

# Meteorological Aids Service Radiosonde Operations

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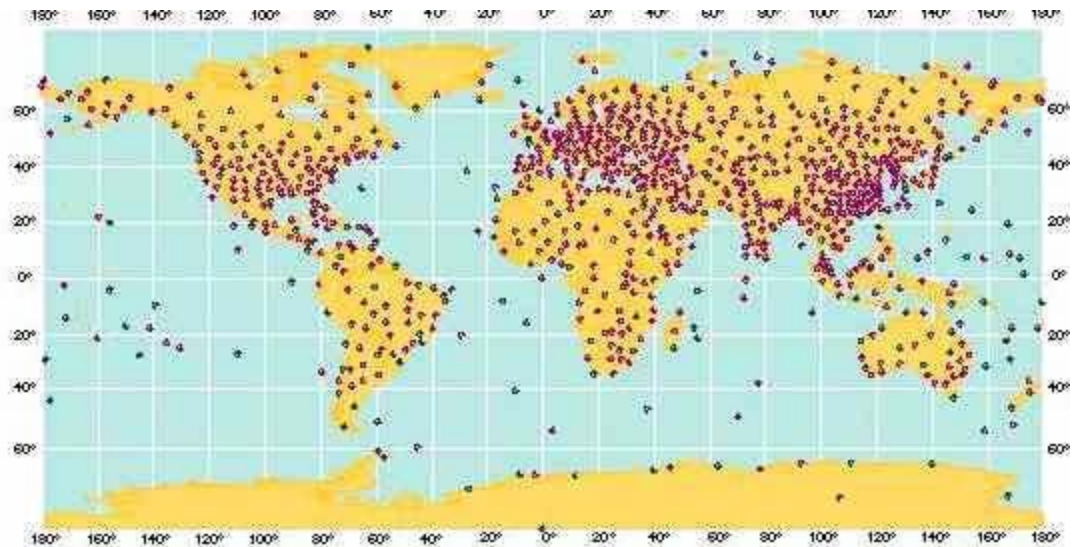
# Outline

- I. Overview of Major Systems
- II. Radiosonde Systems
- III. Typical Flight
- IV. Impact of Interference
- V. Future Trends
- VI. For More Information

