

# APPENDIX VIII

## The Center for Interdisciplinary Remotely-Piloted Aircraft Studies Presentation

### ["Safety-Net" for Baseline Operations](#)

#### [Organization](#)

##### CIRPAS Platforms

- [Pelican](#)
- [Altus](#)
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##### The Science & Technology Initiatives

- [Aerosol Radiative Forcing and Atmospheric Chemistry](#)
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- [Remote Sensing, Operational System Support and Classified Systems](#)

##### Cost Model

- [CIRPAS Partnerships](#)

# **The Center for Interdisciplinary Remotely-Piloted Aircraft Studies**

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## **“Safety-Net” for Baseline Operations**

- **Organization**
  - **CIRPAS Platforms**
  - **The Science & Technology Initiatives**
  - **Cost Model**
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# CIRPAS Organization

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## **Office of Naval Research**

Ocean, Atmosphere, and Space Science and Technology Department



## **Naval Postgraduate School**

Meteorology, Oceanography, Physics, Aeronautics and Astronautics,  
Mechanical Engineering, Electrical and Computer Engineering,  
Operations Research, Space Systems Academic Group



## **California Institute of Technology**

Division of Engineering and Applied Science



## **Princeton University**

Chemical Engineering



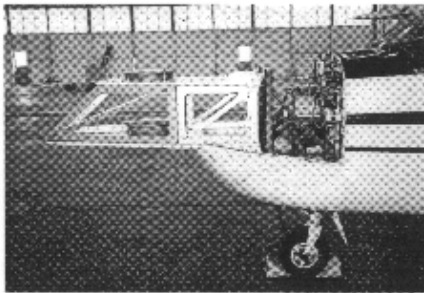
## **Department of Energy**

Atmospheric Radiation Measurement Program



# Pelican

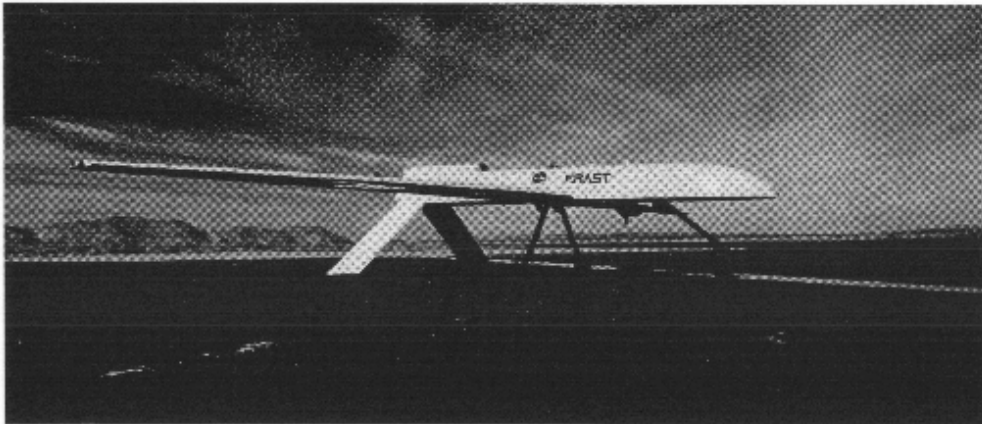
- optional onboard/remote piloting
- distributed real-time data access
- large payload (150kg nose, 50kg wings)
- diverse payload (meteorology, oceanography, chemistry, remote sensing)
- 24 hour missions (remote)
- low altitude (10-20 m minimum)
- slow speed (40 m/s)



