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Sikorsky Grows the Helicopter — the S-55

The Sikorsky S-55 gave US armed services a helicopter bigger and more capable than the S-51 and ensured Sikorsky Aircraft leadership in vertical flight. (All images property Sikorsky Archives.)

The 1,000th Sikorsky helicopter was an S-55, seen at Bridgeport on June 18, 1953 with (R to L) engineering manager Igor Sikorsky; general managers Bill Whelan and Charles J McCarthy; engineers Serge Gluhareff, W. Robins, and Michael Gluhareff; and factory manager Alex Sperber.

Ten years after Igor Sikorsky first flew his VS-300 demonstrator, Sikorsky Aircraft had a global market for its helicopters. The February 11, 1949 edition of Sikorsky News reported on S-51 operations in Argentina, Australia, Canada, China, Egypt, England, Netherlands, South Africa, Switzerland and Venezuela. The US Navy took delivery of the 200th S-51 in November 1949. However, early efforts to grow single-main-rotor helicopters for the Navy and Air Force lost out to tandem-rotor competition. The Sikorsky-funded S-55 flew in 1949 and recaptured leadership with a helicopter big enough to pioneer missions that are common today. Sergei Sikorsky observed,

The company-funded S-55/YH-19 put the engine up front to remedy cg limitations.

"The S-55 was a major breakthrough in Sikorsky Aircraft history. It almost certainly rescued the company from possible ruin."

From 1949 to 1962, Sikorsky built 1,281 S-55s in Bridgeport and Stratford, Connecticut. Another 447 S-55s came from license production at Westland in England, SNCASE in France, and Mitsubishi in Japan. The S-55 ultimately equipped all the US armed services. It rescued wounded soldiers and disaster victims around the world, dipped sonar to hunt for submarines, and shuttled oil workers to offshore drilling rigs. The S-55 was the first helicopter to fly scheduled airline routes and one of the first in hospital-based air ambulance service. It upped the productivity of vertical flight compared to light helicopters.

Sikorsky engineers successfully grew the single-main-rotor layout of the 1,300 lb VS-300/S-46 with the 2,500 lb S-47, 5,000 lb S-48, and 5,500 lb S-51. The 4,750 lb S-53 (military XHJS-1) nevertheless lost a Navy rescue helicopter competition in 1947 to the tandem-rotor XHJP-1. With the S-53 pilot and passengers seated up-front and the engines directly below the rotor centerline, a narrow center-of-gravity (cg) range made the helicopter difficult to stabilize and control with the shifting weight of the rescued. Orders for Air Force arctic rescue and Navy antisubmarine warfare helicopters likewise went to tandem-rotor aircraft less sensitive to cg.

Sikorsky began company-funded development of the 7,200 lb S-55 in 1948 with an innovative layout and controls to counter the cg challenge. According to Sergei Sikorsky, "Ed Katzenberger was responsible for the brilliant solution of putting the engine in the nose of the S-55." Katzenberger was hired by Igor Sikorsky in 1942 as a project engineer on the S-48 (Army XR-5) and would in 1967 become chief engineer of Sikorsky Aircraft. His concept for the S-55 put the engine up-front with the two-seat cockpit above and behind and the 10-passenger cabin and underfloor fuel tank at the cg. The driveshaft from the 550 hp Pratt & Whitney (P&W) R-1340-57 (Wasp S1H2) radial engine inclined behind clamshell nose doors

ran up behind the pilots to the main gearbox, and the tailboom with two-bladed tail rotor helped balance the heavy engine.

The arrangement gave the roomy helicopter wide cg tolerance to fly with varied loads. Also significant, the S-55 main rotor increased flapping hinge offset compared to earlier Sikorsky helicopters to enhance control authority and counter cg changes. Hydraulic servomechanisms simultaneously reduced pilot effort for what Sikorsky News called "fingertip cyclic control." Sergei Sikorsky noted, "Katzenberger and a young Ted Carter [later engineering vice president] sold Sikorsky Aircraft management on the servo-system control of the main rotor by pointing out that the Air Force had accepted the servo control concept on the new F-86 Sabre [Jet] flying stabilizer."