# Operational Overview

## Global Scope

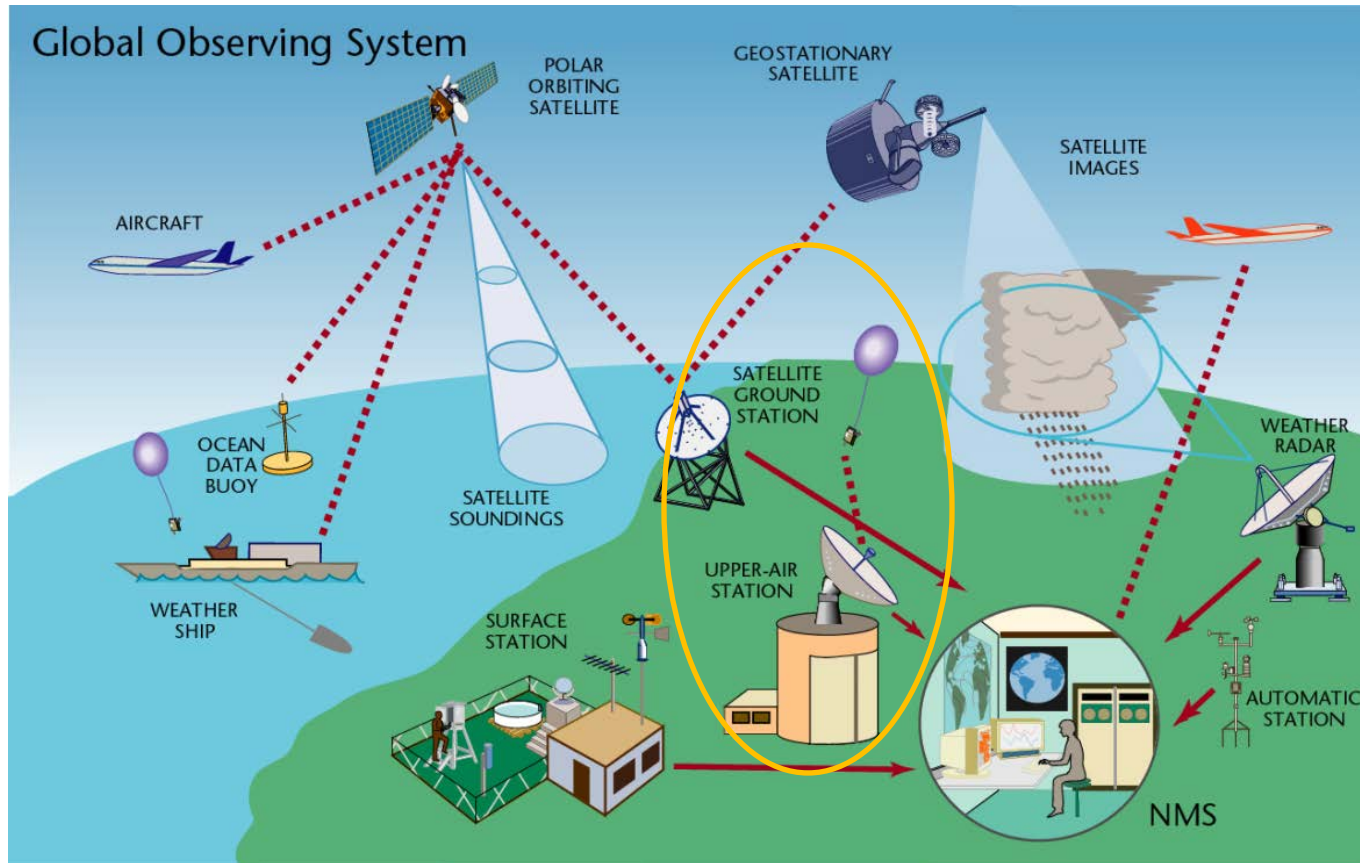
Observations are obtained from nationwide and ship-based networks worldwide



