

Virginia Aviation History Project Report

Norm Crabill



The juxtaposition herein of the two stories about The Wright Experience and NASA's X airplane experience show that, at some level, the hard facts of flying research aircraft didn't change too much in the first 50 years - in both there were problems with stability (pitch-up), and control (lateral effects), with cockpit configurations, and with what the well-dressed test pilot wore. The numbers got bigger (size, weight, power, and especially speeds and altitudes), but the test pilots still had to deal with the fundamentals of flying it back to a safe landing.

The Wright Flyer Flies Again At Kitty Hawk !

On Thursday, November 20, 2003, the reproduction of the Wright 1903 Flyer built by Ken Hyde's The Wright Experience, flew at Kitty Hawk for about 5 seconds. This was followed by a second flight on Tuesday, November 25, with a very short flight of about 1 second, and on Thursday December, 3 with a 4 second flight. Total flight time for these three flights was about 10 seconds. The first and last flights were about 100 feet each. Thus, even though the flight attempt on December 17 was not successful, this aircraft did fly and was controllable as demonstrated on the first and third flights. The second flight apparently lifted off in a high speed condition due to a gust – its flight path almost exactly duplicated Wilbur Wright's flight on December 14, 1903.

To me, the outstanding achievements of the Wrights were 1) their invention of the 3 axis control system; 2) their invention of modern propeller theory, and 3) their superb skill as pilots. It's incredible to me that Wilbur flew their fourth flight for 59 seconds! Although The Wright Experience did not equal that record, it did fly, it was controllable, (barely) and since it was a faithful reproduction, it did uncover the problems the Wrights had to solve to build and fly it. That was the purpose of The Wright Experience's work and these three flights validate that effort.



The Wright Brothers Flyer: Pilot Perspective on Handling

By Dr. Kevin Kochersberger
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Much has been published regarding the handling difficulties of the 1903 Flyer, with the general consensus being that the airplane is extremely difficult to control. Due to the expense of constructing and flying the airplane, analysis has served as a substitute for rating

the Flyer's characteristics. The Wright Experience Flyer was flown by the pilot team four times, with two of those flights covering 97 feet and 115 feet. From these flights, a reasonable assessment of the aircraft from the pilot's perspective has been developed.

The arched shape that one must assume for forward visibility is not comfortable for long periods of time, and some relief could be gained by shifting around in the cradle during engine start, prior to launch. After releasing the holdback wire latch, it is necessary to concentrate on keeping wings level during the takeoff roll since ground clearance is less than two feet at the wingtips. The canard is held neutral to reduce drag without a risk of rotation; a positive canard deflection of at least 10 degrees is necessary to initiate flight. With no airspeed indicator, experience in the 1902 glider at typical flight speeds may have provided the Wrights some ability to detect speed in the Flyer. Recent glider training at a much reduced level from what the Wrights experienced has given modern pilots limited airspeed detection capability.

Once takeoff speed is reached, the Flyer requires significant positive canard to rotate, in part due to the nose-down moment caused by the thrust line. A strong engine will require more positive canard to “unstick” the aircraft, while a weak engine requires less. This is important to consider since a premature takeoff could occur with a weak engine as the canard angle is slowly increased. Complicating the canard control input is the fact that unstable airplanes trim with more positive canard at higher speeds and less at lower speeds, requiring the pilot to adjust trim reference continuously with respect to airspeed.

Canard control forces are reasonable, although the placement of one’s elbows can be awkward because of the location of the fuel mixture control and the fuel line. The hip cradle requires about the same force that the Wrights’ measured on their machine, 14 lbs., which is estimated to be about double the force experienced on the 1902 glider. A good grip on the canard actuator crossbar is needed to work the hip cradle, otherwise the operator’s body moves and the cradle remains stationary.

Due to the high workload after takeoff, extraneous information such as the sound of the engine can disappear. Once airborne, pitch corrections must be applied at a relatively high frequency (measured at almost 2 Hz) to arrest the unstable behavior. The airplane flies more like a powered kite than an aircraft, with a “soft”

feel to the handling in part caused by the lag between the canard input and the pitch response. In addition to the aerodynamic instability, this aircraft is very flexible which makes all control inputs a little less crisp than what the pilot would prefer. With the canard being operated almost to the limits of its control repeatedly, there is some sense to the pilot that the aircraft is being over-controlled. This may be the necessary result of operating an unstable aircraft with control lags built in, but due to the lack of flight time this question will remain unanswered.

Laterally, The Wright Experience Flyer flew briefly in a 30 degree crosswind component based on preliminary data from the flight data recorder. At this sideslip angle, the roll rate due to the wing anhedral can be significant and will likely terminate the flight prematurely. The use of anhedral was a benefit for this ground effect machine since it allows the pilot to fly wings level, reducing the risk of a tip strike, while the aircraft seems to accommodate the resulting sideslip with little complaint. This philosophy may partly explain the lack of vertical surface area on all of their early aircraft.

Putting everything together for successful flights was achieved in 2003 [by Ken Hyde’s Wright Experience], but not without an enormous effort that translated to respect for the breadth of what the brothers were able to accomplish. Not the least of which is a recognition of just how competent they were as operators of their flying machines, something that 100 years of flight have not improved upon.



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Test pilot Dr. Kevin Kochersberger, just after the first flight, still in the harness which served in lieu of a seat belt, and was used only on the first of four flights. He did wear a helmet.

P.S. Kevin does a mean karaoke, too!

Norm’s Notes: Dr. Kochersberger gave a much expanded version of his Wright Experience at the February 25th meeting of the Williamsburg Chapter of the VAHS. A video was made of his talk. Also, the complete text of this paper is available to AIAA members on the AIAA web site.

Kareny Dominguez, VIGYAN Inc.



Thursday, November 20, 2003
First flight of The Wright Experience 03 Flyer just after lift-off

Pilot:
Kevin Kochersberger

Tuesday, November 25
Second Flight

Pilot:
Terry Quiejo

Norm Crabill, Aero-space Consultants



Thursday Dec. 3
Third Flight in a right turn at a low, low altitude

Pilot:
Kevin Kochersberger

Kareny Dominguez, VIGYAN Inc.