Sikorsky test pilot Jimmy Viner first flew the prototype S-55 (Air Force YH-19) at Bridgeport on November 10, 1949. The first of five YH-19A rescue helicopters for the US Air Force flew to Pope Field, North Carolina on April 16, 1950. (It resides today in the Smithsonian.) With its tandem-rotor subhunter in development difficulty, the US Navy gave Sikorsky an order for 10 H04S-1 helicopters and received the first on August 31, 1950. In June 1950, Sikorsky News reported, "As a result of the Navy order, twenty-five new machinists were added to the Sikorsky third shift to meet the urgent Navy delivery requirements."

The Marine Corps soon ordered 40 HRS-1 transport helicopters and accepted the first on April 27, 1951. Early S-55, H-19, HO4S, and HRS helicopters shared the 600 hp P&W R-1340-57 engine. The Navy found the HO4S-1 underpowered and introduced the 700 hp Wright R-1300-3 engine adopted by the HO4S-3, Marine HRS-3, Air Force H-19B, Army H-19D, and civilian S-55C.

Wars and Pieces

War on the Korean peninsula in 1950 caused the US Air Force to deploy two YH-19 helicopters and an Air Proving Ground team as Detachment F of the 3rd Air Rescue Squadron meant to rescue pilots down behind enemy lines. The S-55

A Marine HRS-1 delivers wounded to USS Haven in Inchon Harbor, 1952.

test aircraft arrived on March 23, 1951 and the next day teamed with Air Force S-51s (H-5s) to evacuate 148 wounded paratroopers in 77 sorties. The April 13, 1951 issue of Sikorsky News reported, "The much larger aircraft was capable of carrying eight evacuees and a medical attendant. It evacuated wounded soldiers at a rate four times that of the smaller Sikorsky H-5."

The successful deployment led the Air Force to order 50 production SH-19A search-and-rescue (SAR) helicopters. Future Sikorsky Archives president Dan Libertino saw the S-55 for the first time as a young Air Force sergeant training in Connecticut. He recalled, "Myself and another fellow went up to Sikorsky to be crewchiefs on two aircraft going to San Marcos, Texas. I got in and we started our first flight from Bridgeport to San Marcos, and that was the beginning of my connection with the S-55. It was big, compared to the S-51; that was the comparison everyone had. That gave it good capacity for medical evacuation. It was so different from the S-51 there was no comparison. You could do so much more with it."

The US Navy commissioned helicopter anti-submarine squadron HS-1 with S-55s at Naval Air Station Key West, Florida on October 3, 1951. In

The H04S-1 was the first antisubmarine helicopter deployed on US Navy carriers.

1953, HO4S-1s with squadron HS-4 became the first antisubmarine helicopters to operate from aircraft carriers. The early sub-hunting helicopter could play either "hunter" with dipping sonar or "killer" with torpedoes and continued to operate in hunterkiller teams until the more powerful S-58 (HSS-1) Seabat joined the Navy.

The S-55 (HRS-1) gave the US Marine Corps a helicopter to test "vertical envelopment," flying amphibious assault forces over defended beaches, but mountainous Korea posed different maneuver challenges. The Marines placed their first order for HRS-1s with self-sealing fuel tanks and lightweight troop seats on August 17, 1950, and Medium Helicopter Squadron HMR-161 arrived with 15 HRS-1s in Korea in August 1951 to support the 1st Marine Regiment in the eastern Punchbowl region. Operation Windmill on September 13, 1951 saw the HRS-1s haul about 19,000 lb of supplies to Marines holding Hill 884 in east-central Korea. In the course of the action, the helicopters also evacuated 84 casualties.

Sikorsky Bridgeport added production staff to keep up with S-55 orders.

Successive operations proved the value of Marine helicopters in combat. In Operation Ripple during the summer of 1952, HRS-1s quickly repositioned Marine rocket launchers and firing crews before enemy artillery could return fire. HMR-161 suffered no combat losses in Korea but wrote-off about half of its underpowered aircraft in accidents. In October 1952, the squadron received the HRS-2 with a sloped tailboom to keep main rotor blades from slapping the tailboom in a hard landing. Sikorsky delivered more powerful HRS-3s after the war.