- Over 1300 radiosonde stations
- 800,000 launches per year

# Operational Overview

## Global Observing System (GOS)

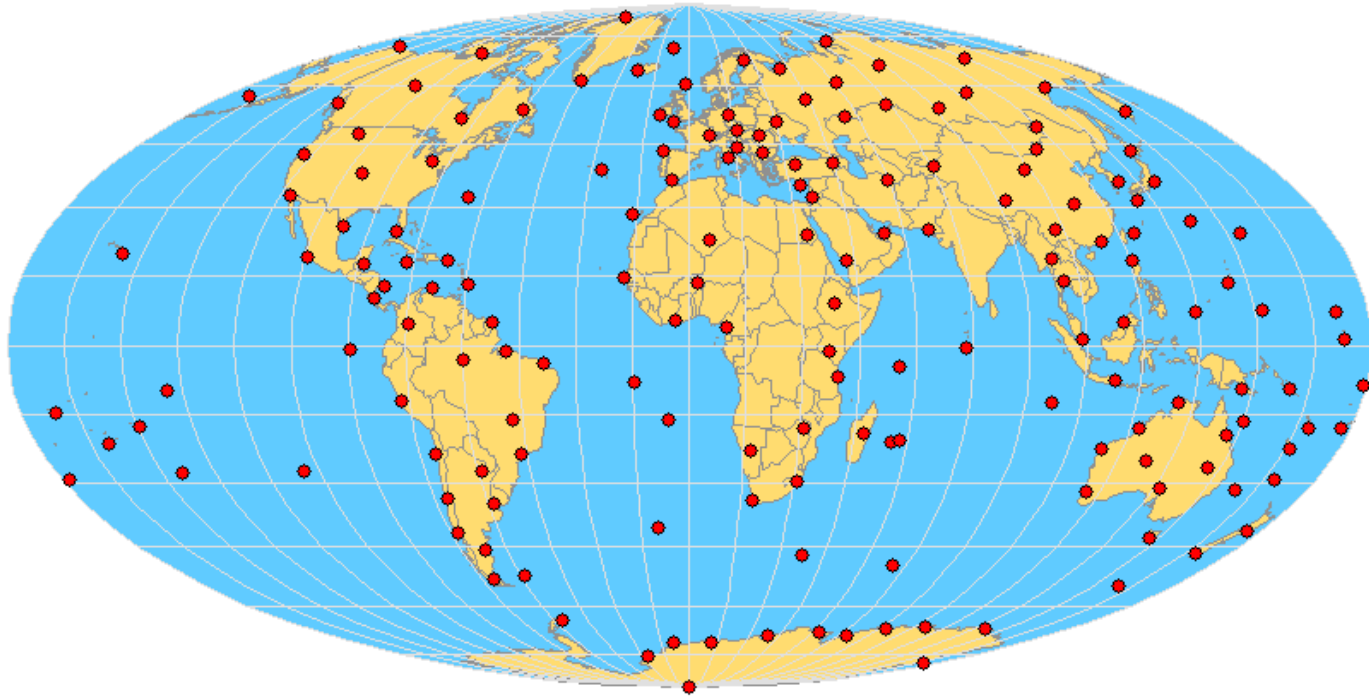


Radiosonde operations are an integral part of the GOS

# Operational Overview

## Global Climate Observing System (GCOS)

**GCOS Upper-air Network**  
(171 Stations)



*GCOS Secretariat, 1 January 2012*

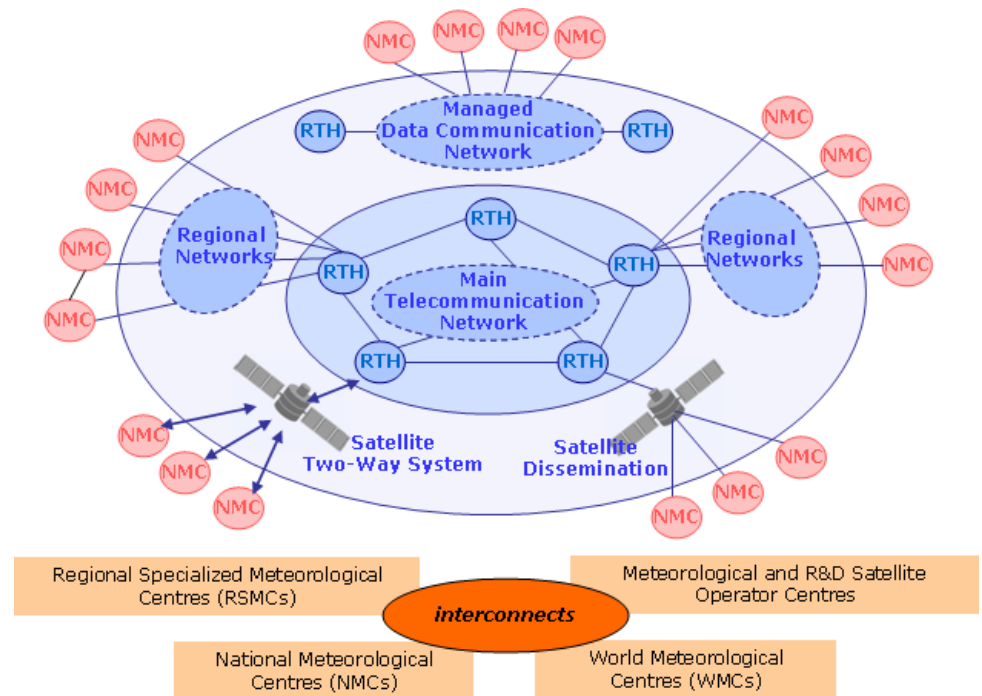
# Operational Overview

## Global Telecommunication System (GTS)

Radiosonde data are collected at National Meteorological Centers (NMC)

Data is distributed throughout the World Meteorological Organization Regions:

- Africa
- Asia
- South America
- North America
- Central America
- Caribbean
- Southwest Pacific
- Europe
- Antarctica



