

PeaceWing Concept

U.S. State Department Pilot Project for GDIN



Environmental Research Aircraft and Sensor Technology (ERAST) Program

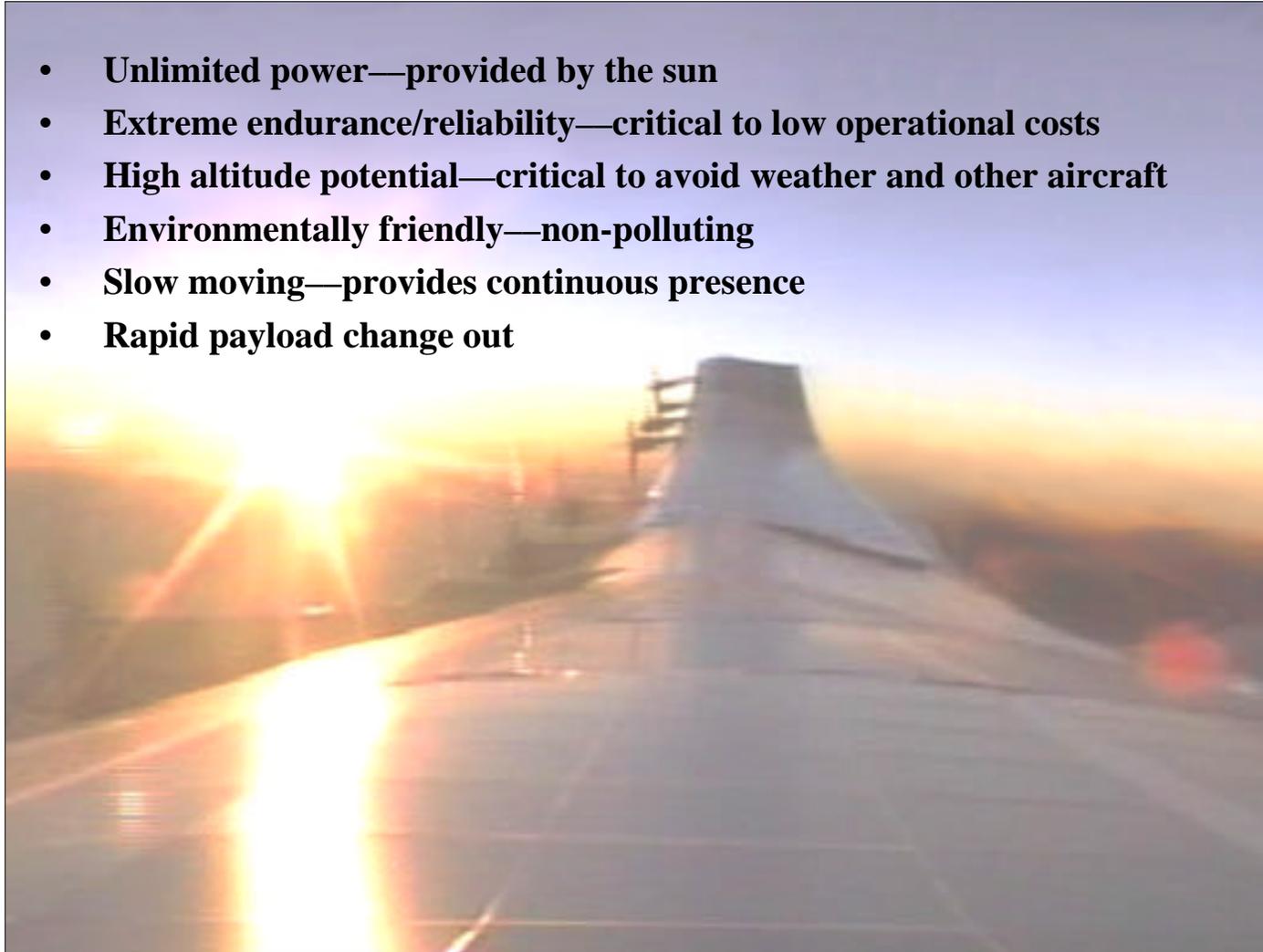
Ankara, Turkey

April 2000



Solar-Powered Robotic Airplanes

- **Unlimited power—provided by the sun**
- **Extreme endurance/reliability—critical to low operational costs**
- **High altitude potential—critical to avoid weather and other aircraft**
- **Environmentally friendly—non-polluting**
- **Slow moving—provides continuous presence**
- **Rapid payload change out**



