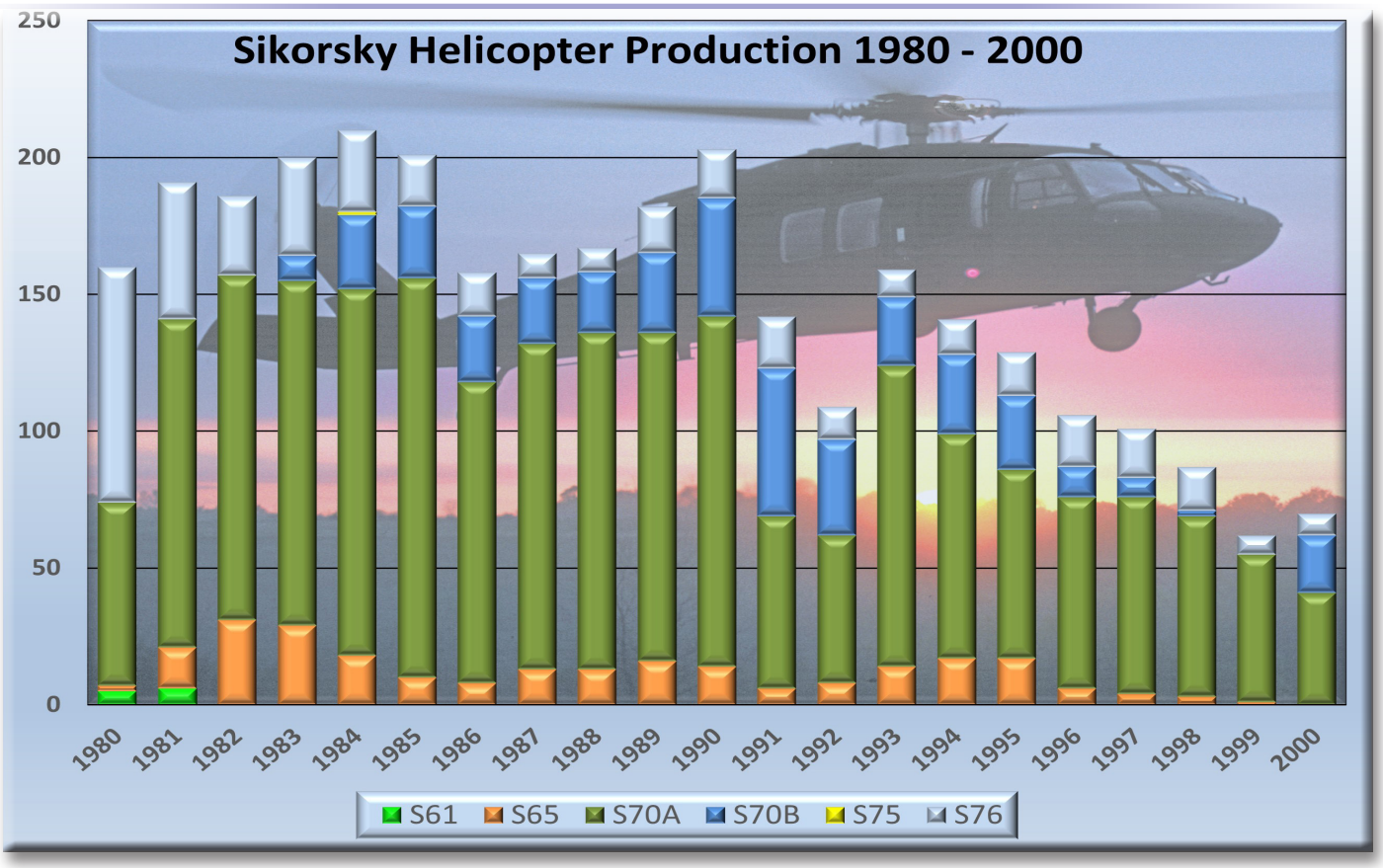
IGOR I SIKORSKY HISTORICAL ARCHIVES

Sikorsky Archives News

July 2021

Published by the Igor I. Sikorsky Historical Archives, Inc. M/S S578A, 6900 Main St., Stratford CT 06615

Four Score at Sikorsky — Part III: 1980 to 2000



From 1980 to 2000, Sikorsky produced a range of helicopters with increasing capabilities and system sophistication. (All images Sikorsky Archives)