# Operational Overview

## U.S. Observation Network

Observations are made at locations throughout the continental U.S., Alaska, Hawaii, Puerto Rico, the Mariana Islands, and American Samoa

- 200 radiosondes per day at 00 and 12 UTC
- 78,000 launches per year
- Pressure, temperature, humidity and winds
- Data archived at National Climatic Data Center



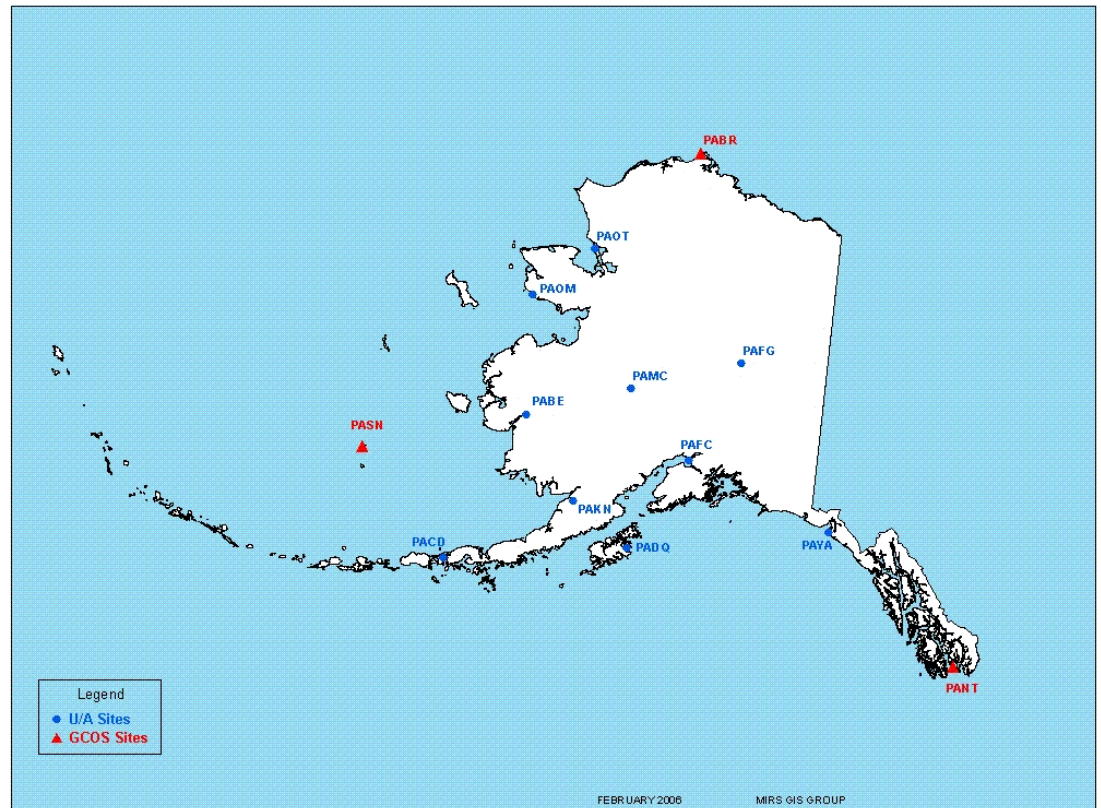


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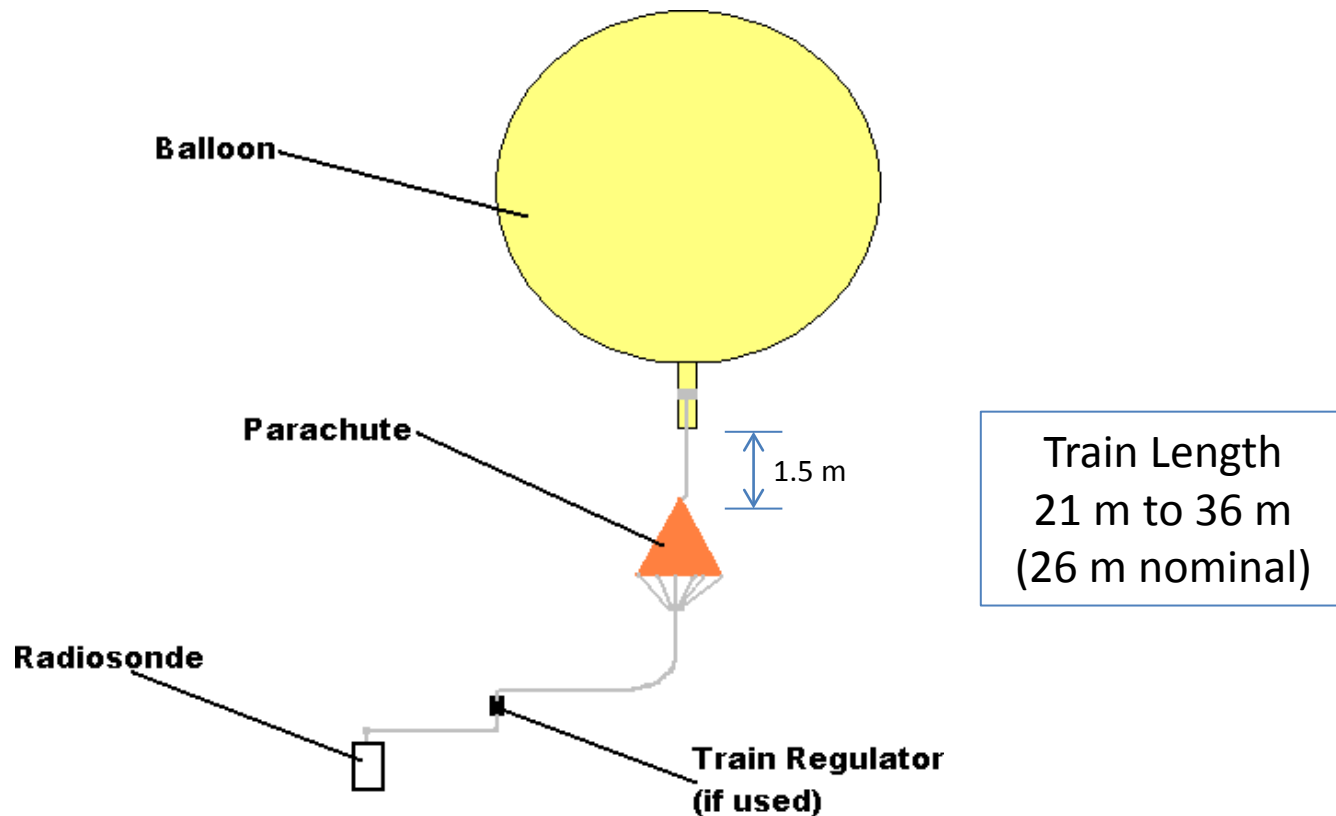
# Operational Overview

## U.S. Data Utilization

- Inputs to
  - Computer-based weather prediction models
  - GOS
  - GCOS
- Monitoring of air pollution dispersion
- Forecasting weather, including severe storms and flash floods
- Developing aviation and marine forecasts
- Preparing weather and climate studies
- Calibrating weather satellites and remote sensing systems
- Atmospheric and climate research

