IGOR I SIKORSKY HISTORICAL ARCHIVES

Sikorsky Archives News

July 2024

Published by the Igor I. Sikorsky Historical Archives

Sacred Heart University, West Campus Room 161D, 3135 Easton Turnpike, Fairfield, CT 06825

Sikorsky Test Pilots Expand the Envelope

Igor Sikorsky was the chief designer and chief test pilot of the VS-300 helicopter.
(Unless noted, images property of Sikorsky Archives)

Visit us at **Sikorskyarchives.com** Contact us at **iisha@snet.net** 203.396-6001

July © 2024 The Igor I. Sikorsky Historical Archives Inc. All rights reserved. A 501 (C) (3) Non Profit Organization.

On June 3, 1910 in his native Russia, Igor Sikorsky took off in his underpowered S-2 biplane and began learning how to fly -- and how to flight-test. In The Story of the Winged S, he later wrote, "Having never before been in the air, even as a passenger, I had to learn the necessary movements which were familiar in imagination but not yet in reality." Test pilot skills learned on the job by the pioneer and formalized by later aviator-engineers enable Sikorsky Aircraft, a Lockheed Martin company, to advance vertical flight today. The company currently has 27 pilots at different test sites, about two-thirds of them qualified for envelope-expanding experimental flight-test. The lead pilot at each site works for the Chief Test Pilot who reports to the Sikorsky vice president of engineering.

Sikorsky's test piloting lessons came with personal risk. His S-2 and S-3 crashed after minutes of flight and left the young designer-tester bruised but determined. In May 1913, Sikorsky test-flew the world's first multi-engined aircraft, his S-21 or The Grand. Later that year and into 1914, he piloted the S-22 Ilya Muromets transport/bomber for the Russian Army and wrote, "A few other world records were established, but more important were the vital engineering results that were achieved. This plane marked the end of a period of experimentation."

Established in America, Igor Sikorsky experimented with a new kind of flying machine as Vought-Sikorsky division of United Aircraft turned from fixed-wing flying boats to helicopters. On September 14, 1939, the emigre pilot and chief engineer made the first tethered hover in his VS-300 (S-46) helicopter at Bridgeport Airport in Stratford, Connecticut. Testing expanded the flight envelope and refined the single-main-rotor configuration. The Sikorsky Helicopter Logbook for October 9, 1940 noted a demonstration for celebrity aviator Charles Lindberg reached 100 ft, the highest altitude to date. However, pilot notes said, "The engine was rough all the time, and sometimes badly rough because vibration was noticed even from the ground. Col. Lindberg noticed it himself and wanted to know the reason."

The VS-300, then flying with three tail rotors, kept vibrating on subsequent flights. On October 14, the logbook read, "Normal takeoff; flight proceeds okay during 14 minutes when on one of the turns the machine looks tilted slightly back and then to the left, rapidly losing altitude. The machine landed on left side about 45° and turned over. Main rotor was smashed; right auxiliary prop broken. Right landing [gear] and nose damaged. Pilot was unhurt, having a few scratches on the nose." Post-crash analysis blamed a broken tailboom weld. Sikorsky resumed VS-300 testing on December 24, 1940. He shared pilot duties with aerodynamicist Serge Gluhareff and US Army Capt. Frank Gregory but crashed again in May 1941, again without serious injury.

Sikorsky hired experienced aviator Charles "Les"

Les Morris was hired to test and demonstrate the VS-300 and R-4 helicopters.

R-4 production grew the Sikorsky flight test organization. L-to-R, "Connie" Moeller, engineering pilot; Jimmy Viner, Chief Pilot; Ralph Lightfoot, engineer; Pat Handy, engineer; Bob Nields, pilot; Harlow Smith, engineer; Maurice Bugbe, pilot, Howard Hunter, engineer; Bob Decker, pilot.

Morris in March 1941 to fly VS-300 tests and demonstrations. A May logbook entry named Sikorsky, Gluhareff, and Morris project pilots. In the course of control development, the experimental helicopter mixed partial cyclic control on the main rotor with different vertical and horizontal tail rotor arrangements for anti-torque, attitude, and directional control. Frank Gregory wanted the military XR-4 to have full cyclic control on the main rotor and eliminate the horizontal tail rotors. Morris tested the VS-300 modified with lateral cyclic in August 1941. In 1985, he told interviewer Harvey Lippincott, ". . .we took the aircraft out to the Bridgeport Airport and in one day I found myself flying it full forward speed 60 to 80 miles an hour, making figure-eight turns, quick stops - everything that a helicopter should do. Suddenly we had a flying machine."

