DOE Research Aircraft Facility

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Purpose and Objective

The DOE Research Aircraft Facility is dedicated to the fulfillment of DOE and national goals related to understanding atmospheric processes as they relate to the DOE's environmental missions and the global environment.

The facility consists of the PNNL Grumman Gulfstream 159 (G-1), its flight crew, technical and engineering support staff, and state-of-the-art instrumentation.

Access to Flight Time

Proposals stating research objectives and requesting aircraft time must be submitted for review by a DOE-empowered advisory panel well in advance of when the research is expected to be conducted.

The panel makes recommendations to DOE on the award of flight hours. After the DOE awards flight hours, the Research Aircraft Facility coordinates the approved requests and schedules flight time.

DOE Research Aircraft Facility

- Grumman Gulfstream 159 (G-1) twin turboprop aircraft
- Up to 250 flight hours per year
- Instrument development, testing, and application; field study support
- Base operating costs for G-1: hangar, utilities, pilot proficiency and training, maintenance
- Offsite logistical costs for G-1 and its flight and scientific crew

G-1 Attributes

- Dimensions: Length 20 m, Wingspan 24 m, Height 21 m, Weight 16,330 kg max
- Nominal operation: Altitude 0.5-7.5 km, Cruise speed 80-200 m/s, Sampling speed 100 m/s, Climb 160-330 m/min
- Endurance with maximum fuel: 6 hr
- Power: 4,000 VA @ 115&230 VAC, 28 VDC
- Crew: 2 pilots, 2-4 scientists
- Cabin payload: 1,300 kg