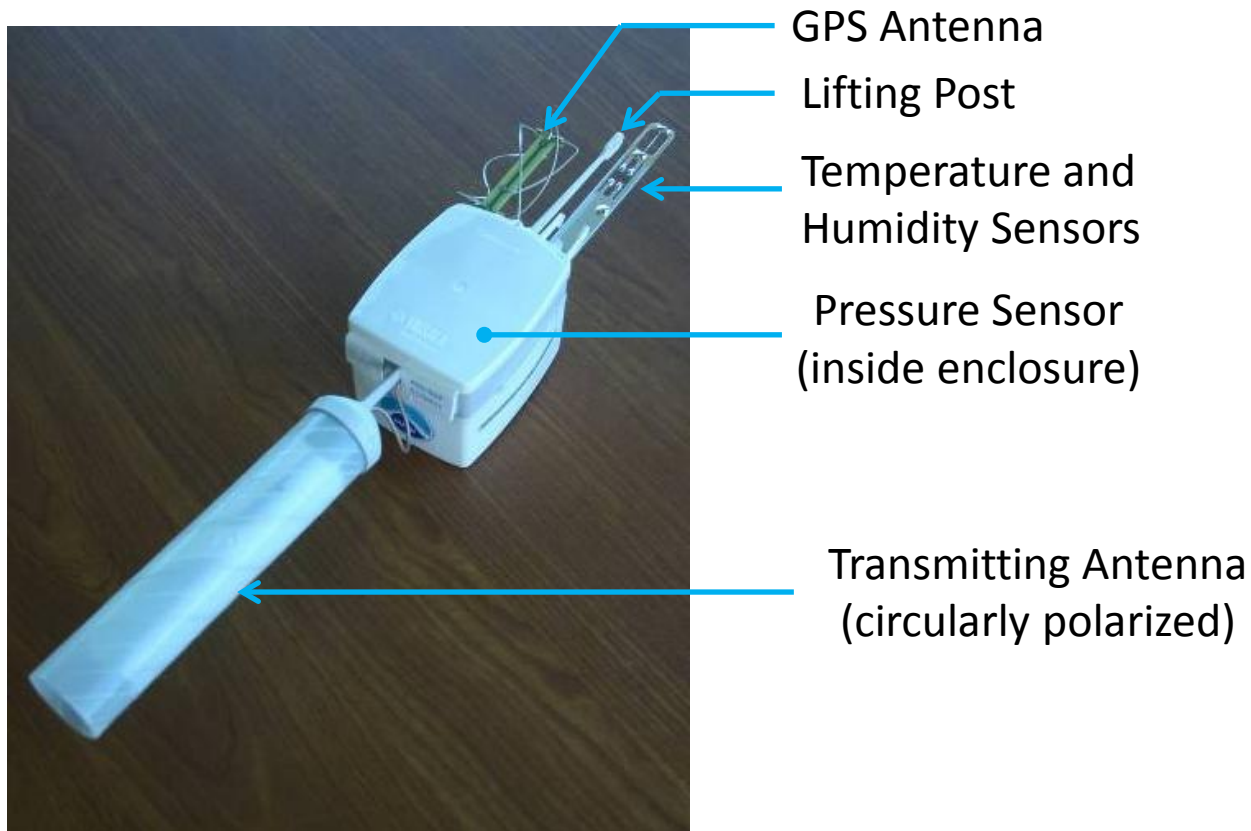
# Radiosonde System

## Flight Train



# Radiosonde System

## Radiosonde Types Used



GPS Antenna

Lifting Post

Temperature and  
Humidity Sensors

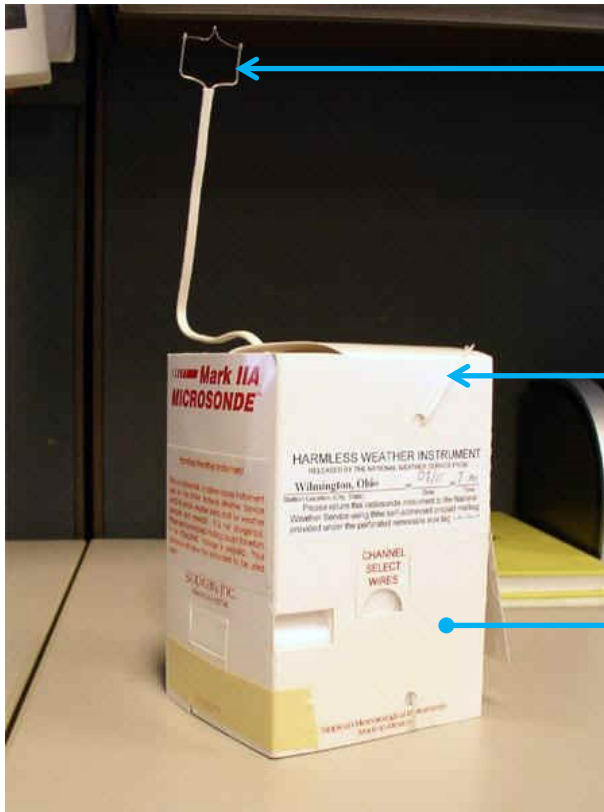
Pressure Sensor  
(inside enclosure)

