On the 'Wing... # 123

AeroVironment's non-polluting visitors to the stratosphere

AeroVironment, headed by Paul MacCready, is developing a number of "proof-of-concept" aircraft for a wide range of applications, including military and civilian surveillance, weather monitoring, and communications. Pathfinder, Pathfinder-Plus, and Centurion are solar powered radio controlled aircraft dedicated to high altitude, long endurance flight profiles. Such aircraft will eventually be capable of continuous flight for periods of weeks or months, relying on solar power to power flight motors and charge storage batteries to be used at night.

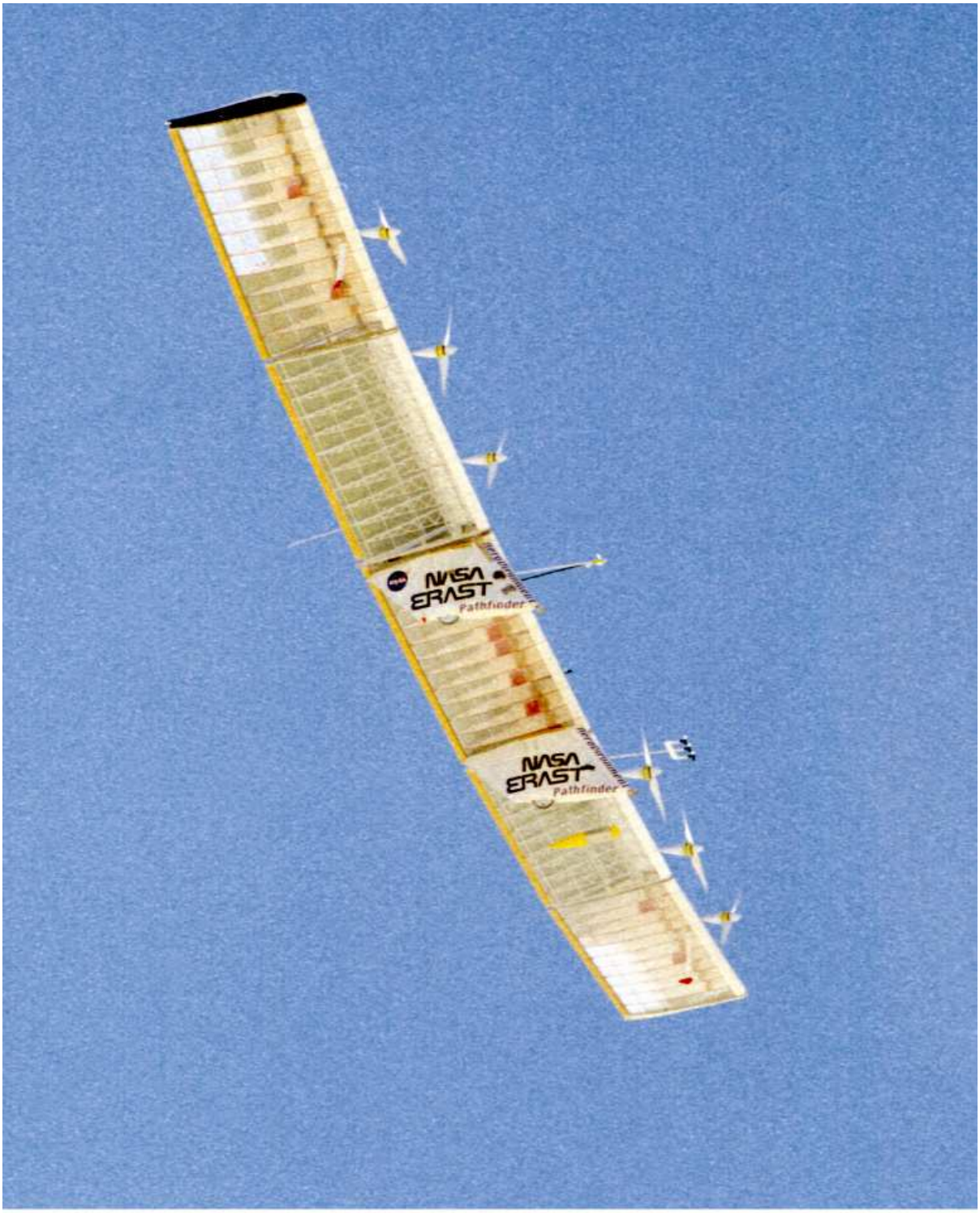
The performance of these aircraft, which look very much like grossly enlarged models for indoor flying, borders on astounding. Pathfinder, for example, flew to a record altitude of 71,500 feet in 1997. Pathfinder-Plus, slightly larger than Pathfinder, has flown to over 80,000 feet. Centurion, with a wingspan of 206 feet, more than double that of Pathfinder, will be able to fly at altitudes in excess of 100,000 feet.