Chief Pilot Morris and Sikorsky flew the prototype XR-4 (S-47) helicopter into Wright Field, Ohio in 1942 for Army testing. Morris continued R-4 demonstrations, but when production began in Bridgeport, Sikorsky Aircraft needed more test pilots to deliver contract-compliant aircraft and to develop more capable helicopters. Quickly trained by Morris in the XR-4, Connie Moeller served as Sikorsky's experimental engineering test pilot from 1943 to 1951.

Moeller explored dangerous helicopter power-settling in 1943, set an unofficial 110 mph speed record in the S-49 (XR- 6) in 1944, flew civil certification tests in the S-51 in 1946, and made the first flight of the S-52 "sport job" in 1947. He noted in his company resume, "I was lucky to do all my helicopter testing without any damage to the ships or to myself and crew. I give much credit to Engineering and to the devoted shop men and crew chiefs who maintained and modified the ships, often working under tight schedules." On July 5, 1947, Moeller made the first and only flights of an R-4B with a single-blade main rotor. His company resume noted simply, "Not pursued further!!!!!!!"

Learn to Fly

Dimitry "Jimmy" Viner started his aviation career in 1923 as a 14-year-old part-time helper with Sikorsky Aero Engineering at Roosevelt Field, Long Island. He later wrote, "It was a natural thing for me to get interested in aviation because of I. I. Sikorsky being my uncle – I was exposed to aviation from my childhood." Viner learned to fly at Curtis Flying Service in 1929. He left Sikorsky only to work as a flight instructor in Massachusetts from 1941 to 1943 and returned to the

Pilot Harold Thompson and engineer Ralph Alex looped the S-52 10 times within 45 minutes on May 9, 1949.

company to fly an XR-4 helicopter for the first time on February 5, 1943.

Viner became Chief Pilot in December 1944, made the first helicopter hoist rescue in a prototype YR-5 (S-48) in November 1945, set a 115 mph helicopter speed record with an S-48 in January 1946, and became the first helicopter pilot to log 1,000 flight hours in 1947. He piloted first flights of the S-51 in 1943, S-55 in 1949, S-56 in 1953, S-58 in 1954, and S-60 in 1959. Viner flew the S-55 that snagged the first aerial parachute recovery in 1960. When he stopped test flying on October 2, 1968 as Chief of Engineering Test Operations, Viner had 4,100 rotary-wing hours.

Bob Decker was a wartime flight instructor with Viner and joined Sikorsky Aircraft in March 1944. The company test group at the time had only four pilots. Decker soloed in an R-4B in 1944 and passed 1,000 helicopter flight hours in early 1949. He flew certification tests of the S-52 and demonstrated the unsuccessful S-53 (XHJS-1) to the Navy in 1948. Decker and Viner flew the prototype S-56, the Marine Corps XHR2S-1, in December 1953. In November 1956, Decker and Marine Major Roy Lee Anderson set three world records for payload and speed with the big, twin-engined helicopter at Windsor Locks, Connecticut.

Bob Decker and Jimmy Viner complete an S-55 test flight.

Wartime bomber pilot Jim Chudars learned about helicopters flying R-5s in the Air Force and S-51s with an early shuttle service at Boston's Logan Airport. He joined Sikorsky in March 1948 and flew Senate candidate Lyndon Johnson around Texas in an S-51. Chudars logged his 1,000th helicopter hour in December 1950. By 1958, the busy Sikorsky flight test staff had 31 pilots and several development programs underway. Chudars and Viner made the first flight in the S-60 on March 25, 1959 at Stratford and demonstrated the piston-engined flying crane at Fort Bragg, North Carolina just 10 days later.

Sikorsky News reported first flight of the turbine-engined S-62 in May 1959, and quoted then-

Decker and Viner flew the prototype S-56, the Marine Corps XHR2S-1, in December 1953.