Concept

- **Solar-powered “atmospheric satellites” represent a revolutionary technology breakthrough with global impact**
- **Next generation platform for low cost telecommunications and observing relief operations**
- **Hovers over intended geographic area indefinitely**
- **Above all weather and air traffic**
- **Complement to modern aircraft and satellites**
- **User friendly and easy to fly**



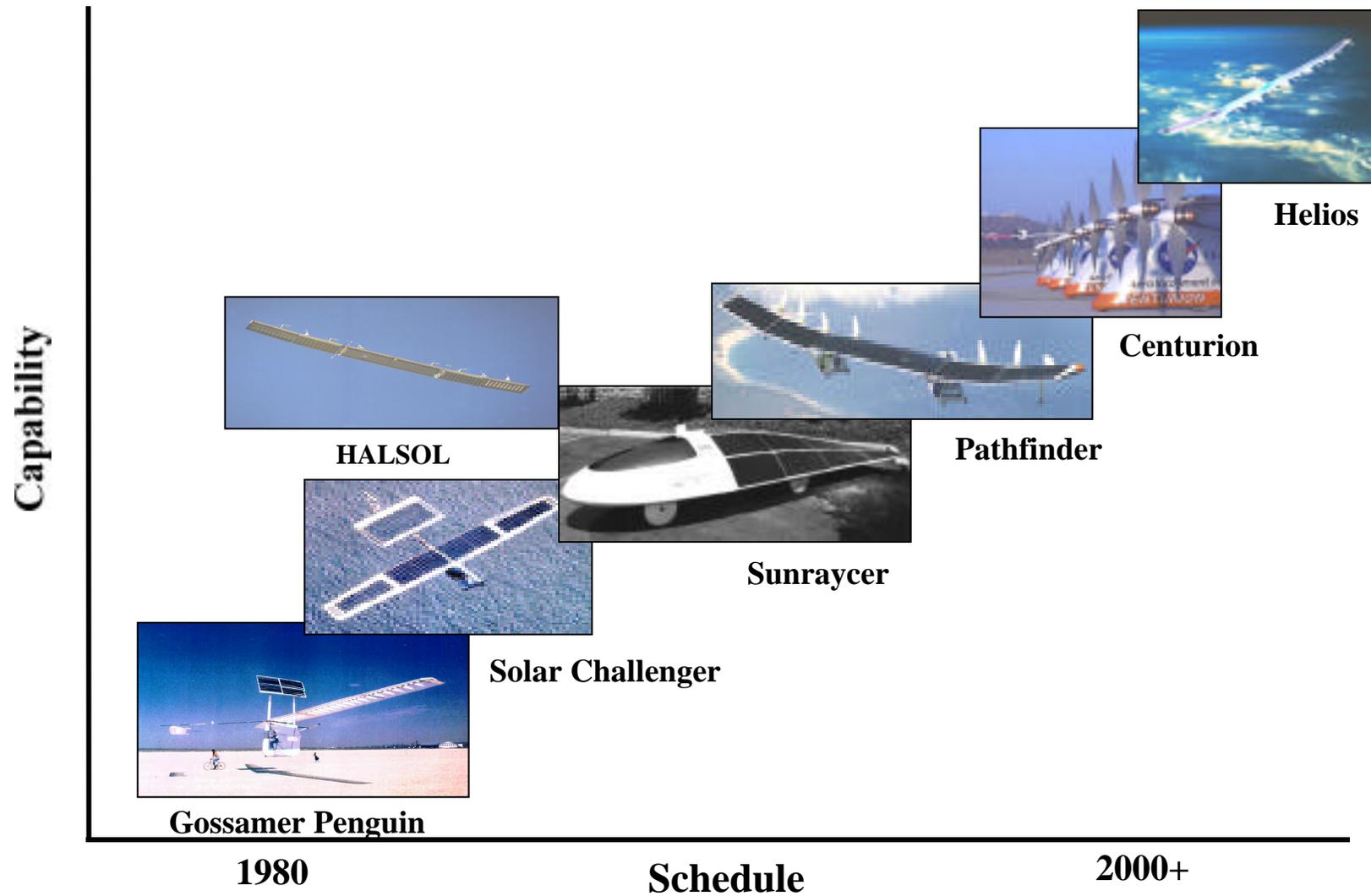
Specific Capabilities

- **High-altitude, long-endurance (HALE) solar - powered airplane**
 - Provides 6 months on-station at 65,000 feet; 100 kg payload
 - Carries 100 kg payload
 - Stable sensor platform
 - Satcom capable
 - Daytime flights available now
 - “Virtual eternal” flight by 2003
- **“Substitute satellite”**
 - Continuous day/night, power-on-demand, operations for telecommunications, remote sensing and air sampling
 - Operates in stationary orbits or at great range