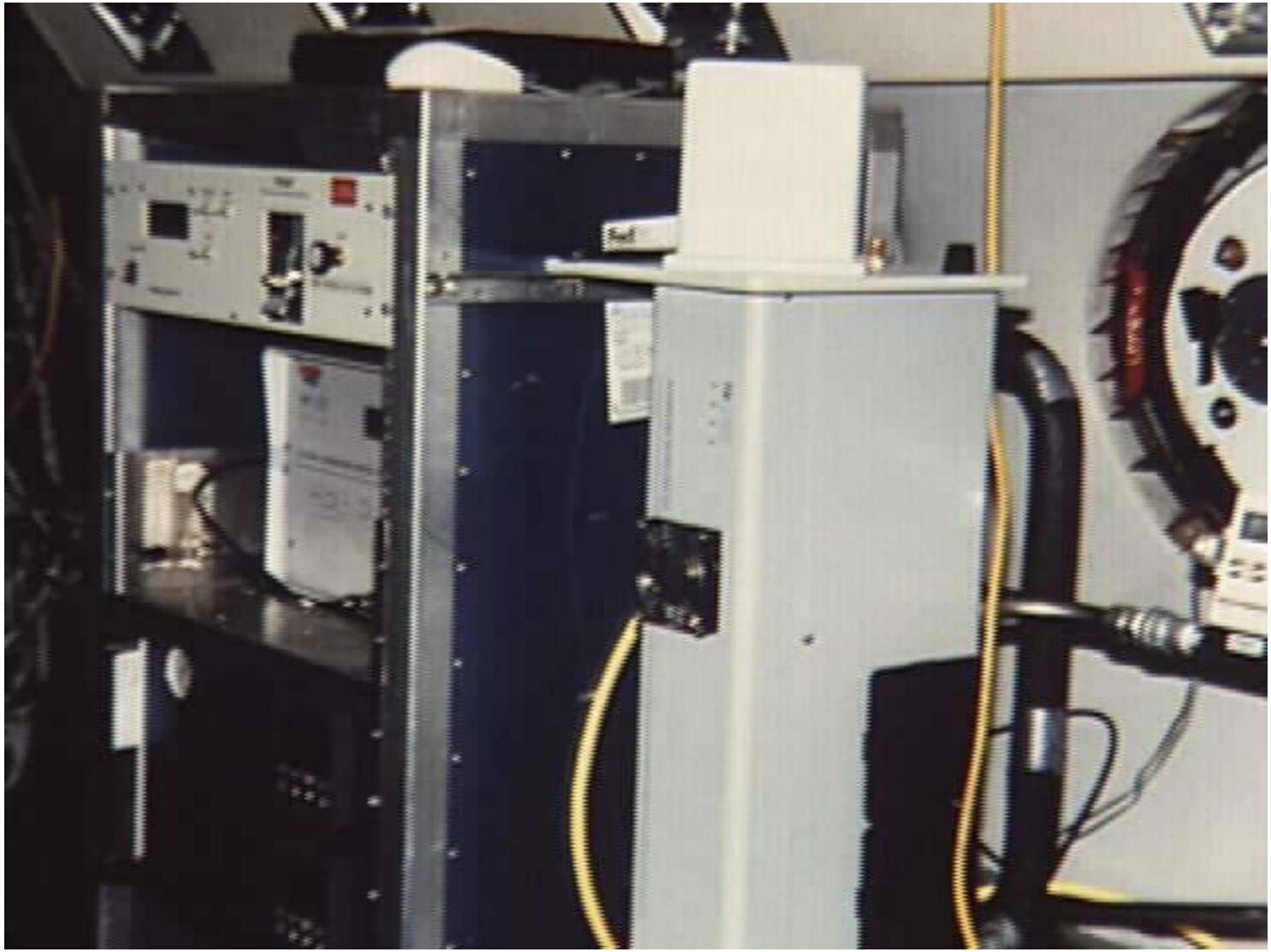
G-1 Instrumentation

- Meteorological sensors
  - Temperature, pressure, dew point temperature
  - Gust probe/GPS vector winds
- Chemical sensors
  - Real-time: O_3, CO, SO_2, NO/NO_2, H_2O, H_2O_2
  - Integrating: filter pack (SO_2, SO_4, NO_3, HNO_3, NH_4), PAN, VOC

G-1 Instrumentation

(continued)

- **Cloud & Aerosol Microphysics**
  - **PCASP, FSSP, OAP2D aerosol/cloud size**
  - **Total scatter/back scatter nephelometers**
  - **Condensation particle counter**
  - **Ultrafine particle counter**
  - **Liquid water content**
- **Radiation**
  - **UV/solar/IR radiometers**
  - **Up/down-looking IR thermometers**



Nephelometer onboard the G-1 during 1997 ARM aerosol IOP

G-1 Instrumentation

(continued)