Assistant Chief Test Pilot Decker downplaying the event. “The people watching us seem more excited than we are. It’s all part of our day’s work, and we’re too busy concentrating on the job at hand to think of anything else.” Decker offered, “You can get a pretty good idea of how the helicopter will handle when you lift it off the ground, hover, move forward and backward and sidewards, and then do a couple of 360s. If it responds well in these maneuvers, then you take it out of the lot.”

As Chief Pilot, Decker set policy that even pilots with engineering degrees had to fly routine production testing before developmental envelope expansion. With more helicopters in service, Sikorsky recruited from military pilot ranks. Decker’s co-pilot for first flight of the turbine engined S-62 in 1958 and twin-turbine S-61 (Navy XHSS-2) in 1959 was Air Force veteran Frank Yirrell. The two demonstrated water landing and taxiing with the boat-hulled S-62 on the Housatonic River behind the Stratford plant. Testing more powerful helicopters to the edges of the flight envelope still came with risk. “Yip” Yirrell, co-pilot Gordon Hazell, and flight test engineer Harvey Hochman were lost during high-speed tests of the big S-61 sub-hunter on April 23, 1960.

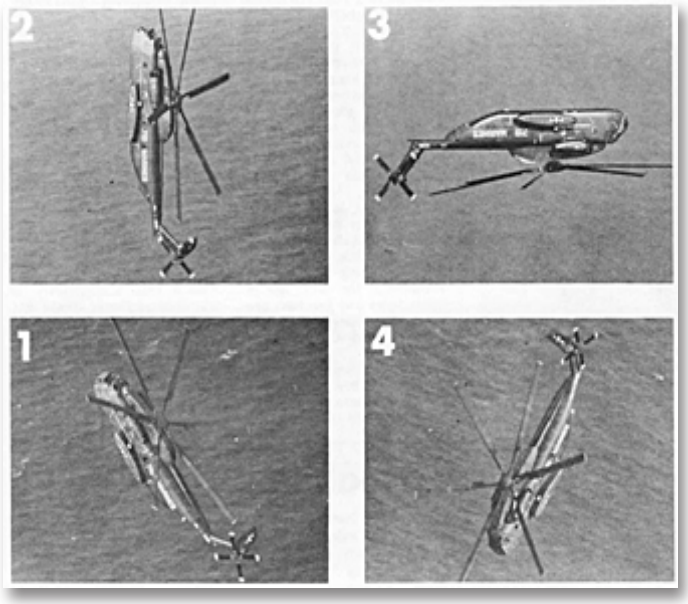
Viner and Chudars took the S-60 flying crane on a demonstration tour soon after first flight.

Bob Decker and Frank Yirrell made the first water landings with the S-62 in 1960.

The stretched S-61R (Air Force CH-3C) cargo helicopter rolled out at Stratford in June 1963. Pilots James “Dick” Wright and Thomas Glynn conducted early aerial refueling tests in late 1965 with the company-owned S-61R outfitted with a dummy refueling probe. Wright became project test pilot for the Vietnam-era HH-3E Jolly Green Giant and received an Air Medal, reportedly the first awarded to a civilian, for his air refueling work.

Byron Graham flew Vought Corsair fighters in World War II and Sikorsky HO5S-1 (S-52) helicopters in Korea. Ferrying a Marine helicopter back to Sikorsky for overhaul in 1956, he applied for a test pilot position and launched a 31-year test career. In 1968, Graham and Marine Lt. Col. Robert Guay looped and rolled an S-65 (Marine Corps CH-53A) over Long Island Sound with the one-time permission of the Navy.

Dick Mills came to Sikorsky from the Marine Corps in 1957. He advanced to chief test pilot on several S-65 programs and later to Chief Research and Development Test Pilot. The first S-65 (CH-53A) twin-turbine cargo helicopter for the US Marine Corps flew at Stratford on Oct. 14, 1964 with Lloyd “Opie” Blanchard at the controls. The Marine Sea Stallion spawned other test efforts. Dick Wright and Pat Guinn made the first flight in the Air Force HH-53B Super Jolly Green Giant in 1967. Frank Tefft and Byron Graham made the first flight in the three-engined YCH-53E on March 1, 1974.



Byron Graham and Marine Major Robert Guay looped and rolled a CH-53A in 1968.