In 1980, Sikorsky Aircraft employed 11,500 people designing, building, and supporting helicopters. The S-70 (UH-60A) Black Hawk was in full-rate production at Stratford for the U.S. Army, and the first S-70B (SH-60B) Seahawk was ready for Navy shipboard tests. The first production S-65E (CH-53E) heavy lifter for the Marine Corps underwent testing while Super Stallions Two through Five were in final assembly at Stratford. More than 100 S-76s had rolled off the Bridgeport line. Chief Executive Officer Robert F. Daniell told the Helicopter Association International in 1981, “Commercial helicopter operators are expressing their confidence in the Sikorsky S-76 in the best way possible -- by placing a record number of orders for them.”

Daniell was named President of Sikorsky Aircraft in July 1981 as the company was evolving from an innovative aircraft maker to a complex systems integrator. The Navy was returning early-model S-61 Sea Kings to Stratford to integrate radars and other SH-3H improvements. The successor Seahawk prototype tested its advanced automatic flight control system at Stratford and went on to IBM Federal Systems (today Sikorsky Systems Integration) in Owego, New York for the Light Airborne Multi-Purpose (LAMPS) Block III mission suite that shaped today's Naval Hawks.

Special mission Black Hawks were also in test. The EH-60B with its big Standoff Target Acquisition System (SOTAS) radar first flew in February 1981. The SOTAS helicopter was never fielded, but Sikorsky later delivered EH-60A Quick Fix II Special Electronic Mission Aircraft to intercept and locate enemy radio signals. A Black Hawk medical evacuation kit passed Army operational tests at Fort Campbell, Kentucky and started the evolution of today's HH-60M Dust Off helicopter. The Army meanwhile integrated a "glass cockpit" in its UH-60A System Testbed for Avionics Research, the ancestor of today's digital cockpit Black Hawks.

In the early 1980s, the S-76, serving here with off-shore operator Air Logistics, was in demand.

Other far-reaching technologies were in the works. In early 1981, the Army Applied Technology Laboratory chose Sikorsky Aircraft as one of two for the Advanced Composite Airframe Program (ACAP) contractors to build lightweight, crashworthy, damage tolerant structures for future rotorcraft. By the end of 1981, the S-69 (Army XH-59) had achieved speeds to 263 knots exploring the Advancing Blade Concept that distinguishes today's fast Raider and Defiant compound helicopters.

'Eighties Engineering

Sikorsky sales exceeded $1 billion for the first time in 1982. The company received an Air Force contract to convert two Black Hawks into air-refuelable HH-60D Night Hawks with glass cockpits and night/adverse weather sensors. The sophisticated Night Hawk was canceled in favor of the Air Force integrated HH-60G Pave Hawk. However, it foretold the Combat Search And Rescue (CSAR) systems on today's HH-60W Jolly Green Giant II.

One ambitious helicopter program would focus Sikorsky innovations in composite structures, helicopter dynamics, flight controls, and mission systems. In late 1982, the Army documented deficiencies in its light scout/attack and utility fleets and recommended development of a new Light Helicopter Experimental (LHX) for high-intensity battlefields. The Black Hawk had proven survivable on a low-technology, low-intensity battlefield in Operation Urgent Fury on the Caribbean island of Grenada in October 1983. LHX would suppress radar, infrared, and acoustic signatures to defeat dense, integrated air defenses on future battle fields.

The S-75 built for the Advanced Composite Airframe Program proved the advantages of fiber-reinforced composites and began the transition to digital design.

The S-75 ACAP demonstrator assembled in Stratford flew at West Palm Beach in 1984. It hinted at low-observable shapes for helicopters and represented the first use of Sikorsky's Computer Aided Interactive Design System for detail design and manufacturing planning. The S-75 began the engineering transition from ink-on-mylar drawings to today's digital design environment. A year later, the S-76 SHADOW (initially, the Sikorsky Helicopter Advanced Demonstrator of Operator Workload) demonstrated electronic flight controls, sidearm controllers, and other cockpit innovations.

In 1984, the U.S. Army and Sikorsky had celebrated delivery of the 500th UH-60A, and the Army had awarded Sikorsky a second joint-service, multi-year production contract to deliver S-70s for the Army, Navy, and Air Force. The navalized S-70B Seahawk had been selected by Australia, Japan, and Spain, and Sikorsky announced sales of commercial S-70Cs to the People's Republic of China. A March 1985 Sikorsky News editorial by company president and chief executive officer William F. Paul noted 1979 Black Hawks of the first production lot each took nearly 80,000 manhours to assemble. By the eighth lot, each helicopter consumed less than 20,000 manhours.