 - Order of magnitude cheaper than satellites
 - Extremely reliable
 - Extremely slow



Centurion

Solar Plane Technology Path



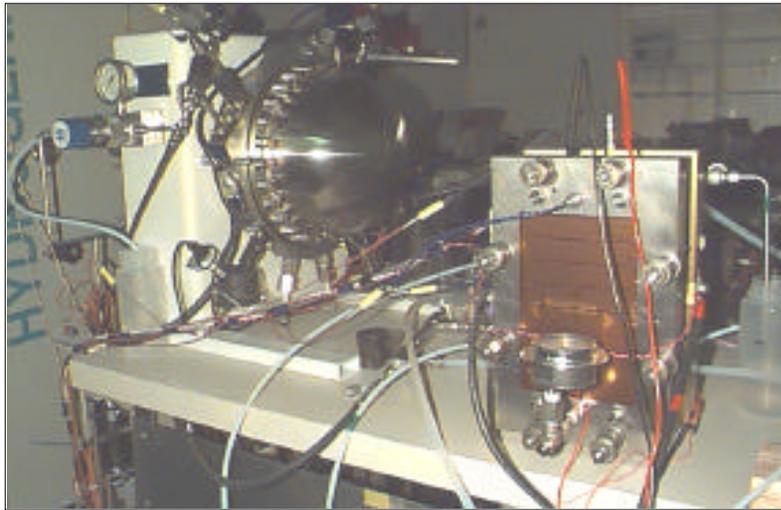
Technology Background

- **U.S. military initiated solar powered UAVs for missile defense in 1992**
- **NASA and AeroVironment (AV) have developed HALE solar UAVs since 1994**
- **Pathfinder set world record in Hawaii –71,500 ft in July 1997**
- **Pathfinder Plus set new world record in Hawaii–80,201 ft in August 1998**
- **Centurion made successful maiden flight on November 1998 at NASA Dryden; lifted 600 lbs to low altitude**
- **Helios Prototype is 2.5X the size of Pathfinder; designed to fly to 100,000 ft in 2001 using solar cells and batteries for short duration flights; first flight August 1999**
- **Helios will fly high using renewable energy for day/night operations—extreme endurance operations in 2003**



