



Newsletter

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Model-Based Development and Flight Test: The Remarkable Story of the X-32B STOVL Joint Strike Fighter Aircraft

*Speakers: Dennis O'Donoghue, Boeing Chief X-32B Test Pilot and
Henry Beaufriere, Boeing Technical Fellow*



During the summer of 2001, Boeing demonstrated the short takeoff, hover, transition and vertical Landing (STOVL) capabilities of its Joint Strike Fighter Concept

Demonstrator Aircraft, the X-32B. Using an innovative and previously unproven method of STOVL envelope expansion, the test team successfully validated the entire STOVL flight envelope from conventional wingborne flight to hover and vertical landing in only eight days of testing. By comparison, the only other direct lift STOVL aircraft, the Harrier, required almost an entire year of testing to accomplish the same feat.

The remarkable success of Boeing's JSF One Team in flight test of the X-32B was due to the "model-based" approach to development and test of the highly integrated propulsion and flight control system. Subscale models were used to establish an extensive high-fidelity aero-propulsion database. This database was used to synthesize the flight control laws, validate the controllability and handling qualities of the aircraft in piloted simulation, and predict the performance of the aircraft in flight test. Real-time comparison of flight test data with predictions from modeling and simulation allowed the test team to quickly establish the flight envelope of the aircraft. The unparalleled level of success demonstrated by the team validated the effectiveness of model-based flight test for STOVL envelope expansion.

The presentation will provide an overview of the JSF program, Boeing's STOVL JSF aircraft, design and development of the integrated propulsion/flight control system, and results from the X-32B flight test program.

Mr. Dennis O'Donoghue is an experimental test pilot for Boeing and currently serves as a project pilot for the Sonic Cruiser

program. From 1996 to 2001 he was assigned to the Joint Strike Fighter Program as chief test pilot of the X-32B STOVL aircraft. During the JSF flight demonstration program Mr. O'Donoghue logged 41 test flights, including first flight of the X-32B, first hover, and first vertical landing.

Mr. O'Donoghue received his wings in 1982 and began his flying career as a tactical jet pilot with the U.S. Marine Corps. Since graduating from the US Naval Test Pilot School, he has logged over 5000 flight hours in 72 different aircraft types, including over 1700 hours in the Harrier series. He holds an Airline Transport Pilot Certificate with type ratings in the B-737, B-757, B-767, B-777, DC-9, G-159, L-300 and L-382. Mr. O'Donoghue holds the rank of Colonel in the Air Force Reserve and is currently assigned as the Vice Commander of the 446 Airlift Wing at McChord Air Force Base, Tacoma, WA.



Mr. Henry Beaufriere is a Boeing Technical Fellow with expertise in the area of flight control system design, stability and control, and flying qualities. Mr. Beaufriere spent 21 years with the Grumman Corporation

where he was responsible for the piloted simulation and validation testing of the X-29 flight control system and contributed to a variety of aircraft programs including the OV-1D Mohawk, Gulfstream III, HIMAT, EF-111, F-14, F-14X, A-6 and EA-6B.

Mr. Beaufriere joined Boeing in 1995 as the technical lead responsible for the flying quality/Vehicle Management System design proposals of both the X-32 Concept Demonstrator Aircraft and the Preferred Weapon System Concept (PWSC). He is currently assigned to the Sonic Cruiser program, helping to define Boeing's next-generation commercial aircraft.

Joint AIAA/SFTE Lecture - Dinner Meeting

Date: **Tuesday, November 19, 2002**
Place: **Old Spaghetti Factory, 2801 Elliott Avenue, Seattle**
Entrée choices are spinach tortellini or baked lasagna.
Please specify choice when making reservations.
Time: 6:00 PM Social, No-Host Bar
6:30 PM Dinner
7:00 PM Program – **X-32B Development and Flight Test**

Dinner Reservations: Call anytime (425) 342-0988 or send email to vera.a.martinovich@boeing.com or paul.l.clement@boeing.com
Dinner Price: \$15 AIAA/SFTE Members and Guests
\$18 Non-Members
\$12 Students
Program Only: \$5 (Free for persons 17 and under)
Please make reservations by 11/15. A reservation is a commitment to pay!

