

# Flight Display Systems

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# Ellipse Direct

# Data

Ellipse Direct

Revolutionary New Airborne DirecTV  
System.

# The Product

- Flight Display Systems has developed a new low cost airborne satellite DirecTV system. Brand name Ellipse Direct.
- The system consists of a Radome that houses the antenna and a receiver box in the aircraft.
- The antenna automatically locks on and tracks the satellite without the aid of GPS.
- It is easy to install, low downtime and less than  $\frac{1}{2}$  the price of other systems.

# Satellite TV for all aircraft

- Now, aircraft operators have the option to install airborne satellite DirecTV on ANY SIZE AIRCRAFT.
- The Radome mounts on the fuselage.
- The antenna automatically tracks the satellite without the aid of GPS.

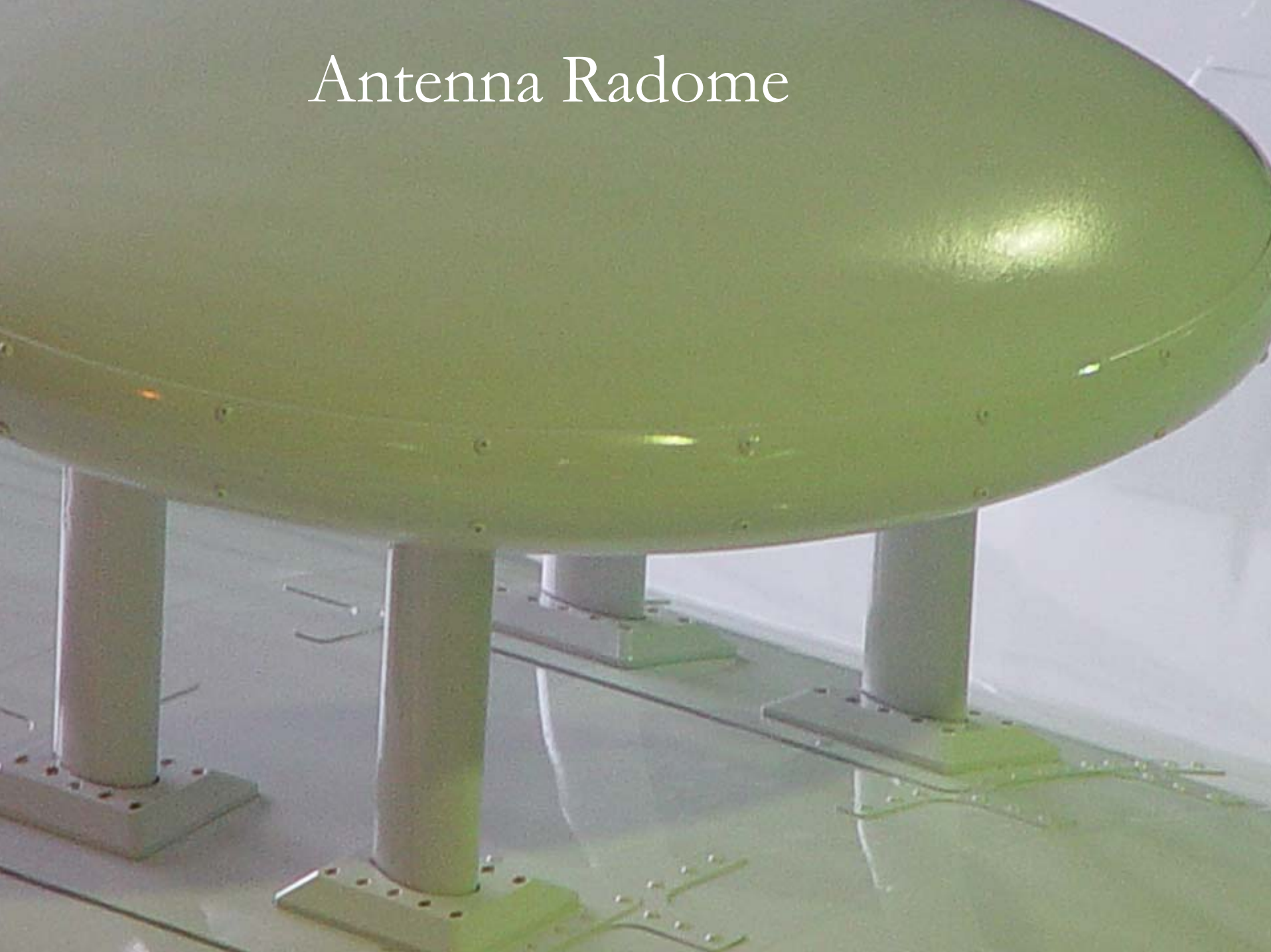
# Innovative Approach

- Our patented radome design is the first major breakthrough for low cost in-flight satellite TV
- “New” Antenna – Proven - Phased Array, Mechanically Steered, Low Profile.
- Antenna Manufacturer, KVH, has sold thousands of satellite antenna’s and is the industry leader in rugged mobile applications

# Radome/Antenna

- What does the Radome that houses the antenna look like?