When the Army overcame Air Force resistance to heavier Army helicopters, the senior service ordered H-19C Chickasaws. The 6th Transportation Company (Helicopter) flew its first Korean mission on March 20, 1953, an emergency resupply to isolated units of the 1st Division. Interservice agreements subsequently allocated Army helicopters to medical evacuation and Air Force to aircrew rescue. The pioneering Army unit was joined in Korea by the 13th Transportation Company, and in June 1953 both H-19 companies formed a resupply bridge to an isolated regiment.

Air Force SH-19s of the 3rd Air Rescue Group typically sat ground alert at forward operating sites, and on April 12, 1953, two scrambled from Chodo Island off North Korea to hoist ace Captain Joseph McConnell from the Yellow Sea minutes after he ejected from his MiG-damaged Sabre. Air Force S-55s also inserted agents behind enemy lines and ultimately flew negotiators to ceasefire talks. Air Rescue Squadrons operated H-19s around the world, and in 1953 saved lives during Netherlands North Sea floods.

Back in the US, the Coast Guard received the first of seven HO4S-2G rescue helicopters in November 1951 and followed up in 1952 with 23 more powerful HO4S-3Gs. "The Horse" was the first helicopter

instrumented for night flight and made the first recorded night hoist rescue in the Gulf of Mexico in January 1955. In December 1955, a single HO4S-3G rescued 138 California flood victims by operating for 29 continuous hours shared by two pilots. The publicized rescues helped move Coast Guard SAR from fixed-wing airplanes to helicopters. Another eight Coast Guard HRS-3s came from the Navy, and in 1957 an HO4S-3G with a reinforced tail flew Operation Tug-Bird to test the helicopter's ability to tow disabled vessels and drop the tow line to rescue cutters. Coast Guard headquarters subsequently ordered each air station maintain at least one S-55 equipped for towing.

More Is Better

The Bridgeport production line delivered the 1,000th Sikorsky helicopter – an Air Force S-55/H-19B -- in 1953. For all the US services, the S-55 was a pioneer and a testbed. The Air Force made the first transatlantic helicopter crossing to deliver two new H-19As to Europe. Loaded with extra fuel, Hopa-long and Whirl-o-way flew from the factory to Westover Air Force Base, Massachusetts. On July 15, 1952, they launched from Westover to Wiesbaden, Germany, covering 3,984 statute miles in 20 days with 51 hours, 55 minutes flying time. The longest leg stretched more than eight hours.

In 1954, a Marine HRS-2 unsuccessfully tried a Rocket-On-Rotor system that tipped each main rotor blade with a small hydrogen peroxide rocket fed from a rotorhead tank. The Army fired rockets from an H-19 in the experimental Sky Cav platoon at Fort Rucker, Alabama in 1957. In September 1956, Marine Experimental Helicopter Squadron HMX-1 set an unrefueled flight record with a Navy HO4S-1 flying 13 hours and two minutes. Loaded with extra fuel, the S-55 weighed 8,350 lb at takeoff. Navy HO4S-3s flew with Antarctic Development Squadron VXE-6 during Operation Deep Freeze from 1955 to 1958.

Military S-55s advanced air arms around the world. The Mutual Defense Assistance Program transferred four US Air Force H-19s to the French Air Force in 1954. Sikorsky had signed an S-55 license production agreement with the French SNCASE (Societe National de Construction Aeronautique Sud Est) in 1952, and the French-built Elephante Joyeux equipped French Army, Navy, and Air Force squadrons. Sikorsky also entered an S-55 license arrangement with Westland in the UK in November 1950. The UK Royal Navy and Royal Air Force flew Westland Whirlwinds in actions worldwide, and the UK production line introduced powerful, lightweight turboshaft engines in 1959. Sikorsky also had a license agreement with Mitsubishi Heavy Industries in Japan, and home-grown S-55s served the Japan Air, Ground, and Maritime Self Defense Forces and commercial operators.

Air Force H-19s Hopa-long and Whirl-o-way crossed the Atlantic.

SNCASE produced the military S-55/H-19 Elephante Joyeux under license in France.

A Westland Whirlwind flew The Queen Mother from the UK Royal Navy aircraft carrier Ark Royal in 1956.

Chile used the H-19 to lift survivors from tsunami waters in 1960 and ordered the last S-55s.