Transmitting Antenna  
(circularly polarized)

Vaisala  
RS92

# Radiosonde System

## Radiosonde Types Used



Temperature Sensor

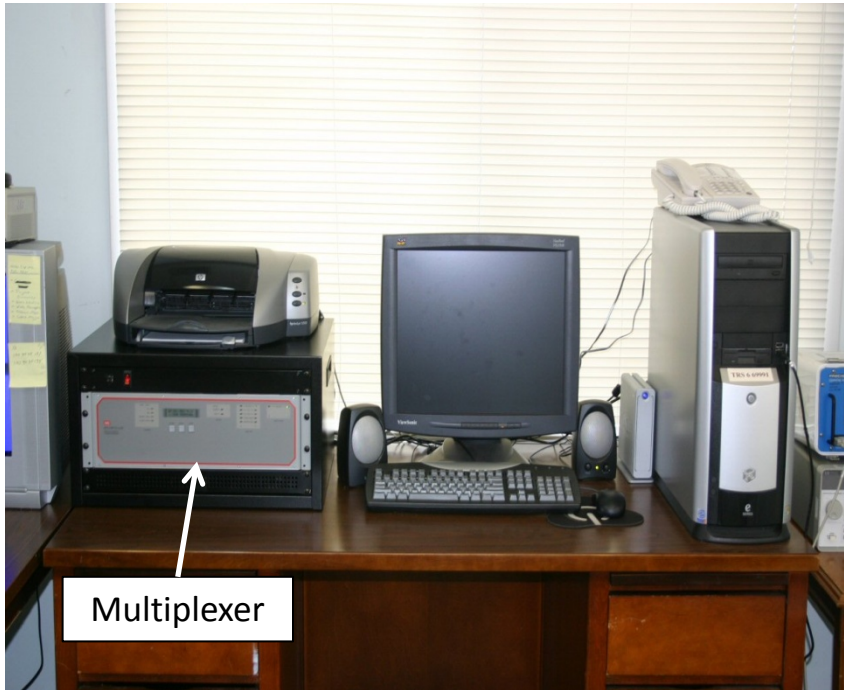
Hanging String

Humidity and Pressure Sensors,  
GPS and Transmitting Antennas  
(inside enclosure)

Lockheed Martin Sippican  
Mark IIA

# Radiosonde System

## Ground Station



Multiplexer

Radiosonde Work Station (RWS)



Telemetry Receiving Station (TRS)