# Antenna Radome



# Radome/Antenna

- Can you show me some pictures of an actual installation?
- The next four slides show the installation on a Challenger CL600 aircraft.

Challenger



Challenger



Challenger

Challenger

Challenger





DirecTV Challenger

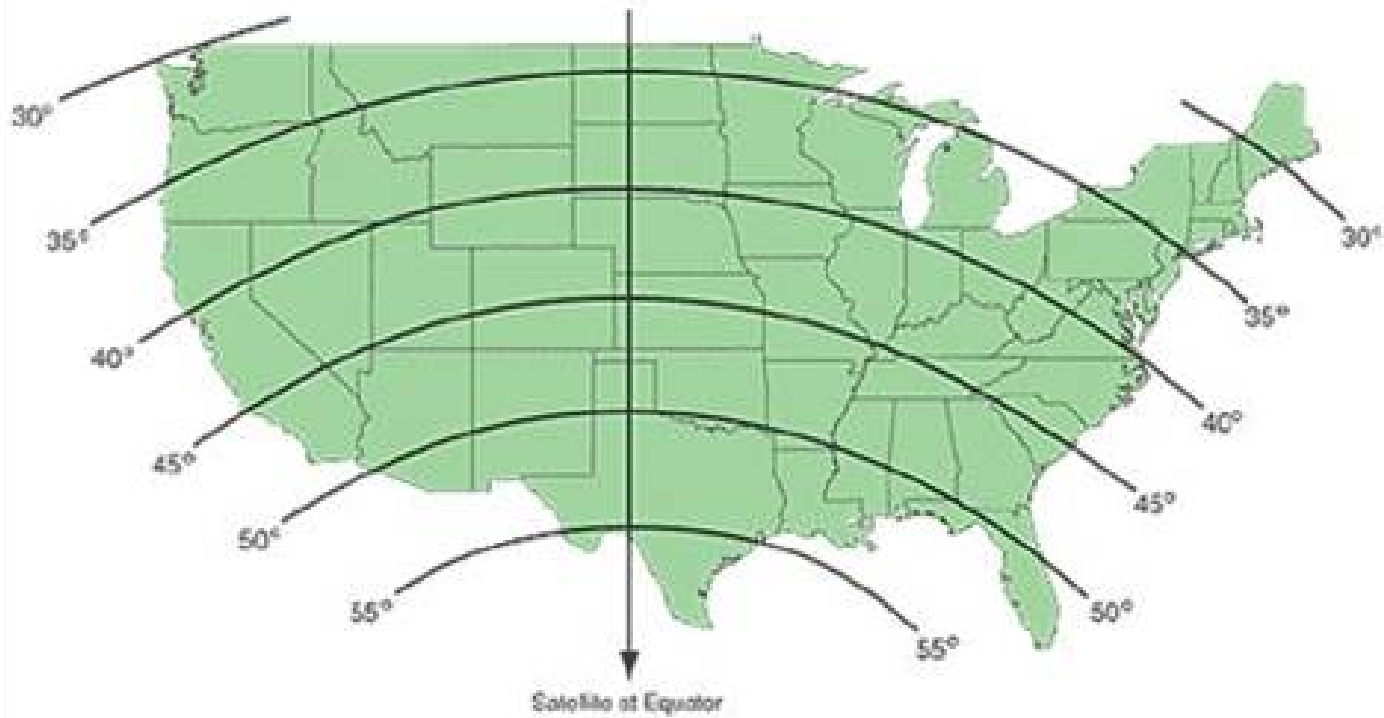
# What's Important to the passengers?

- Owners and passengers do not care what the antenna looks like. All they care about is that they can purchase an airborne satellite DirecTV system at a low price. One owner made the point very clear. He said “I do not care what the antenna looks like or the technical aspects when I am sitting in the cabin watching an NFL football game. All I care about is that it works.”

# Satellite Map

- Can you show me a map of where the satellites are located?