Sikorsky used the S-76 as the basis of its SHADOW flight control and FANTAIL shrouded tail rotor technology testbeds for the LHX program.

The S-69 Advancing Blade Concept tested compound helicopter technology for today's Defiant and Raider.

Sikorsky was prime contractor for the US Navy sonar-dipping SH-60F CV Helo.

Sikorsky systems integration expertise simultaneously grew more sophisticated and more valuable. In February 1985, the U.S. Navy named the company prime contractor to develop the SH-60F carrier-based anti-submarine helicopter. The so-called CV Helo would replace the Sea King. Bill Paul said, “One of the most essential CV-Helo tasks is integration of the aircraft’s weapons system. Sikorsky’s commitment to systems integration includes company-funded technology programs and a $38 million investment in a systems integration laboratory.” Stratford opened its new, three-story research and engineering center in March 1985.

Sikorsky and Boeing announced their LHX First Team in June 1985 to develop a stealthy helicopter with a bearingless main rotor, fly-by-wire flight controls, night/adverse weather sensors, supercomputer processing, and digital connectivity. In 1985, the Army expected to buy 4,595 LHXs in Scout/Attack (SCAT) and Utility versions. Utility LHX succumbed to budget pressures, but the Army still wanted 1,292 SCAT helicopters for cavalry squadrons and light attack battalions. Sikorsky also broadened its commercial helicopter offerings with the more powerful S-76B certified in 1985 and demonstrated a militarized H-76 Eagle with weapons and a mast-mounted sight.

SCAT LHX promised to be “the quarterback of the digital battlefield” networked with ground and air units. Sikorsky helicopters already gave theater commanders battlespace insight. When U.S. forces clashed with Libya in the Gulf of Sidra in early 1986, Navy ships launched SH-60B Seahawks to downlink radar and electronic signatures data. When war between Iran and Iraq drew U.S. forces to the Persian Gulf in 1987 for Operation Earnest Will, Seahawks acquired thermal imagers and shared the big picture.

The first SH-60F with dipping sonar and tactical displays flew at Stratford in March 1987. “Austere” derivatives were tailored to Navy CSAR and Coast Guard Medium Range Recovery requirements. The first Navy HH-60H flew in August 1988, and Sikorsky News showed the first Coast Guard HH-60J on the Stratford line in March 1989. Another special mission spinoff was integrated for the President of the United States. A

The Coast Guard HH-60J and Navy HH-60H were built on CV Helo systems integration.

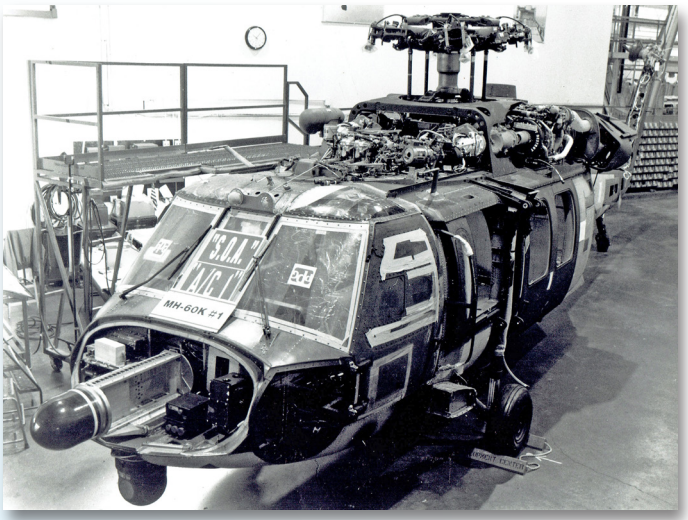
Stratford ceremony on November 30, 1988 marked delivery of the first of nine VH-60N White Hawks to the U.S. Marine Corps for the HMX-1 Executive Flight Detachment. Sikorsky naval helicopters were also capturing international orders. Spain received its first S-70B-1 Seahawk in 1988. Japan accepted its first S-80M-1 Sea Dragon minesweeper in February 1989. Australia took its first S-70B-2 Seahawk in September 1989.