Aircraft like these, acting as replacements for satellites, could collect weather data over extremely long periods of time, relay pager and cell 'phone data, and serve as surveillance platforms. Placement on station would be far less expensive than the satellites they would replace. Operating at much lower altitudes than satellites, radio transmissions would not need to be so powerful, thus allowing use of less expensive equipment. Since they are much more easily recovered than satellites, on-board equipment could be replaced as soon as technologies improved.

Pathfinder is a rather large aircraft, with a span of 99 feet. Construction materials for the constant chord wing include foam, carbon, and Kevlar. It's covered with mylar, and solar panels are mounted across the upper surface of the wing. The solar cells generate power from sunlight striking both the upper and lower surfaces of the solar cells. Flying over clouds therefore improves performance, as the light coming from below dramatically increases power output. Control surfaces are actuated by 141 servos.

The planform of Pathfinder-Plus is something of a combination of Pathfinder and Centurion, constructed by modifying Pathfinder in a number of ways. The wingspan was extended from 99 to 121 feet by replacing the original Pathfinder

Dryden Flight Research Center EC96-43765-8 Photographed November 1996
LIGHT AS A FEATHER--Technicians easily lift a 20-foot wing section during assembly of the Pathfinder solar-powered aircraft. NASA photo by Dennis Taylor



Dryden Flight Research Center EC96-43817-11 11/19/96 Photo
Pathfinder Flight #1 NASA photo by Carla Thomas

center section, 22 feet long, with a 44 foot section. This new center section utilizes the Centurion airfoil and a more efficient solar array. Pathfinder-Plus is powered by eight electric motors, two more than Pathfinder.

AeroVironment, Inc., of Simi Valley, California, is the primary contractor for Pathfinder, Pathfinder-Plus, and Centurion. Current flight testing is being conducted by ERAST, NASA's Environmental Research Aircraft and Sensor Technology program, in conjunction with Dryden Flight Research Center, Edwards, California. The record breaking flights have taken place at the U.S. Navy Pacific Missile Range Facility (PMRF) at Kauai, Hawaii.

Aircraft	Span	Motors	First flight	Record(s)
Pathfinder	99'	6 (~1,250w each)		11SEP95, 50,500' 09JUN97, 67,350'
Pathfinder-Plus	121'	8		07AUG98, 80,285'
Centurian	206'	14	19NOV98	100,000' plus (potential)

Dryden Flight Research Center EC98-44621-252 Photographed 17JUN1998
Pathfinder-Plus on a development flight in Hawaii. The modified version of the Pathfinder aircraft features a number of upgrades designed for the follow-on Centurion, a similiar but much larger aircraft being designed. (NASA photo/Nick Galante)

Sources:

Wurts, Jan. E-mail message posted to the RC Soaring Exchange by Joe Wurts, 14 June 1997. (Jan was on site in Kauai for the Pathfinder record flight on 09 June 1997.)

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Photos from <http://www.dfrc.nasa.gov/gallery/photo/Pathfinder/> and <http://www.AeroVironment.com/news/news-archive/news-pthfdr-newrecord/>

Dryden Flight Research Center EC97-44287-1 Photographed 28AUG1997
Pathfinder over runway in Hawaii (NASA/Nick Galante)

Dryden Flight Research Center EC97-44138-1 7Jul1997 Photo
The solar-powered Pathfinder flying wing lifts off on its record-setting flight over Hawaii on July 7, 1997. Pathfinder set a world altitude record for propeller-driven aircraft of 71,500 feet. (NASA/U.S. Navy photo)