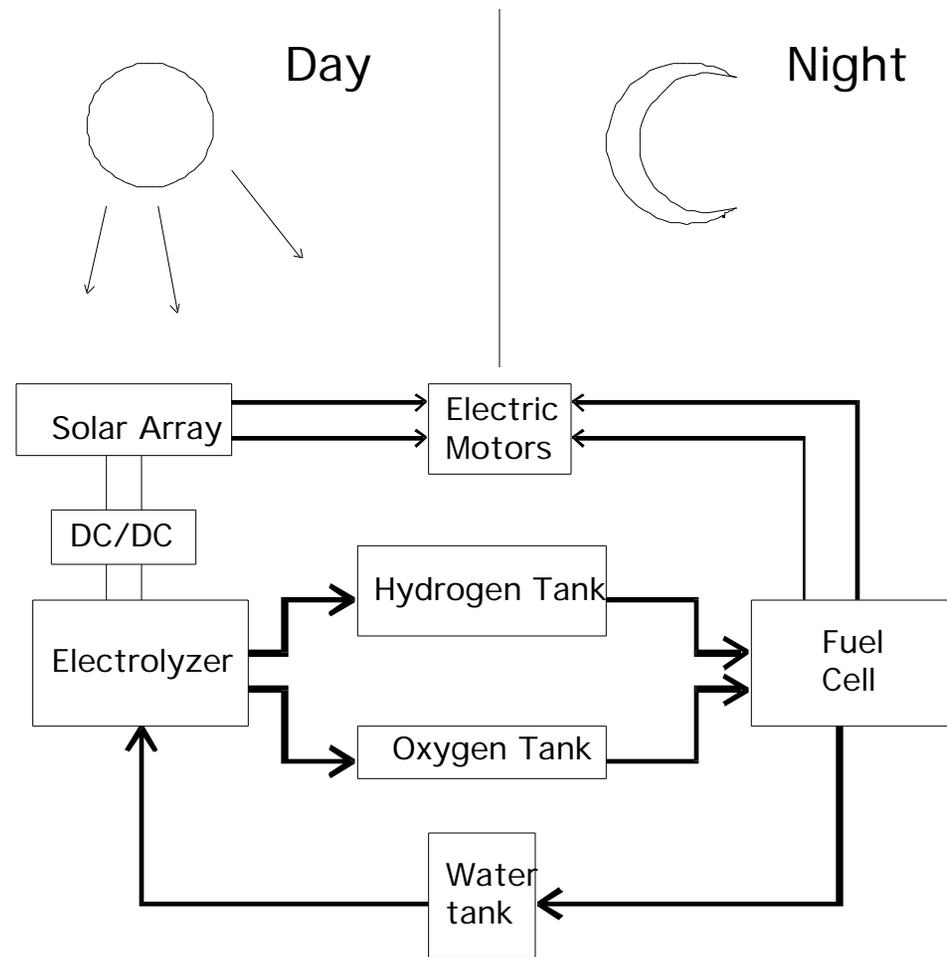
**Pathfinder Plus
Pacific Missile Range Facility (PMRF)
Barking Sands, Kauai**

Helios Power System Concept—Fly by Night



- Helios requires lightweight, high performance RFC system not available in the marketplace
- Closed cycle system with thermal control necessary for cold, HALE operations
- Basic fuels are water and sunlight
- Battery technology not sufficient

Regenerative Fuel Cell (RFC)



Operational Experience

- **Aircraft flown in Hawaii and California extensively**
- **Hundreds of accident-free hours flown in civil and military airspace**
- **Small, high performance sensors flown to observe the environment**
- **Aircraft can accommodate over-the-horizon satellite communications**
- **System rapidly deployable**



