. D-Model deliveries for the US Navy ended in 1970, but Stratford continued to build Sea Kings for export. Four S-61D-4s went to Argentina. The Brazilian *Aeronaval* received its first S61D-3 in April 1970.

The SH-3D also provided the pattern for Sea Kings license-built abroad. The first Westland WS-61 Sea King flew in the UK in May 1969. The HAS.1 sub-hunter entered service at Royal Naval Air Station Culdrose



The RH-3A with towed cable cutting array gave the US Navy its first operational mine-sweeping helicopter.



Spain was the first S-61D/SH-3D export customer in 1965. Here, a Spanish SH-3D joins an amphibious warfare exercise in 2016.

in 1970. The Royal Air Force acquired its first Sea King in 1978 for search-and-rescue around the UK. In 1982, UK Royal Navy Sea Kings screened for submarines, rescued sailors, and inserted troops during the Falklands war. A quick airborne early warning conversion became the production Sea King AEW.5.

Westland independently developed the Sea King HC.4 Commando version for the Royal Marines and subsequently sold the utility/assault helicopters to international operators. A 1962 Sikorsky S-61 evaluation in Germany failed to launch a license agreement. However, Westland ultimately sold 22 Sea King Mk. 41s with search radars and anti-ship missiles to the German Navy. More international sales put Westland Sea Kings in Australia, Belgium, Qatar, Egypt, and India. The Sea King Mk.45 for the Pakistan Navy, acquired Exocet anti-ship missile capability. Royal Navy Sea Kings officially retired in 2018, but two helicopters fly under contract with HeliOperations in the UK to train German Navy pilots.

The Japanese Maritime Self Defense Force placed an initial order for 11 HSS-2s in May 1962 and received one aircraft assembled by Sikorsky and two partially assembled airframes in 1963. Mitsubishi Heavy Industries in Nagoya was licensed to build the Japanese HSS-2/SH-3D with T58-IHI-10 Ishikawajima-Harima engines and later produced the HSS-2B/SH-3H with search radar. Japan ultimately took delivery of 185 Sea Kings, including two to support Antarctic exploration.

Construzioni Aeronautiche Gionvanni Agusta delivered its first Sea King to the Italian Navy in 1969, Follow-on

orders stretched deliveries through 1987 including missile-armed versions for Italy and export aircraft for Iran and Peru. Venezuela received the utility AS-61A, and Brazil and Argentina supplemented Sikorsky-built Sea Kings with Agusta ASH-3D and H helicopters.

Sea King to Seahawk

US Navy plans for Sea Control Ships in the early 1970s drove the service to convert 151 SH-3A, D, and G Sea Kings to multi-sensor SH-3Hs from 1972 to 1982. The SH-3H had 1,400 shp -10 engines and was cleared to 21,000 lb gross weight to carry dipping sonar plus sonobuoys, magnetic anomaly detector, and search radar. Buoys, MAD, and radar were the primary sensors of the SH-60B Light Airborne Multi-Purpose Seahawk (LAMPS Mk. III), and specially configured Sea Kings played a pivotal role in Sikorsky Seahawk development.

Don Antilla was the was the avionics engineer responsible for TACNAV lab and flight development testing of Seahawk technology on a Sea King testbed in 1973 and 1974. "We were trying to prove we could use a digital computer to help integrate sensor information so you could detect and track submarines. That was the first time we ever coupled a Nav system to the flight controls, working with my friends at IBM Owego (today, Lockheed Martin Rotary and Mission Systems)."

Antilla rode the cockpit jump seat behind pilots Curt Canon and Byron Graham for repeated trials day and night. "You

learn a lot just by being there and watching the pilots operate it," he observed. Antilla noted, "Never once did a pilot say, 'Geez, do we need to repeat that rest profile again?' They were proactive. They weren't just drivers, they were participants." Antilla concluded, "A lot of the capabilities that we learned from the TACNAV wound up in the LAMPS Mk. III." Doppler navigation and sonobuoy plot stabilization routines developed during the TACNAV evolution were applied to the new SH-60B. Two Navy YSH-3Js flew in 1976 to test systems for the LAMPS III Seahawk.