# *Altus*

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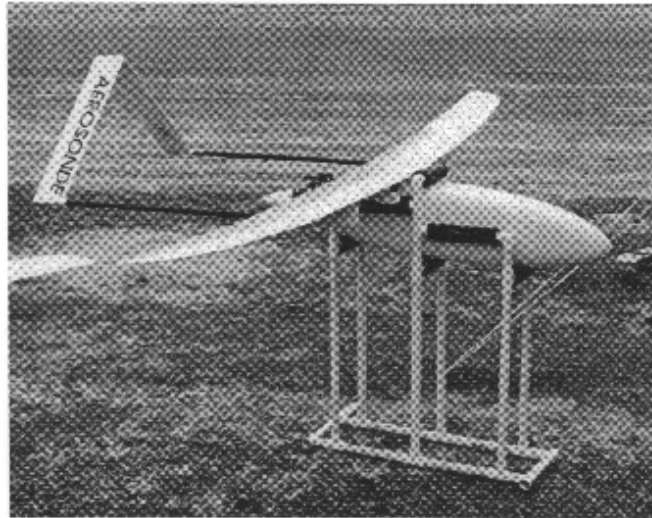
- General Atomics *Predator* derivative
- 150 kg payload
- Ultimate altitude maximum of 65,000 ft
- Flight duration of 50 hours



# Aerosonde

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- atmospheric vertical profiles of temperature, humidity, pressure and winds (50 m to 4 km)
- low-cost radiosonde (balloon) alternative
- reusable
- programmable flight profiles (1500 km range)
- ultimately over 12-hour duration



# Science & Technology Initiatives

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Funded  
Proposal  
Planning

- **Aerosol Radiative Forcing**
  - TARFOX (Jul 1996) Wallops Is., VA - *Pelican*
    - NASA, ONR
  - ACE-2 (Jun-Jul 1997) NE Atlantic - *Pelican* (first remote mission), *Altus?*, *Aerosonde?*
    - NSF, NASA, ONR
  - ACE-3 (Apr 1999 or 2000) Western Pacific
- **Atmospheric Chemistry**
  - Southern California Ozone Study (Aug-Oct 1997) - *Pelican*
    - CA Air Resources Board

# S & T Initiatives (continued)

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- **Instrument Development**
  - CCN Spectrometer - size vs supersaturation (0.1% to 2%)
  - Gas Chromatograph - sulfur species, hydrocarbons and halogenated compounds
  - Mass Spectrometer - SO<sub>2</sub>, SO<sub>3</sub>, CH<sub>3</sub>SO<sub>3</sub>H, H<sub>2</sub>SO<sub>4</sub>, NO, NO<sub>2</sub>, HNO<sub>2</sub>, HNO<sub>3</sub>, NH<sub>3</sub>, possibly DMS
  - Integrating Nephelometer - scattering at 450, 550, & 700 nm
  - Counter-flow Virtual Impactor - cloud drop residual particles
  - PMS probe modification - weight and power reductions



# S & T Initiatives (continued)

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- **Meteorology**
    - Coastal Meteorology (Jun, Aug 1996) CA coast - *Pelican*
      - ONR
    - DOE ARM-UAV IOP (Aug 1996) Oklahoma - *Altus*
    - EOPACE (Nov 1996) San Diego coast - *Pelican*
    - Turbulence capability on *Pelican* and *Altus*
    - *Aerosonde* test and evaluation (1997)
    - South China Sea Monsoon Exp. (1998) - *Aerosonde*
    - Large Eddy Simulation Exp. (1998 or 1999) CA coast - *Pelican* and/or *Altus*
  - **Oceanography**
    - CalCOFI (Oct 1996) CA coast - *Pelican*
      - ONR, NRL
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# S & T Initiatives (continued)

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- **Remote Sensing**
  - Aerosol optical depth retrieval (TARFOX, ACE-2)
  - Ocean Color (CalCOFI)
  - 94 GHz Radar
  - Lidar
- **Operational System Support**
  - EW Vulnerability Assessment (Sep 1996) Pt. Mugu-*Pelican*
- **Classified Systems**
  - JETEP - Aerosol Retrieval with NTM
  - NTM system test and evaluation (H.Loomis)
  - UAV Sensor Technology (test and development)

# CIRPAS Partnerships

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- National Science Foundation
- Stockholm University - student/faculty exchange
- UK MRF - technology development
- NASA Environmental Research Aircraft and Sensor Technology (ERAST) Program (Dryden Flight Research Center)
- NASA Ames Research Center - sensor development
- NASA Mission to Planet Earth - RPA Study
- Naval Research Laboratory - Hyperspectral Imager
- Joint Environmental Technology Exchange Program-JETEP
- Numerous University collaborative projects