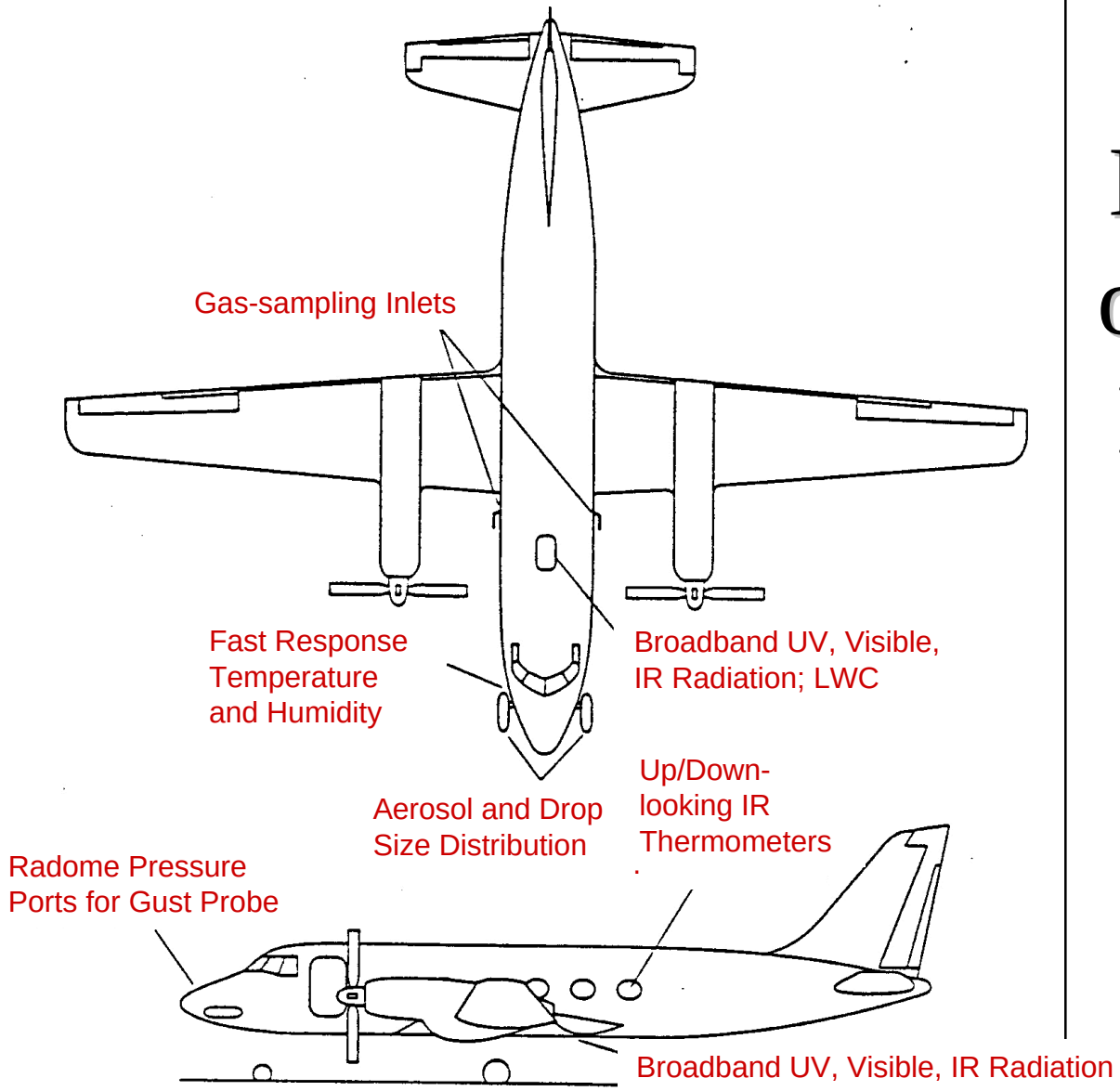
- **Aircraft parameters**
  - **Altitude, air speed, position, attitude**
  - **Weather radar**
- **Data acquisition system**
  - **SEA 16-bit, 32 channel multiplexer/ADC**
  - **Interfaces to Loran, GPS, TAGA, PMS probes**