Fly to Learn

John Dixson earned his aeronautical engineering degree from Notre Dame and left the Army after a Vietnam tour as a gunship pilot. He recalled, "I had two kids and no job. On Monday, I drove to Sikorsky; on Tuesday I drove to Boeing," Assistant Chief Pilot Jim Chudars gave Dixson his Sikorsky tour, and the company made an offer. "I took the job. They obviously had more oars in the water tech-wise -- this was 1966." Dixson flew production testing through 1969. "You would fly on any given day in production an SH-3D, SH-3A, CH-54A, S-61L or N, or the Air force CH-3C or E. It was no big deal."

Dixson's company-funded assignment to the Navy Test Pilot School at Patuxent River, Maryland was pre-empted by a spending cut, but the now-civilian pilot read the military curriculum. "The test pilot schools do a great job training pilots to do a specification-compliance test flight," he noted. "They train pilots to check for compliance with the stated requirements the Army, the Navy, or the Air Force put on the aircraft. Development flying in the helicopter business is very different from compliance flying."

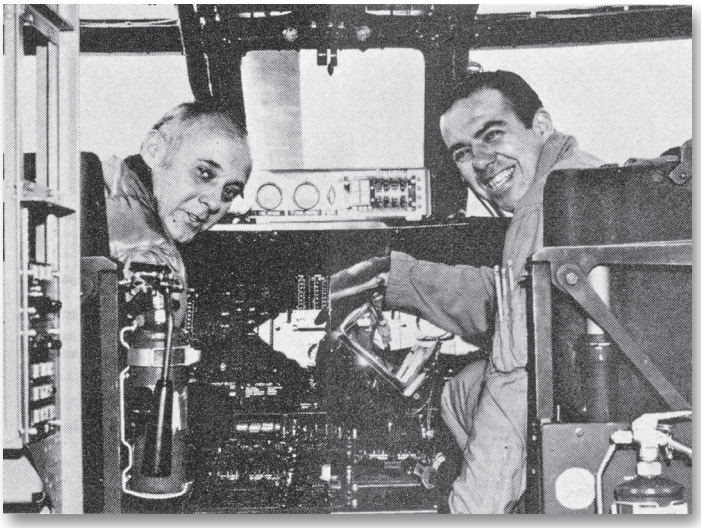
As a developmental test pilot, Dixson flew load-stabilization and remotely controlled precision hover experiments in the S-64 Skycrane in 1970. Byron Graham and Kurt Cannon set helicopter speed records with the sleek S-67 Blackhawk in December 1970, and Graham and Dixon flew the company-funded gunship around US military bases in 1971. "The demonstration envelope for the S-67 included some aerobatics," Dixson explained. "I had come out of Army flight school,

Graham and Dixson flew the S-67 Blackhawk on a tour of US military installations in 1971.

Byron Graham toured with the S-67 Blackhawk in 1971.

Fort Wolters -- we didn't do aerobatics in helicopters." At Fort Bragg, Graham simply told his co-pilot to fly the routine, including rolls. "That was the full extent of my training. . . He was a great engineering pilot, a really good stick." Dixson subsequently flew with three different Army guests in the S-67 front seat. "It took three guys before I could get it upside down. They didn't know I was teaching myself along the way."

In the Sikorsky pilot office, Dick Wright succeeded retired Air Force General Frank Everest as Chief Pilot and in 1972 appointed Dixson project chief test pilot for the critical Utility Tactical Transport Aircraft System (UTTAS). Wright and Dixson made the first flight of the prototype YUH-60A at Stratford in 1974. "The first flight was a trip in the park. Everything went according to Hoyle. The first flight out of the yard was an eye-opener. As we accelerated and used 100% torque, we knew we had nose-up problem up to 40 kt. It became more of a problem climbing out." Dixson recalled, "On the beginning aircraft, the vibration levels were absolutely horrible. There were problems everywhere you looked. All of those would be show-stoppers in a competition." Flight test assessed each problem and engineering remedy. "That was the one thing I learned that was worthwhile: Never give



Dick Wright and John Dixson made the first flight in the S-70 (YUH-60A) in 1974.

The YUH-60A won the UTTAS competition in 1976.

up." The YUH-60A was declared UTTAS winner on December 23, 1976.