Connecticut-built S-55s flew with air arms from Argentina to Thailand. The S-55 was the first helicopter acquired by the Indian Air Force in 1954. Igor Sikorsky greeted the Venezuelan military attache at Bridgeport in 1955 to turn over a VIP-furnished S-55. The South African Air Force received two S-55s in 1956. Two Israeli S-55s arrived too late for the Suez campaign that year, but the country ordered six more S-55 SAR helicopters in 1958, soon replaced by Sikorsky S-58s. The 1,000th S-55 was delivered in 1956. Sikorsky News reported that, with Bridgeport facilities full of S-58s, a "miniature assembly line" for S-55s shared S-56 manufacturing space in the new Stratford factory.

Paying Jobs

At the time of the YH-19 first flight, Sikorsky Aircraft quoted a price of $120,000 for a passenger-carrying version of the new helicopter. Early experience with the military H-19 helped the FAA certify the civil S-55A for passengers in March 1952. Los Angeles Airways ordered two S-55s in 1952 and began package express service in 1953 and passenger service between area airports in 1954. (By 1961, LAA S-55s were carrying 5,000 lb of mail a day from the Los Angeles Post Office Terminal Annex to the main Post Office.)

New York Airways (NYA) bought four S-55s for $150,000 each in January, 1953. In December, 1956, Igor Sikorsky was guest co-pilot on NYA's first passenger-carrying S-55 flight from LaGuardia Field to New York's new Hudson River heliport. By 1957, NYA had S-55s flying from Manhattan to LaGuardia, Newark, and Idlewild (today JFK International) Airports.

Sabena World Airways of Belgium began the first international helicopter passenger service crossing Belgium, Netherlands, Germany, and France

Igor Sikorsky flew as co-pilot on the first New York Airways flight from the Hudson heliport.

in September 1953. In the US, Los Angeles Airways, National Airlines, and Mohawk Airlines all started scheduled passenger service in 1954. Chicago Helicopter Airways inaugurated helicopter flights in November 1956. S-55s were superseded in airline service by S-58s and later turbine-engine helicopters.

In the oil industry, the S-55 was the first helicopter with the range and cabin space to fly workers to offshore rigs in the Gulf of Mexico. The January 22, 1954 Sikorsky News reported the first order for S-55s from Petroleum Bell, later Petroleum Helicopters International (PHI). Other contract operators and oil companies followed

Petroleum Helicopters Inc. became the first commercial S-55 operator in 1954.

suit. Brunei Shell Petroleum started offshore helicopter operations with five S-55s under contract in the mid-1950s. It flies Sikorsky S-92s today.

S-55 production stopped in 1959 but resumed in 1961 to build three follow-on aircraft for the Chilean Air Force, the last delivered in 1962. At that time, Sikorsky News reported S-55s had accumulated 1,475,000 flight hours, nearly half the total flown by all Sikorsky helicopters delivered in the company's first 20 years. Sergei Sikorsky concluded, "Igor Sikorsky was very proud of the S-55. In his opinion it was a major engineering success."

Freeport Sulfur operated the commercial S-55 to platforms in the Gulf of Mexico.

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Memberships and Donations enable us to continue the Archives mission of acquiring, managing, protecting and disseminating historical documentation associated with Igor Sikorsky and his legacy

Please contact us at iisha@snet.net
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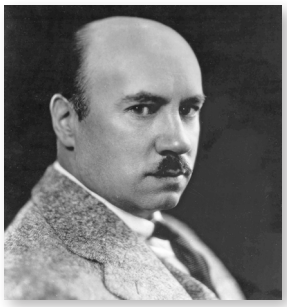
Prepared by Frank Colucci and John Bulakowski with graphic art and layout by Jodi Buckley.

The Sikorsky Archives took center stage at the Lockheed Martin Field Service Representative colloquium in March. Above, Archives president Dan Libertino was awarded the prestigious Harry Hleva award recognizing Field Service Operations employees who excelled in their customer service role. Pictured above: (L to R) Tim Harrison, David Keith, Dave McConnell, Dan Libertino, Jim Lambert, Mike Gates, and Steve Goodall."



"The helicopter has already claimed a place in air operations, I believe it is on the threshold of greatly expanded service to mankind."

Igor I Sikorsky, *Present Trends in Helicopter Research,* Royal Canadian Institute, Toronto, 11/15/47.