



Sikorsky Archives News

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THE COMANCHE ADVANCED TECHNOLOGY EVOLVED FROM RISK REDUCTION R & D PROGRAMS



COMANCHE

ACAP



FANTAIL



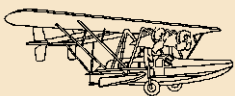
EAGLE



SHADOW



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CHRONOLOGY OF THE RAH-66 COMANCHE PROGRAM

-The U.S. Army established the LHX (Light Helicopter Experimental) program in 1983. Preliminary design contracts were awarded to Bell Helicopter Textron, Sikorsky Aircraft, Boeing Vertol, and Hughes Helicopters.

-In June, 1985 Boeing and Sikorsky joined forces and collaborated to win the LHX contract. The Boeing-Sikorsky win strategy was to invest in risk reduction Research and Development programs to demonstrate that the advanced technologies developed were ready for inclusion in their version of the LHX helicopter.

-The S-76® helicopter was used as the flying test bed to develop and demonstrate the viability of

the following new technologies for the LHX program:

- **ACAP (Advanced Composite Aircraft Program)**
- **FANTAIL protected high control rapid response anti-torque system**
- **SHADOW (Sikorsky Helicopter Advanced Demonstrator of Operator Workload)**
- **AUH-76 Armed Helicopter**

-The U.S. Army awarded the LHX (named the Comanche helicopter) contract to the Boeing-Sikorsky team in January, 1991. First flight occurred in January, 1996. The Engineering Manufacturing Development phase started in June, 2000.

-The U.S. Army priorities changed due to two ongoing wars and international terrorism, and the program was cancelled in February, 2004. ☹

THE ADVANCED COMPOSITE AIRFRAME PROGRAM (ACAP)

was created to demonstrate the benefits of a fully composite airframe structure. ACAP

utilized the S-76 dynamic and flight control systems. ☹





The composite fuselage was developed to test strength, weight and cost of the manufacturing processes. The final configuration contained 82% composites and achieved unprecedented advancements in design and manufacturing processes.

The frangible fuselage was shaped to reduce radar signatures, and incorporated energy absorbing landing gear, fuel cells and crew seats. The ACAP ultimately proved to be the most crash resistant and ballistically tolerant aircraft ever made for the time period. ☺



THE ADVANCED ELECTRONIC COCKPIT

was developed using S-76A and S-76B aircraft modified with extended nose sections. The test configuration was christened the SHADOW AIRCRAFT. The aircraft provided a three pilot configuration comprised of the pilot and copilot in the basic S-76 aircraft, and the third pilot in the nose extension for testing and developing the advanced cockpit concepts.

The SHADOW provided the perfect vehicle for developing and evaluating single pilot handling capabilities. The new four-axis side arm controller, full authority fly-by-wire, heads up and helmet mounted displays, map readers, interactive voice systems, forward looking infrared and touch sensitive systems were developed providing the advanced technologies for the next generation helicopters. ☺



S-76A Shadow



S-76B Shadow



Fantail Aircraft Paced By Ground Vehicle During Sideward Flight Testing at WPB, FL



Flight Tests at WPB, FL

FANTAIL CONFIGURATION DEVELOPMENT

The Comanche requirement for a protected tail rotor spawned the development of the FANTAIL configuration. An S-76B was modified with a shrouded anti-torque rotor called the FANTAIL. The configuration demonstrated the value of the shrouded tail rotor system for safety and survivability. In addition, the FANTAIL provided the helicopter with a new and radical maneuvering capability. The highly maneuverable and agile FANTAIL proved to be exceptionally quiet with a noise reduction of 15 db compared to an unshrouded tail rotor. The FANTAIL aircraft was capable of flying unmatched air maneuvers including:

- **180 Degree Snap Turns**
- **Sideward Flight At 80 Knots**
- **Rearward Flight At 70 Knots**
- **360 Degree Pirouettes At 35 Knots**



Flight Demonstration At Paris Air Show



ADVANCED ARMAMENT SYSTEMS

The Comanche mission required incorporation of advanced armament systems. An S-76A and S-76B was modified to accommodate basic airborne weapons systems. The aircraft was modified and strengthened to accept a Pitch Compensated Armament Pylon (PCAP). The main gearbox and rotor system was modified to accept a stabilized Mast Mounted Sight (MMS), and the cockpit was redesigned to incorporate weapons management and control system. The aircraft was redesignated AUH-76 Eagle.

The AUH-76A was utilized as a flying firing weapons test bed. Many domestic and foreign machine guns, cannons and rockets were tested. The AUH-76B progressed into more sophisticated missile systems including TOW, ITOW, SKUA, HELLFIRE and STINGER. The aircraft proved to be the perfect test platform for the RAH-66 Comanche. The advanced technology contributions of the ACAP, SHADOW, FANTAIL and AUH-76 EAGLE were a major influence on the development of the Comanche aircraft. ☺



AUH-76



AUH-76 with 50-70 MM Rockets



AUH-76 In Flight Weapons Firing

RAH-66 COMANCHE



AUH-76 Tow Missile Testing

COMANCHE TECHNOLOGIES

were transferred to current and future Sikorsky product line aircraft:

- Composite blade structure
- Composite airframe components
- Advanced transmission systems
- Fly-by-wire flight control systems
- Heads up and Helmet mounted displays
- Multi-functional digital cockpit displays
- Map readers



- Interactive voice systems
- Forward infrared and touch sensitive systems
- Health monitoring systems
- Vibration control improvements



AUH-76 EAGLE HELICOPTERS WERE DELIVERED TO THE PHILIPPINE AIR FORCE FOR SEARCH AND RESCUE, AND AIR DEFENSE MISSIONS.



Bill Gallagher provided the data for this issue of the newsletter based on his personal association with the evolution of the advanced technologies developed. Bill is a retired Sikorsky design and development engineer who was recognized by his peers as a group leader

who could complete an assigned project within budget and time constraints. He was famous for leading clandestine programs to their successful completion. The photos below show his adventurous nature and joys during his adventures in the North Sea and the Orient.



Bill evaluated the North Sea offshore oil mission requirements for the S-92 aircraft. He was transported by the competitor's aircraft shown in the background. His adventure confirmed the superiority of Sikorsky products. ☺

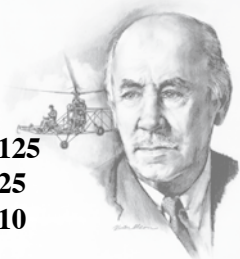
Bill on another boondoggle in Bangkok, Thailand

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Newsletter designed and edited by Lee Jacobson, Bill Gallagher and Edgar Guzman.



“The aeronautical engineer always struggles with what might be termed a three-cornered problem. He must get speed, load capacity and flying range, and to accent any one, he must sacrifice the other”.

Igor I. Sikorsky