Nick Lappos returned from flying attack helicopters in Vietnam to earn his engineering degree from Georgia Tech. "I knew that I wanted to be in aerospace engineering – I wanted to be a design engineer," he said. In a Sikorsky job interview, former head of flight test Phil D'Ostilio asked Lappos. "Would you think you'd want to be a test pilot?" The aviator-engineer joined the company in February 1973. "I flew with our senior test pilots in the year or two after I got there." Production tests in SH-3s, civil S-61s, and CH-53s mixed with systems development flights. "The training was real. It was vigorous, and it was very good." The Navy contract management office at Sikorsky agreed and, for Lappos, waived its requirement for a test pilot school diploma.

Lappos co-piloted the developmental S-69 Advancing Blade Concept, S-70B Seahawk, S-72 Rotor Systems Research Aircraft, and S-65E Super Stallion. He observed, "Development test flying is to carefully work up the structure, dynamic response, and systems. It's a deep engineering look at the aircraft, not just fundamental performance." The S-76 was conceived in 1974, and accelerated development was important to meet market demand for a fast, new commercial heli-

Nick Lappos went from the Comanche program to lead S-92 development

copter. Chief Pilot Dick Wright asked the 27-year-old Lappos to be S-76 project pilot working with designers. “I had a chance to watch that process from the beginning,” noted Lappos. “It was wonderful.”

The first of four S-76 prototypes flew on March 13, 1977 at the new Development Flight Center in West Palm Beach, Florida where good weather could sustain the aggressive schedule. “It was basically the same test plan that was done for the Black Hawk and other models,” noted Lappos. “What challenged us was the pace.” The S-76A was certified in November 1978 and the first production helicopter delivered in February 1979. In February 1982, Nick Lappos, Bill Kramer, Byron Graham, Dave Wright, and Tom Doyle set world speed, time-to-climb, and sustained altitude records with the S-76A at West Palm Beach. Lappos flew air-to-air combat maneuvering trials against a US Army Black Hawk in 1983.

The Army identified shortcomings in its light helicopter fleet in 1982, and Lappos as Chief Research and Development Pilot teamed with Rus Stiles testing Light Helicopter Experimental (LHX) technologies for the RAH-66 Comanche. Stiles was a graduate of the Navy Test Pilot School and had flown the Sikorsky CH-3 and HH-53 in the Air

Rus Stiles was the Comanche Project Pilot through the flight test program from 1996 to 2004.

Force. He was recruited from the Military Airlift Command Test Division by former commanding officer and then-Sikorsky West Palm Beach Chief Pilot Syd Gurley. “Because of my qualifications, after about a year, I was just given a promotion

The S-76 test program was the first conducted at West Palm Beach Florida.

to engineering pilot. . . We were starting to do research flights into fly-by-wire, and we were getting into the advanced cockpits that would become the Comanche program."

LHX spawned flying testbeds. Stiles recalled, "We had put together a fly-by-wire surrogate in an S-76 which really amounted to a pallet of actuators that interfaced with the standard flight controls." S-76 project pilot Nick Lappos proposed the SHADOW, an S-76 with a single-seat, fly-by-wire crewstation grafted on the nose. Another S-76 became the Fantail with a protected anti-torque system. "I flew both. Nick took the lead in early Fantail development. I worked on the fly-by-wire and avionics installation check-outs in SHADOW. We trained a few other guys to fly safety pilot on the SHADOW, but Nick and I did most of the flying on the Fantail."

Chief Pilot Frank Tefft made Stiles part of LHX engine and structural testing efforts. Stiles flew the first YRAH-66A in January 1996. "I was really the first and only chief program pilot for Comanche. . . I did most of the envelope expansion stuff, just because I had most of the experience in the simulator." Sikorsky built a new engineering simulator in Stratford with interchangeable cockpits for the Comanche and other programs. "Because the simulators became so high-fidelity – Sikorsky made a huge investment in constantly improving the simulation – we were able to rehearse most everything we did. We were able to inject failures and things that we might anticipate. On the other hand, the West Palm Beach telemetry flight test people were just awesome. They were watching us all the time. We exceeded some limits at times, but they were so well-versed in structures, flight controls, engines that they knew how to put us back into an envelope that would be safe to get home."