12 hp From 180 Pounds, The Story Of The Wrights Flyer's Engine

By Charles E Taylor

*In commemoration of the approaching 100th anniversary of flight, the following is the **third** installment of a **six-part** article written by Charles E Taylor, as told to Robert S Hall when Orville Wright died January 30th, 1948. Charles E Taylor then became the only surviving member of the three who built the first airplane. Charlie Taylor was the only employee and intimate associate of Wilbur and Orville Wright throughout the critical years. Without precedent or fanfare, Taylor built the engines for the Wright's first planes to their designs. The article below was written in 1948 while Taylor was living in retirement in California, it was first published in Collier's, December 2nd, 1948 and was reprinted in the Airline Pilot, December 1978. Charles E Taylor died January 30th, 1956.*



Sometimes I think the kids were the only ones who really believed that Will and Orv would fly. They hadn't learned enough to say it couldn't be done. We block-tested the motor before crating it for shipment to Kitty Hawk. We rigged up a resistance fan with blades an inch and a half wide and five feet two inches long. The boys figured out the horsepower by counting the revolutions per minute. Those two sure knew their physics. I guess that's why they always knew what they were doing and hardly ever guessed at anything. We finally got everything crated and on the train. There was no ceremony about it, even among us. The boys had been making these trips for four years, and this was the third time I had been left to run the shop. If there was any worry about the flying machine not working, they never showed it and I never felt it. You know, it's a funny thing, but I'm not sure just how or when I learned that Will and Orv had actually flown the machine. They sent a telegram to their father saying they had made four successful powered flights that day—Dec. 17, 1903--and would be home for Christmas. I suppose their sister, Katherine, or maybe the bishop came over and told me about it. I know I thought it was pretty nice that they had done what they set out to do, and I was glad to hear that the motor ran all right. But I don't remember doing any jig steps. The boys were always so matter-of-fact about things, and they never made an effort to get me excited. Even when they got home there was no special celebration in the shop. Of course they were pleased with the flights. But their first word with me, as I remember, was about the motor being damaged when the wind picked up the machine and turned it topsy-turvy after

Wilbur had completed the fourth flight. They wanted a new one built right away. And they were concerned with making improvements in the controls. They were always thinking of the next thing to do; they didn't waste much time worrying about the past. Will and Orv The Wrights didn't go into the airplane experiment with the idea of making a lot of money. They just seemed to be curious about the problems involved—I suppose you would call it a challenge—and they were determined to find out why they couldn't make it work. It was not a game with them or a sport. It may have been a hobby at the start, but now it was a serious business. I was happy working for Will and Orv, and I know they were pleased with my work. They showed it in many ways. Orville even left me an \$800 annuity in his will. When I finally left his employ in 1919, he could have forgotten about me then and there. But the fact he did not, helps me believe he appreciated that I had a part in giving the airplane to the world, though nobody made any fuss about it, and I didn't either. Will and Orv were always thoughtful at Christmastime. The second year I was with them they gave me a two-inch micrometer. Another year it was a one-foot scale. And one Christmas they gave me a \$10 gold piece. People have asked me if I knew why neither Wilbur nor Orville ever married, particularly since their older brothers, Reuchlin and Lorin, and their sister, Katherine, did. I'm sure I never asked them, but I remember that Orv used to say it was up to Will to marry first because he was the older of the two. And Will kept saying he didn't have time for a wife. But I think he was just woman-shy—young women, at least. He would get awfully nervous when young women were around. When we began operating at Simms Station on the outskirts of Dayton in 1904, we always went out on the traction cars. If an older woman sat down beside him, before you knew it they would be talking; and if she got off at our stop, he'd carry her packages and you'd think he had known her all his life. But if a young woman sat next to him, he would begin to fidget, and pretty soon he would get up and go stand on the platform until it was time to leave the car.

PNW Aerospace Timeline

Dinner Meeting and Lecture

Third Tuesday every month

Topic: X-32B STOVL Joint Strike Fighter Aircraft
Date/Time: 19th, November 2002, Social at 6:00 p.m.
Location: **Old Spaghetti Factory, 2801 Elliott Ave, Seattle (Note New Location)**

Past

1867-1868 Lilienthals experiment with flapping wings
1874 Kites and powered models
1891-1896 2000 manned gliding flights, one fatal crash
1900-1939 Lindbergh crossed Atlantic
1940-2000 V-2, B-17, B-52, 707, Sputnik 727, DC-9, DC-10, 737, 47, 67, 57, Apollo, ICBM,
2002 First flight of the Boeing 747-ER, which can carry 15,000 more pounds of people or cargo and can fly about 410 nautical miles farther than existing 747-400s