# Typical Flight Preparation





# Typical Flight Launch



# Typical Flight

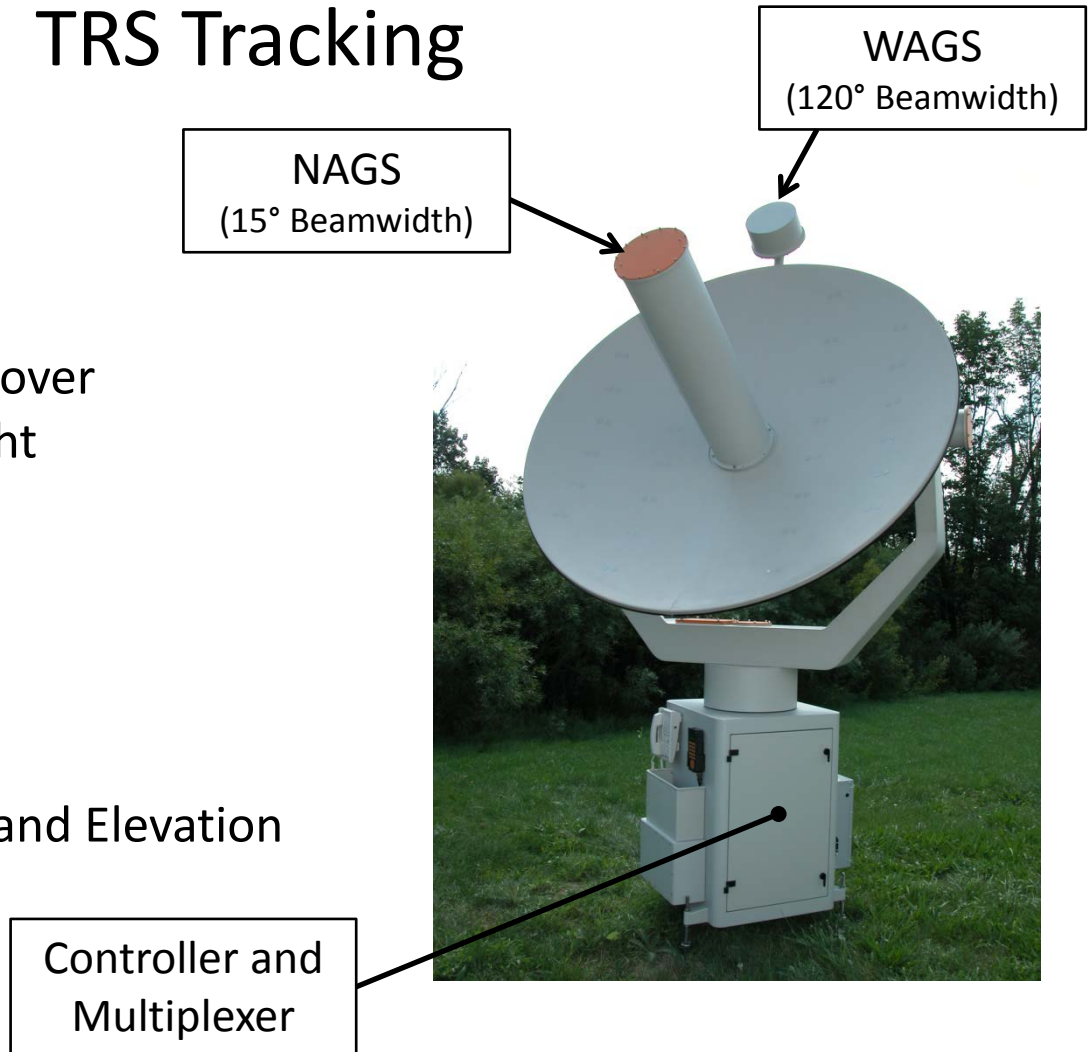
## Launch



# Typical Flight

## TRS Tracking

- 2 Directional Antennas
- WAGS to NAGS changeover  
10-15 minutes into flight
  - Time
  - Motion
  - Signal Strength
- “Double diamond”
- GPS Backup: Azimuth and Elevation



# Typical Flight

## Data Logging

Data logged at one-second intervals

- Pressure
- Temperature
- Humidity
- Geographic Coordinates
- Geometric Height
- U and V Components (motion vector)
- UTC

# Impact of Interference

- Adversely impacts forecaster's ability to accurately predict weather events
- Temperature, humidity, pressure, location, wind speed and direction data can be corrupted or lost
- Excessive interpolation degrades data quality
- Lost signal results in early flight termination

# Future Trends

- Improved sensor performance
- Greater spectrum efficiency
- Increased tolerance to interference
- Reduced radiosonde cost



# For More Information

National Weather Service

<http://www.ua.nws.noaa.gov>

World Meteorological Organization

<http://www.wmo.int/pages/prog/www/OSY/GOS.html>

International Telecommunication Union

*Use of Radio Spectrum for Meteorology: Weather, Water and Climate Monitoring and Prediction (Edition 2008)*, Handbook R-HDB-45-2008-MSW-E

<http://www.itu.int/en/publications/ITU-R/pages/publications.aspx?parent=R-HDB-45-2008&media=electronic>