The Fantail (top) and SHADOW (bottom) tested critical Comanche technologies.

Tools and Techniques

After his Comanche assignment, Nick Lappos became Sikorsky Director of Test Engineering and ultimately S-92 program manager responsible for getting the big commercial transport certified. Company Chief Pilot John Dixson and program chief pilot Bob Spaulding flew the S-92 for the first time on December 23, 1998. During development, Lappos continued to serve as a visiting test pilot and leveraged the advances in flight simulation. "When I first started at Sikorsky, the only simulator was run by the research group

The X2 demonstrator completed testing in 2011 with 22 flight hours.

in Hartford. . .It was slow and had a rudimentary visual system. The first good simulators we built in Stratford in the early 1980s were research simulators that allowed us to do a great deal of the handling qualities work."

Kevin Bredenbeck was introduced to the Comanche simulator by Rus Stiles. Bredenbeck joined the Sikorsky test pilot ranks in 1994. He had graduated from Embry Riddle, flown medical Black Hawks in Desert Storm, and was an engineer refurbishing H-60s with the Connecticut National Guard when recruited by Nick Lappos. "You were assessed through the senior pilots," Bredenbeck explained. "It was old-school. You were the co-pilot. You had the clipboard, and you followed them on the production flights. It could be Black Hawk, Seahawk, '53, and then '76s at the time. It was quite exciting from a young guy's perspective, flying with some really talented folks who had been around helicopters for a long time."

Bredenbeck also received formal training at the National Test Pilot's School in Mojave, California in 1996. "It was a firehose of five, almost six, months of flight-test focused on helicopters." Bredenbeck became program chief pilot on the Turkish Air Force glass cockpit Black Hawk, predecessor of the US Army UH-60M. He made the first flight and early envelope expansion tests in the Mike model Black Hawk with its wide-chord rotor blades and digital cockpit. Bredenbeck became Chief Pilot when John Dixon retired, and he was chosen by Sikorsky leadership to pilot the X2 high-speed compound helicopter. The single-seat demonstrator achieved 253 kt in September 2010. "The aircraft could have gone faster. We could have done more, but the objective was proving a helicopter could go at 250 kt at cruise, which is basically 70% torque."

With Bredenbeck, Sikorsky testers set up a Model Development Safety Committee with experts in

Keven Bredenbeck and Bill Fell flew the S-97 proving technologies for the bigger SB>1 Defiant.

structures, fight controls, handling qualities, and systems to authorize proposed tests. The test pilot explained, "Things that would take months with Boeing, the Government, or NAVAIR we could get through, effectively, in a couple of weeks and be off flying the aircraft safely and efficiently." Tasks were classed high-, medium-, and low-risk. "The flights had to be in accordance with how was the pilot mentored. We documented all of the requirements that John and his staff used to put on us young guys." Bredenbeck became Director of Test and Evaluation/Flight Operations. "What was great at Sikorsky when I was growing up was we weren't developing one aircraft. There were multiple platforms where you got to cross-pollinate and learn the characteristics of this tail rotor, this main rotor. It was like a toy store for a test pilot."

William "Bill" Fell came to Sikorsky as a highly

The S-76D first flew in February 2009.

The S-97 with integrated auxiliary propulsion demonstrated 200 kt speed and tactical agility.

The SB>1 Defiant Joint Multi Role Technology Demonstrator achieved 247 kt with X2 technologies.

experienced US Army experimental test pilot including time in the Comanche prototypes at West Palm Beach. “I got to know some of the Sikorsky people.” He recalled, “They were solid test pilots who knew their trade and were just crazy-smart and brave.” Fell was a graduate of the Navy Test Pilot School, and unlike most new Sikorsky hires, started in experimental testing. He piloted the fly-by-wire UH-60M Upgrade, armed Israeli Battle Hawk, and commercial S-76D.

The S-76D first flew in February 2009, and Bill Fell continued development tests through 2013 including high altitude operations in Leadville, Colorado, cold weather work at Fairbanks, Alaska, and sea level certification in Florida. “I’ve probably done between two and three hundred actual engine failures in the S-76D in all locations, hover, high-speed flight. . . It’s a very safe machine, and I’m pretty proud to have been part of the development of that aircraft.”