Sensor Technologies

**Airborne Real Time Imaging System
(ARTIS)**



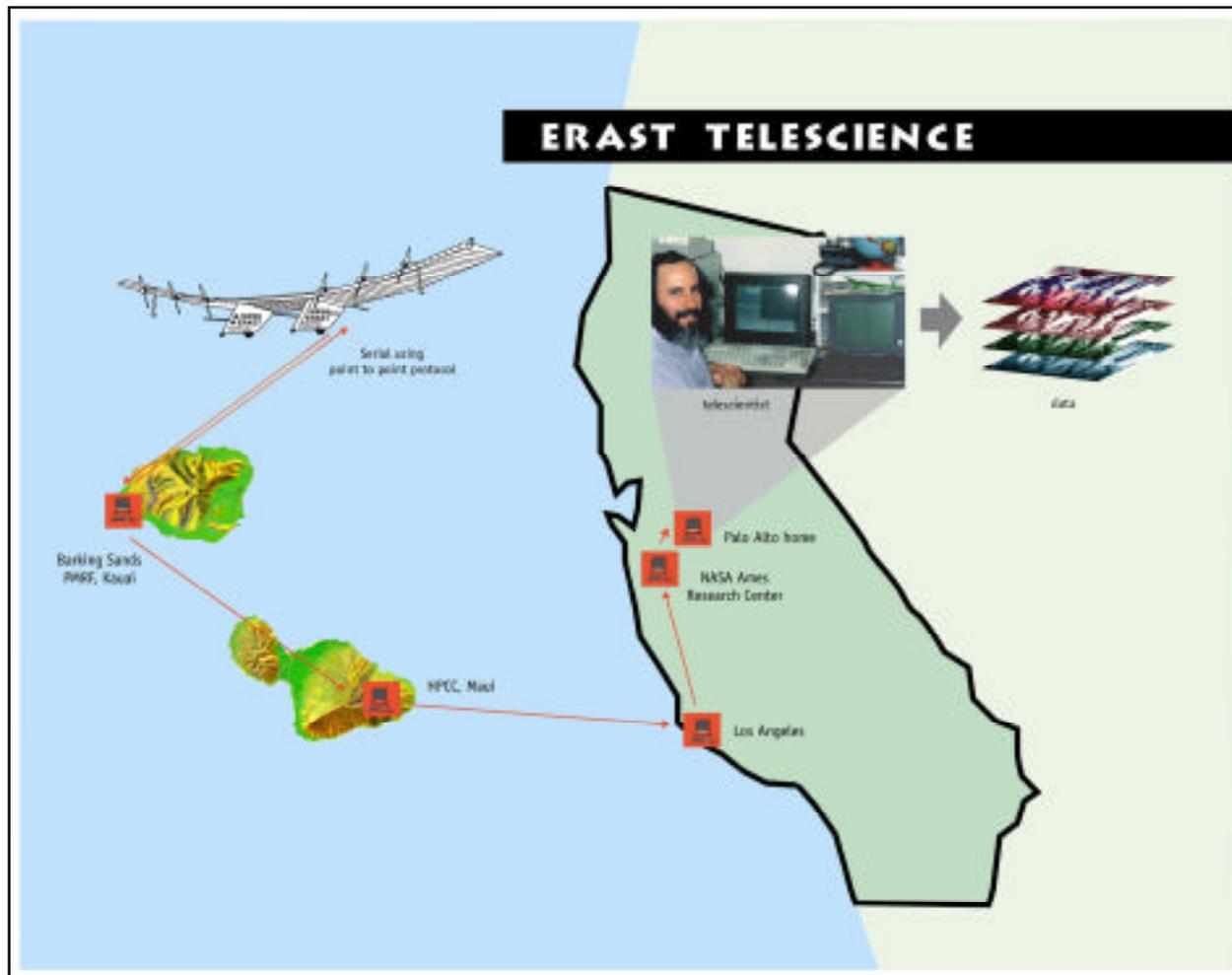
**Digital Array Scanning Interferometer
(DASI)**