The Defense Advanced Research Projects Agency (DARPA) and NASA contracted with Sikorsky to test a four-bladed helicopter rotor that could stop in flight and become a fixed X-wing with ducted air circulation control. The intent was to have an aircraft that could hover with the efficiency of a helicopter but dash as a fixed-wing to 450 kt. The X-Wing was to be flight tested on the S-72 Rotor System Research Aircraft previously built for NASA and the Army by Sikorsky. However, funding was cut off in 1987 after much development work due to concerns about the high technical risk of a circulation-controlled stopped rotor.

Sikorsky also started work on Unmanned Air Vehicles in July 1986 under a contract from DARPA. The company used internal funds to test a shrouded coaxial rotor vehicle in July 1988. The Cypherhead proof-of-concept UAV led to a Cypher Technology Demonstrator that made its first tethered flights in April 1992. The Cypher flew tests and demonstrations through the 1990s.

'Nineties Nuances

Sikorsky moved ahead with Black Hawk improvements and international partnerships. The Army UH-60L with Seahawk improved durability gearbox and more powerful engines entered production in 1989 and



The MH-60K integrated terrain avoidance radar and night-vision devices for Special Operations

set the S-70A configuration for international customers. Mitsubishi Heavy Industries in Japan signed a Black Hawk license production agreement. In 1990, Sikorsky Aircraft and Korean Air signed a license agreement to build the UH-60P Black Hawk in the Republic of Korea.

The bitter disappointment of Operation Eagle Claw in the Iranian desert a decade earlier drove the U.S. Department of Defense to fund special operations helicopters with systems for long-range, night/adverse weather missions. Sikorsky rolled out the first MH-60K

In successive versions, the S-76 found market success among aeromedical and Search-And-Rescue helicopter operators. The New Jersey State Police flew the S-76B.

at Stratford on March 14, 1990 with integrated terrain avoidance radar, night vision devices, and a digital cockpit. Program manager Rudy Beckert remarked at the rollout, 'It carries perhaps 30% more electronics than any Black Hawk derivative we've built so far." He added, "We'll set up a line that's very similar in timing and process to what we do on the Seahawk line. This aircraft has an order-of-magnitude [greater] complexity and maybe a little more."

Sikorsky commercial helicopters were also gaining more sophisticated and integrated avionics. In November 1990, a new S-76 search and rescue (SAR) helicopter landed on the Stratford helipad. It was the second S-76 SAR aircraft for the Royal Hong Kong Auxiliary Air Force and the first certified by the US Federal Aviation Administration for hands-off approach to hover under IFR conditions.

The Army had received more than 1,000 Sikorsky Black Hawks by the time coalition forces rushed to Operation Desert Shield in 1990. In the fast-moving Desert Storm of 1991, UH-60s flew troops, equipment, supplies and the wounded. Quick Fix EH-60As located, intercepted, and jammed enemy communications. At sea, Navy SH-60Bs and SH-60Fs provided situational awareness to carrier battle groups. Marine CH-53Es and CH-53Ds hauled heavy cargo and Navy MH-53Es swept mines from sea lanes before, during, and after the war.

The YRAH-66 Comanche flew in 1996 and was the focal point of Sikorsky air vehicle and systems integration.

In April, 1991, the Boeing-Sikorsky First Team won the competition to build LHX prototypes and pursue a Full Scale Development contract for what would become the RAH-66 Comanche reconnaissance attack helicopter. At an October ceremony in Stratford, Sikorsky President Eugene Buckley acknowledged, "We could not have done it without the entire company: every person in every department and on every program we have." Plans called for the RAH-66 to be built in a joint program with Sikorsky and Boeing components and systems assembled by Sikorsky in Bridgeport. Assembly of the first prototype started in November 1993.

Sikorsky used "paperless" three-dimensional computer-aided design for the first time on the stealthy Comanche. The design database was stored in IGOR, Sikorsky's electronic drawing vault to be updated and shared by team members in different locations. The electronic mockup provided a means to check-fit Comanche assemblies before they were built. Steel tools machined directly from CATIA files molded large composite parts that fit with precision. The first YRAH-66 flew in January 1996 with Sikorsky pilot Rus Stiles and Boeing co-pilot Bob Gradle.