The Sikorsky-funded S-97 Raider integrated X2 technologies in a fast, agile tactical helicopter that flew for the first time at West Palm Beach on May 22, 2015. Bill Fell noted, “From the moment it was an idea, I was the project pilot on it and still am.” He took the coaxial compound helicopter through 200 kt in forward flight, 25 kt flying sideways and rearward, 60-degree banking turns at 160 kt and fuselage-level acceleration and deceleration. The big SB>1 Defiant subsequently applied the coaxial rigid rotor advancing blade concept, integrated propeller thruster, fly-by-wire flight controls, and active vibration suppression to a Future Long Range Assault Aircraft. Bill Fell considered early retirement from the Sikorsky test pilot community but elected to stay for the first flight of Defiant in March 2019 and continuing development of the Raider. “I’m glad I did,” he observed. “The satisfaction of putting Raider through a full envelope and putting Defiant through a full envelope was huge.”

Sikorsky Chief Pilots

Les Morris 1941 to 1943
Jimmy Viner 1943 to 1959
Bob Decker 1959 to 1972
Pete Everest 1972 to 1974
Dick Wright 1974 to 1989
Frank Tefft 1989 to 1993
John Dixson 1993 to 2005
Kevin Bredenbeck late 2004 to 2015
John McGonagle 2015 to Present

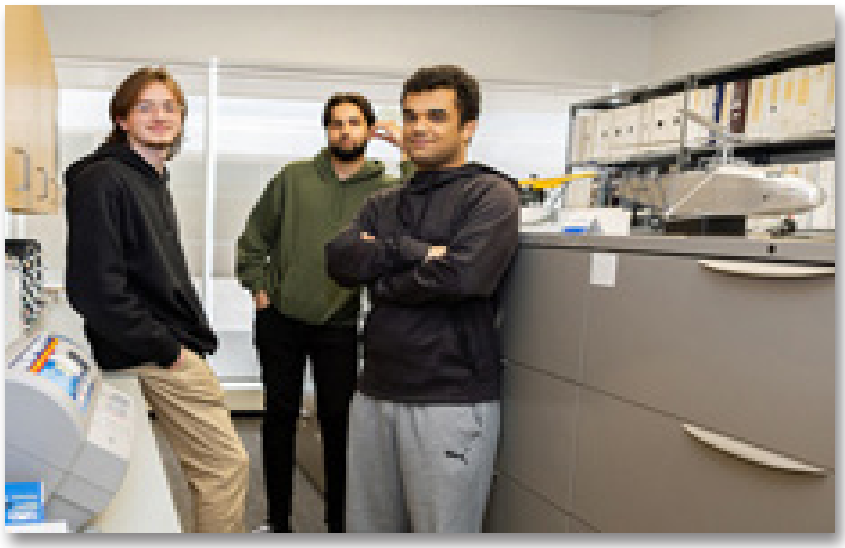
Help Us Preserve the Igor Sikorsky Legacy

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
or see our website
www.SikorskyArchives.com
for details on how you may help us

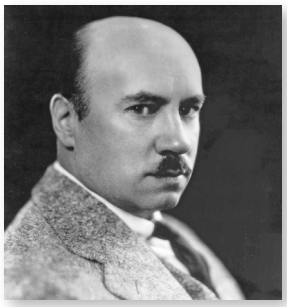
Thank You

A 501(C)(3) Non-Profit Organization



Sacred Heart University juniors Joaquin Camaran, Mahmud Kandawala and Thiago Reis are working at the Sikorsky Archives as software engineer interns to set up a comprehensive online database that can access our tremendous holdings.
(Sacred Heart University photograph)

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



"I had to follow the very interesting, even though difficult, career of an early pioneer to build an aircraft without knowing how to build it, then climb into the pilot's seat and try to fly it without knowing how to fly it. When a crack-up occurred, which happened very, very frequently, I did not know whether to blame the pilot or designer or the builder. In a way this was convenient for it eliminated any quarrels or disagreements."

Igor Sikorsky, *Recollections of a Pioneer,* October 1968

Sikorsky Archives News
Sacred Heart University, West Campus, Room 161D, 3135 Easton Turnpike, Fairfield, CT 06825