Retired Members Brunch

Third Saturday Every other month at MOF

Speaker: John Martin
Date/Time: 16th November 2002 9 am
Location: Museum of Flight, Seattle
Contact: Tom Holgate 253-838-0333

Future

6th November Mentor Day, UW (6:00 PM)
Mentor Days For more information, please Contact Eric Lester at 425-294-6979 or e-mail: eric.s.lester@boeing.com for info.
10th December Mike Zyskowski - Microsoft Flight Simulator Room 306 Guggenheim Hall UW

Museum Of Flight 2002 Pathfinders

This Month's Chairman's corner is dedicated to the recent Museum flight announcement that NASA Astronaut *Dick Gordon* and Horizon Air Founder *Milt Kuolt* have been selected to receive the **2002 Pathfinder Award by the Museum of Flight**. First given in 1982, the annual award recognizes individuals with ties to the Pacific Northwest who have made signal contributions to the development of aviation or aerospace.

Richard F. "Dick" Gordon, Jr. was born in Seattle in 1929, Gordon graduated from North Kitsap High School and the University of Washington. He earned his wings as a naval aviator in 1953 and attended Test Pilot School in 1957. He served as a test pilot until 1960, flying the F8U, F11F, FJ, A4D and F4H aircraft. In May 1961, Gordon won the prestigious Bendix Trophy by flying from Los Angeles to New York in two hours and 47 minutes. Gordon was selected by NASA as an astronaut in 1963. He piloted the three-day Gemini XI mission in September of 1966. With Charles "Pete" Conrad, Jr., Gordon set a new altitude record of 850 miles, and performed two space walks. Gordon subsequently flew as command module pilot for Apollo 12. In 1971, Gordon was named chief of advanced programs for NASA's Astronaut Office, where he conducted preliminary design and testing work for the



Space Shuttle. He retired from NASA and the Navy in 1972 with the rank of captain.

Milton G. "Milt" Kuolt II The son of missionaries, Kuolt was born and raised in a small village in India. He returned to the United States in 1940 and graduated ten years later from Central Washington University in Ellensburg with an economics degree. Kuolt worked for Boeing nineteen years, working his way up from janitor to business planning manager for the 737. Kuolt's path finding contributions to Northwest aviation, however, came later. In 1981, having established himself as a successful entrepreneur, Kuolt decided to start an airline, to be called Horizon Air. With three-dozen employees and two elderly Fairchild F-27 turboprops, Horizon began service on September 1, 1981, between Seattle and Yakima, Wash. Within a few years, Horizon grew to become one of the nation's top half dozen regional carriers. In 1984, Kuolt took Horizon public, and in 1986, the airline was acquired by Alaska Air Group.



On behalf of the Pacific Northwest Chapter of the AIAA, I would like to congratulate the 2002 Pathfinder Award Recipients.

Section website: http://www.geocities.com/aiaa_2000/index.html
 National website: <http://www.aiaa.org>

Please submit newsletter materials to Karl D' Ambrosio by the tenth of November for the December Newsletter.

Outstanding Section Awards	Membership Award
1972-1973	1997-1998
1977-1978	Young Member
1978-1979	Activity Awards
1991-1992	1990-1991
1993-1994	1991-1992
1994-1995	1994-1995
1994-1995	1995-1996
Section Special Event Awards	Career Enhancement Award
1976-1977	1997-1998
1977-1987	Newsletter Awards
1978-1979	1994-1995
1982-1983	1995-1996
1987-1988	1996-1997

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Address Corrections

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Section Officers and Directors

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Vice-Chairman-Elect	Ben Sarao	1432 242 nd Place SE, Sammamish, WA 98075	206-768-7166	bmsarao@hotmail.com
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Retired Members	Tom Holgate	2704 SW 314th, Federal Way, WA 98023	253-838-0333	holgatz@aol.com
Newsletter	Karl D' Ambrosio	5026 18 th Avenue NE, Seattle, WA 98105		Karld@emfcowa.com
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PSEC Liaison	Vera Martinovich	0R-RK	425-342-0988	vera.a.martinovich@boeing.com
Evolution Of Flight	Ben Sarao	1432 242 nd Place SE, Sammamish, WA 98075	206-768-7166	bmsarao@hotmail.com
Museum of Flight Liaison	Open			
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Public Policy	Karl D' Ambrosio	5026 18 th Avenue NE, Seattle, WA 98105		Karld@emfcowa.com
Young Professionals	Emmanuel Domingo	PO Box 591, Bothell, WA 98041	425-487-2888	edomingo@in-tec.com

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