G-1 Instrumentation

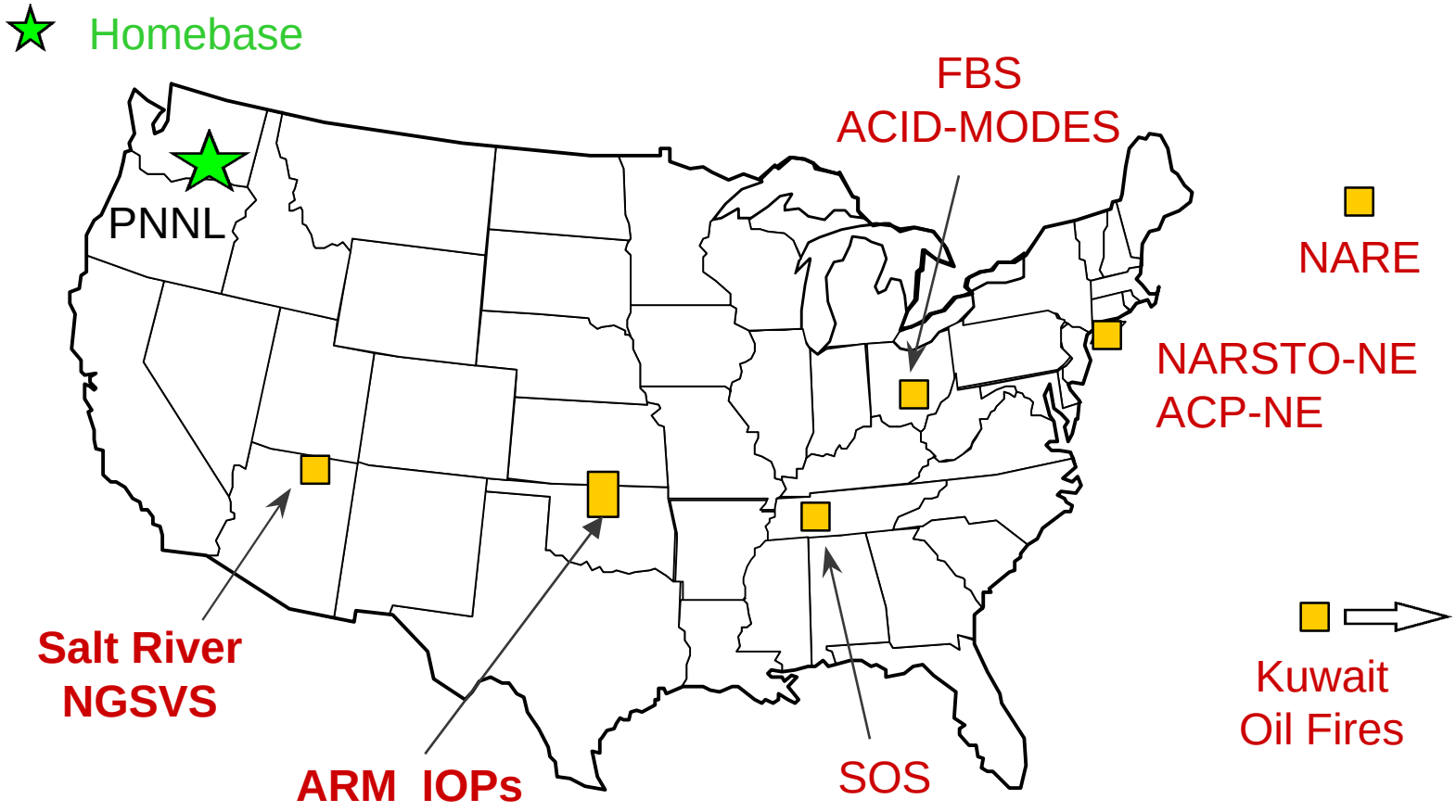
(continued)

- **External instrumentation collaboration**
  - **BNL: NO_x/NO_y, H_2O_2, Carbonyl**
  - **BCO: TAGA, PAN-GC, VOC**
  - **ANL: VOC, VOC-GC, PAN/NO_2**
  - **EML: Aerosol, Radionuclide collectors**
  - **U-WA: CFVI, CCN, B_{scat}**
  - **U-NV/DRI: CCN spectrometer**
  - **PNNL: ITMS, Radionuclide collector**

Location of Major External Sensor Systems on the G-1



Projects Utilizing the G-1

- DOE/OBER
  - ARM Aerosol/Cloud IOPs 1997
  - ACP-NARSTO/Northeast 1995, 1996
  - SOS/Nashville 1995
  - NARE 1992, 1993
  - Kuwait Oil Fires 1991
  - PRECP/Frontal Boundary Study 1989
- Other government
  - EPA ACID-MODES 1988, 1990
- Industry
  - Salt River Project 1990

Locations of Projects Using the G-1