The S-61 program provided the basis for several technology testbeds. The high-speed S-61F or NH-3A was an SH-3A rebuilt with a fixed wing, podded J60 auxiliary jets, a long-span horizontal tail, and a larger tail pylon and fin with adjustable rudder. The test helicopter flew for the first time on May 21, 1965, and in July 1965 attained 242 mph. The Sikorsky-owned S-61A/B demonstrator, N318Y, was the testbed for the swing-tail rotor of the unsuccessful S-66 bid for the Army's Advanced Aerial Fire Support System. S-61 dynamics were the basis of the elegant S-67 Blackhawk gunship.

Waiting for new SH-60F Seahawks, the Navy cycled 26 SH-3Hs through a Service Life Extension Program (SLEP) at Sikorsky in 1986. The fleet-worn helicopters were flown or trucked to Bridgeport for teardown and rebuilt with kits in Stratford. Mark Evans began his Sikorsky career as a manufacturing engineer in 1967 and in 1986 was tasked by senior executive vice president Gene Buckley to save the struggling SLEP. "It was a year behind schedule," he recalled. "The problem was every airplane had a different statement of work." Aircraft modified at different times and subject to irregular corrosion needed magnetic and dye penetrant inspections, varying repairs, and different parts to meet fleet standards. Evans noted, "They gave us the basket cases." The SLEP helicopters returned to the fleet, some for conversion to UH-3H utility aircraft. The US Navy officially retired the Sea King in December 2009, 50 years after the first S-61 flight.

In uniform, Mike Baxter flew HS-squadron Sea Kings from carriers and Light Airborne Multi-Purpose System helicopters off small LAMPS frigates. He was assigned to Sikorsky when the company performed the SH-3H SLEP and later joined the company. Significantly, the



Westland produced the Sea King Mk. 41 for the German Navy. One appears here in a 2019 Baltic Sea exercise. (US Navy via DVIDS)



A US Navy UH-3H recovers Explosive Ordnance Disposal swimmers in March 1997 off Puerto Rico. (US Navy via DVIDS)

SH-3H mission suite integrated inner-zone sub-hunting capabilities of carrier-based HS Sea Kings with outer-zone ASW and sea surveillance capabilities of the frigate-launched SH-60B LAMPS Seahawk.

The new/old Sea Kings had powerful implications for US naval aviation today heavily dependent on the multi-mission MH-60R and MH-60S Seahawks. Baxter explained, "The SH-3H [mission] suite blended LAMPS- and HS-types of capabilities and laid the groundwork



Presidential VH-3Ds remain in service until the Sikorsky VH-92 achieves Full Operational Capability. (US Navy via DVIDS)

for the eventual elimination of the [fixed-wing] S-3B Viking mission, cementing the helicopter tactical role on the carrier and eliminating one complete type/model/series from the carrier deck. This was a big deal, and it's why there are MH-60Rs on carriers today, along with MH-60Ss."



Sikorsky Stratford workers remanufactured 26 Sea Kings for the US Navy in the SH-3H Service Life Extension Program.



An Argentine Navy S-61T modernized by Carson Helicopters lands on the USS George Washington during an Atlantic exercise, May 30, 2024. (U.S. Navy)

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Prepared by Frank Colucci and John Bulakowski
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January 31, 2026: Two Roads Brewery of Stratford, CT. released its 14th edition of 'Igor's Dream' Russian Imperial Stout beer and introduced a 'Sergei's Dream' Stout celebrating Igor Sikorsky and his son, Sergei respectively. Pictured above (l to r) John Bulakowski, President of the Igor Sikorsky Archives, Brad Hittle, President of Two Roads, Igor Sikorsky Jr, son of Igor Sikorsky, Igor Sikorsky III, son of Igor Jr., and Dan Libertino, President Emeritus of the Igor Sikorsky Archives.



“ . . . the role of the helicopter, the jobs it can perform, jobs which nothing but a helicopter can do - are here to stay.”

Igor Sikorsky, Recollections of a Pioneer address, 1968.



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