Gene Buckley championed development of the next Sikorsky helicopter, and the company unveiled a wood-and-fiberglass mockup of its conceptual S-92 at the Helicopter Association International convention in 1992. The Helibus was originally a big-cabin S-61 replacement with a Black Hawk drivetrain and new-technology main rotor blades. By 1994, strict new international safety standards and tougher performance requirements from

commercial operators drove development of a more powerful S-92 with damage-tolerant structures and lower operating and support costs.

Sikorsky began flying wide-chord, all-composite main rotor blades on a Black Hawk in December 1993. The risk reduction performance demonstration provided the high-lift blades for today's H-60M and S-92 helicopters. Black Hawk systems integration was also advancing the state of the cockpit art. When Sikorsky signed a contract in December 1992 for S-70s to equip the Turkish Armed Forces, it launched development of an integrated digital cockpit. In April 1996, the company announced a Black Hawk glass cockpit option and a new digital automatic flight control computer to help manage pilot workload. The improvements would provide the starting point for today's S-70M (H-60M) and S-92 crewstations.

On May 5, 1994, nearly 20 years after the first flight of the YUH-60 prototype, the 2,000th Sikorsky S-70 left Stratford with a delivery crew from the US Army's 101st Aviation Brigade. A new H-60 multi-year procurement contract in 1997 covered 108 H-60s for the U.S. services including UH-60Ls for the Army, HH-60Gs for the Air Force, and 42 new CH-60 fleet combat support helicopters for the Navy. The CH-60 would evolve into today's multi-mission MH-60S and share a common cockpit with the multi-sensor MH-60R Naval Hawk.

The first S-92 flew at West Palm Beach on December 23, 1998 and marked major advances in computer aided design and manufacturing. International S-92 partners shared their computer design files in an electronic mockup, and new computer workstations enabled Sikorsky engineers to see their designs in the bigger context. Two Helibus marketing mockups were built for trade shows, but no engineering mockup was made, and

The MH-53E minesweeper cleared sea lanes before, during, and after Desert Storm.

partners never exchanged parts before the first aircraft was assembled. In 1999, S-92 program manager for business development Fred Geier told Vertiflite magazine, "When we assembled Aircraft One with parts from around the world, it went together smoother than our 2000th Black Hawk."

Computer aided design and advanced systems engineering would have far-reaching implications for Sikorsky business over the next two decades. The first production MH-60S made its maiden flight January 27, 2000 introducing a new generation of sophisticated, integrated Naval Hawks. Sikorsky delivered 41 new UH-60Ls that year, and the Army was making plans for a recapitalization program that would ultimately build new Black Hawks for the digital age.

The first S-92 was built by an international team in a digital engineering environment.

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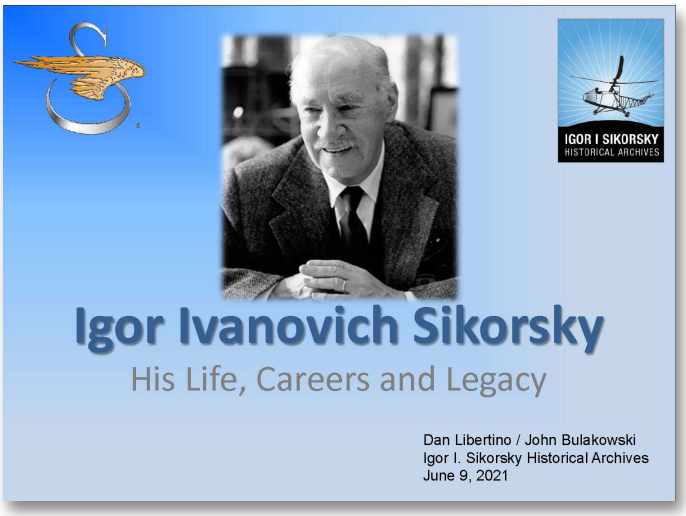

As part of the Sikorsky Archives' mission of preserving and disseminating information and encouraging students in STEM (Science, Technology, Engineering and Mathematics), Dan Libertino and John Bulakowski conducted a virtual presentation on June 9th to 75 Sikorsky summer interns on the life and legacy of Igor Sikorsky.

Prepared by Frank Colucci and John Bulakowski with graphic art and layout by Jodi Buckley.

"The saving of life is a source of great satisfaction to me. I sincerely hope that in addition to a big success in general for yourselves, that the saving of life would remain the source of satisfaction and great interest to you who are entering the helicopter field."

Igor Sikorsky's concluding remarks in a presentation to junior engineers
- October 24, 1969

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