High altitude Optics

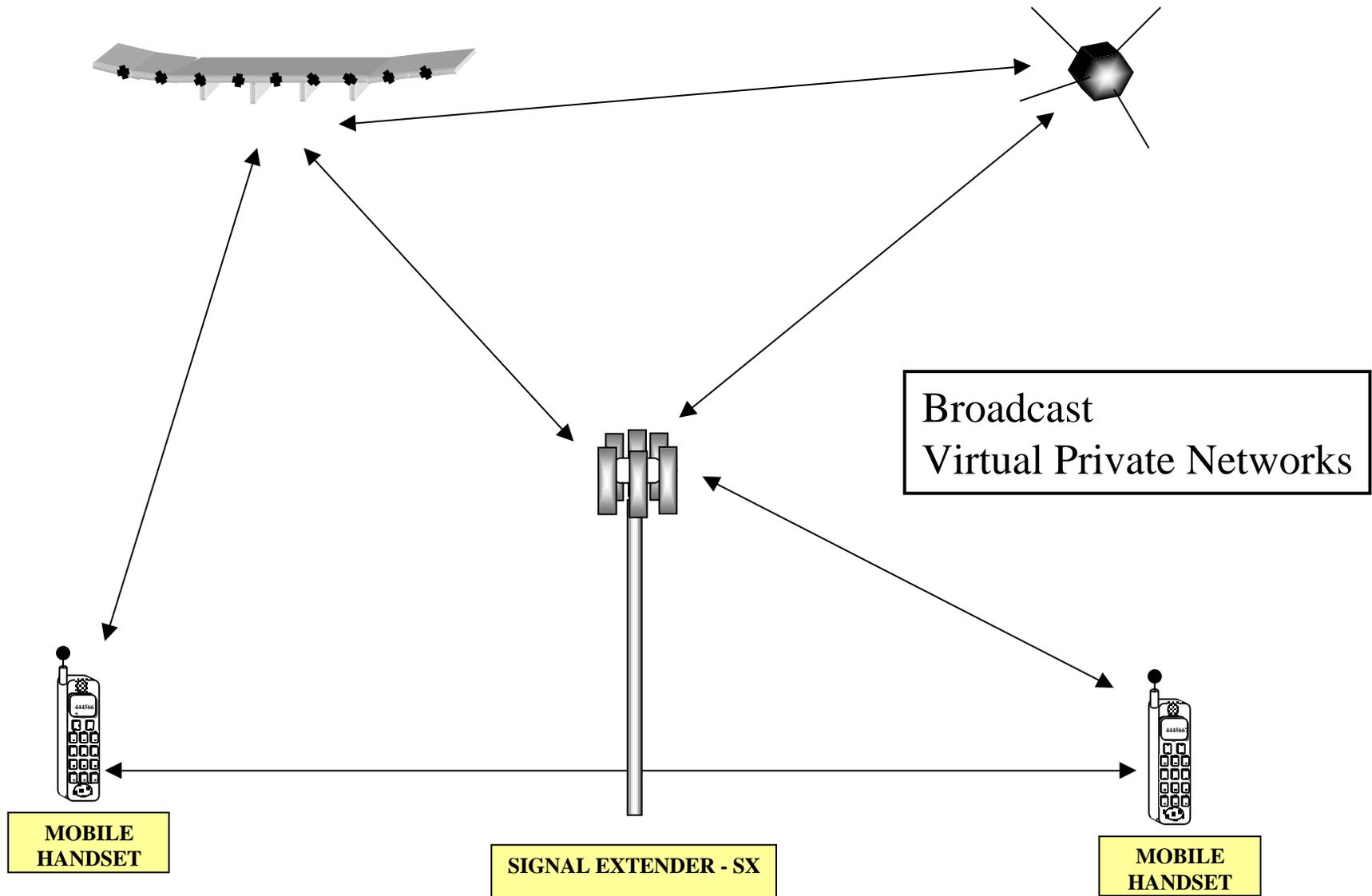


Virtual Operations



Near-real-time remote sensing operations using the Internet

Airborne Telecom Concept



Appeal–Education Outreach



Hawaii 1998

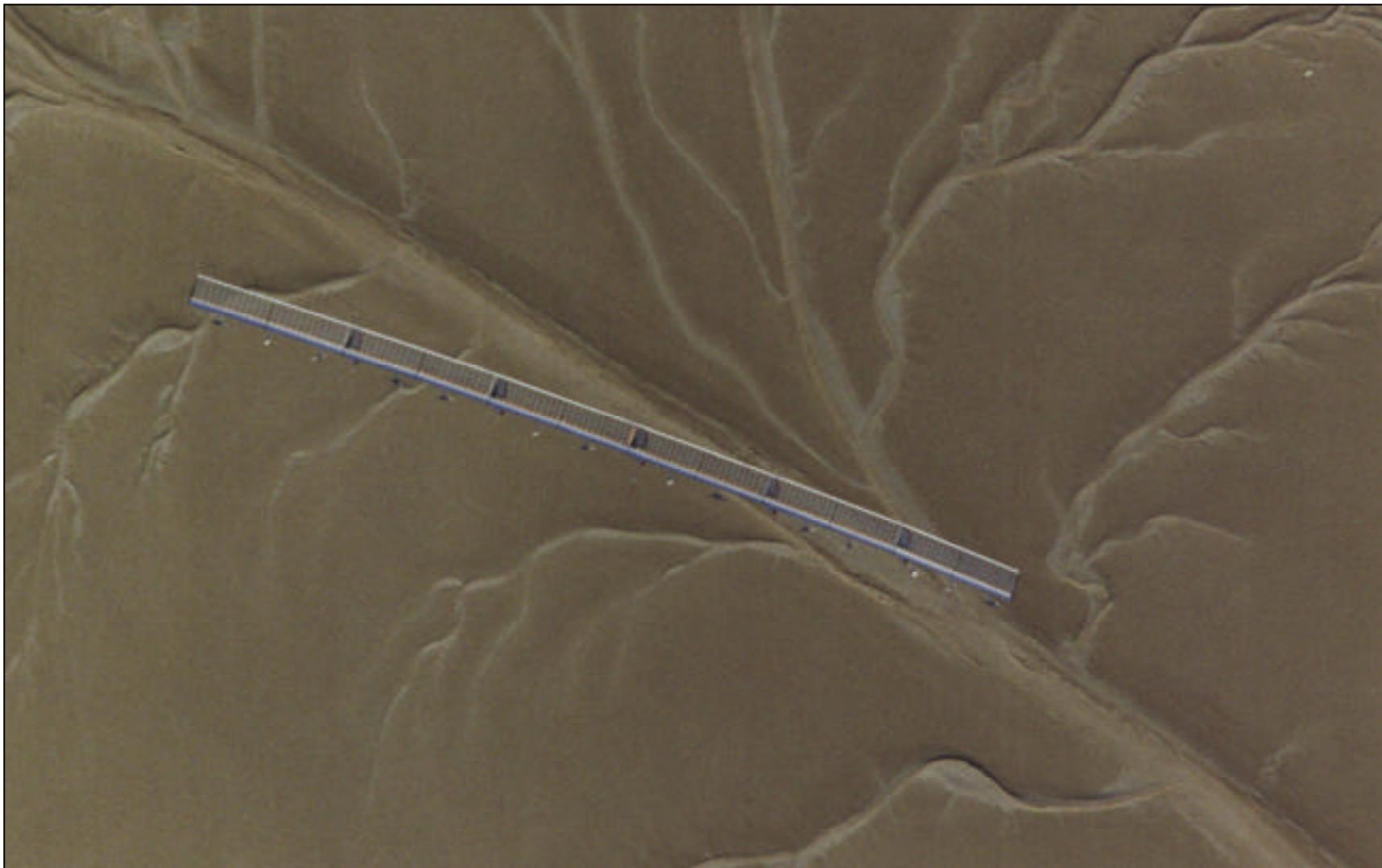
Helios Prototype–August 1999



Wingspan–247 ft

AeroVironment, Inc.
c/o Bob Curtin
4685-3H Industrial Street
Simi Valley, CA 93063
805/581-2187
curtin@aerovironment.com
www.aerovironment.com
or
Dale Tietz
512/263-8054
vraptor01@aol.com

Helios Prototype In Flight



PeaceWing-Pathfinder Plus and Helios

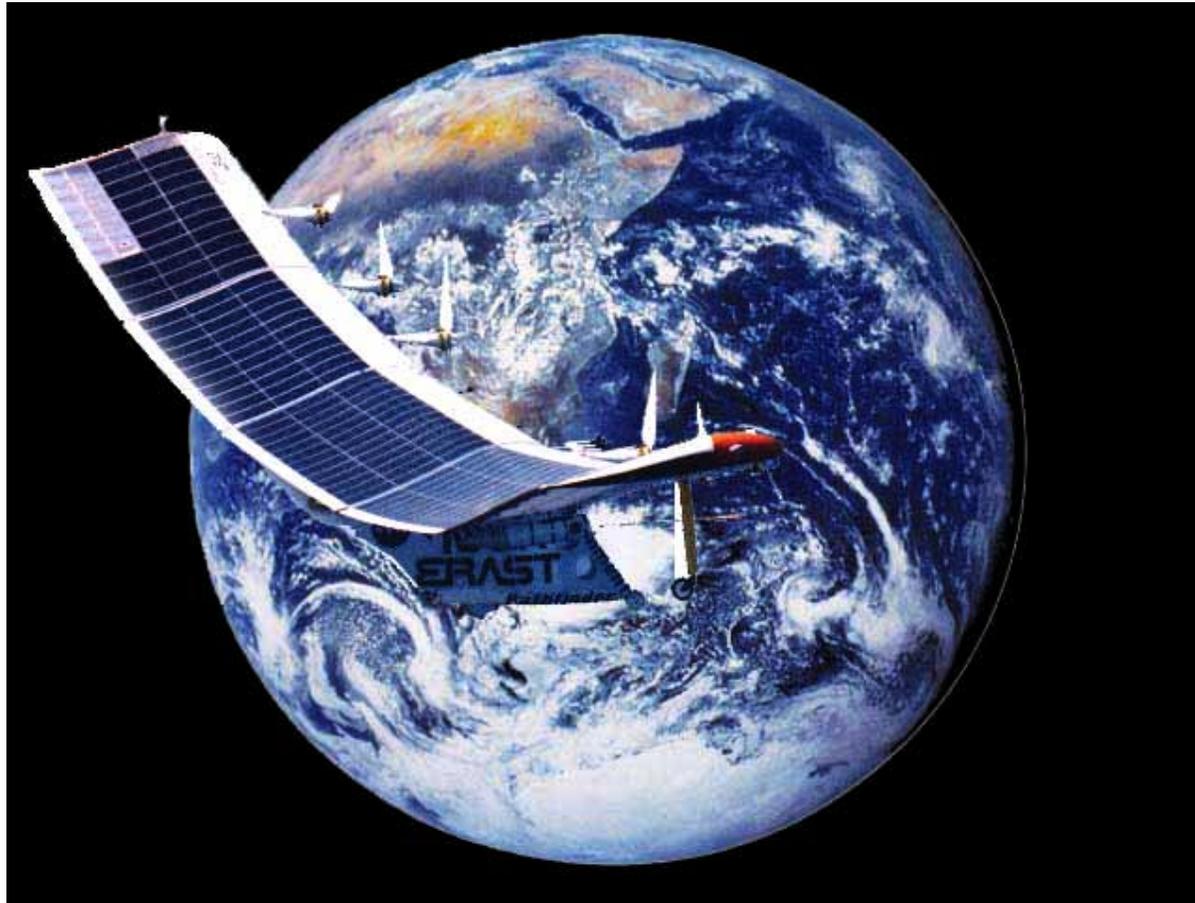
Kenya

Italy

Mexico

Turkey

Brazil



Ready for demonstrations