# TracVision A5 Satellite Elevation Map



# How does DirecTV work?

- All satellites are in geo-stationary orbit precisely over the equator and appear to stand still.
- All North American DirecTV antennas always point to the south at the satellite.
- Unlike a house mounted antenna an aircraft antenna must be able to track the satellite during flight and taxi operations.

# What Channels will I receive?

- 125+ Channels of DirecTV service on your aircraft.
- News, sports, weather, movies
- Premium movie channels; optional sports packages; 40 digital music channels
- Two receivers so you can watch two different programs at the same time.



# Why mount the antenna above the fuselage of the aircraft?

- The antenna size provided us with no existing location to house the antenna.
- We decided to use the same proven design as the U.S. Air Force on their AWACS aircraft.

# Innovative Approach

- Look to proven designs
  - AWACS
    - USAF Boeing 707 AWACS
    - USN E-2C Hawkeye
    - Russian Ilyushin

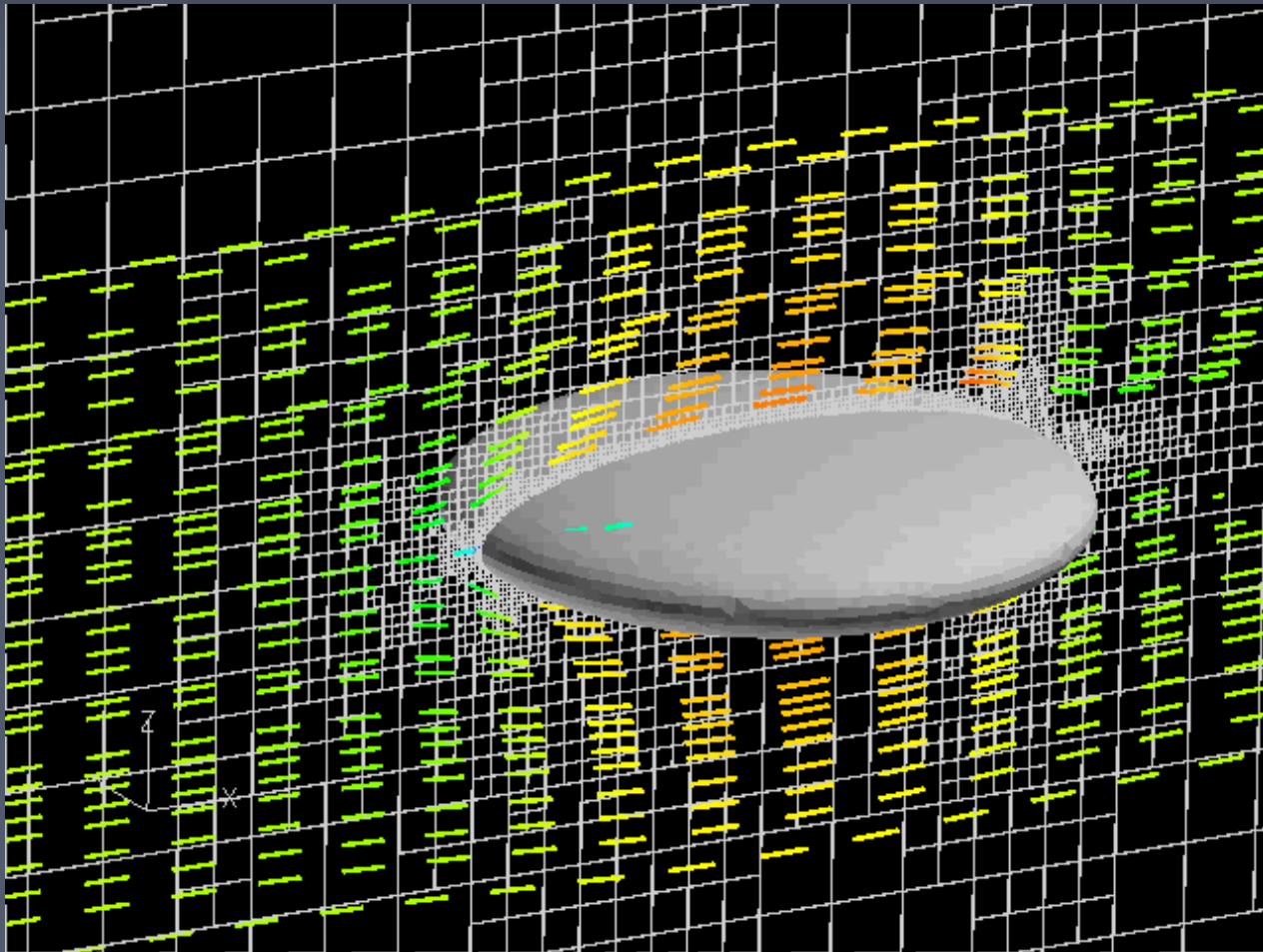


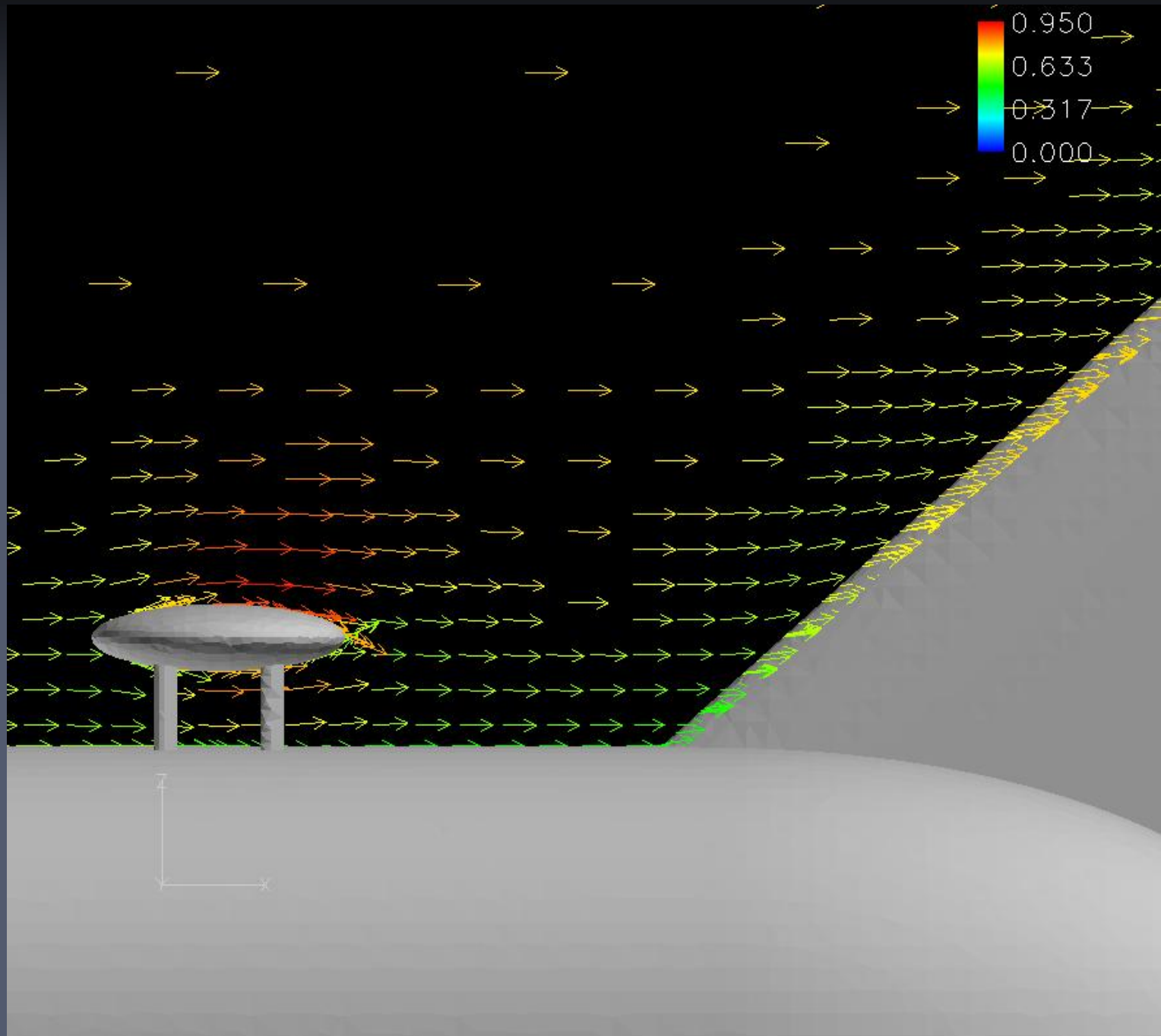
# How was the design tested?

- GA Tech performed CFD (Computational Fluid Dynamics) Evaluation of Airflow on each airframe.
- We tested our Radome design concept using NASCART-GT on various corporate aircraft airframes, altitudes, airspeeds, and angle of attack.
- We made sure it would work before we started production.

# Evaluative Process

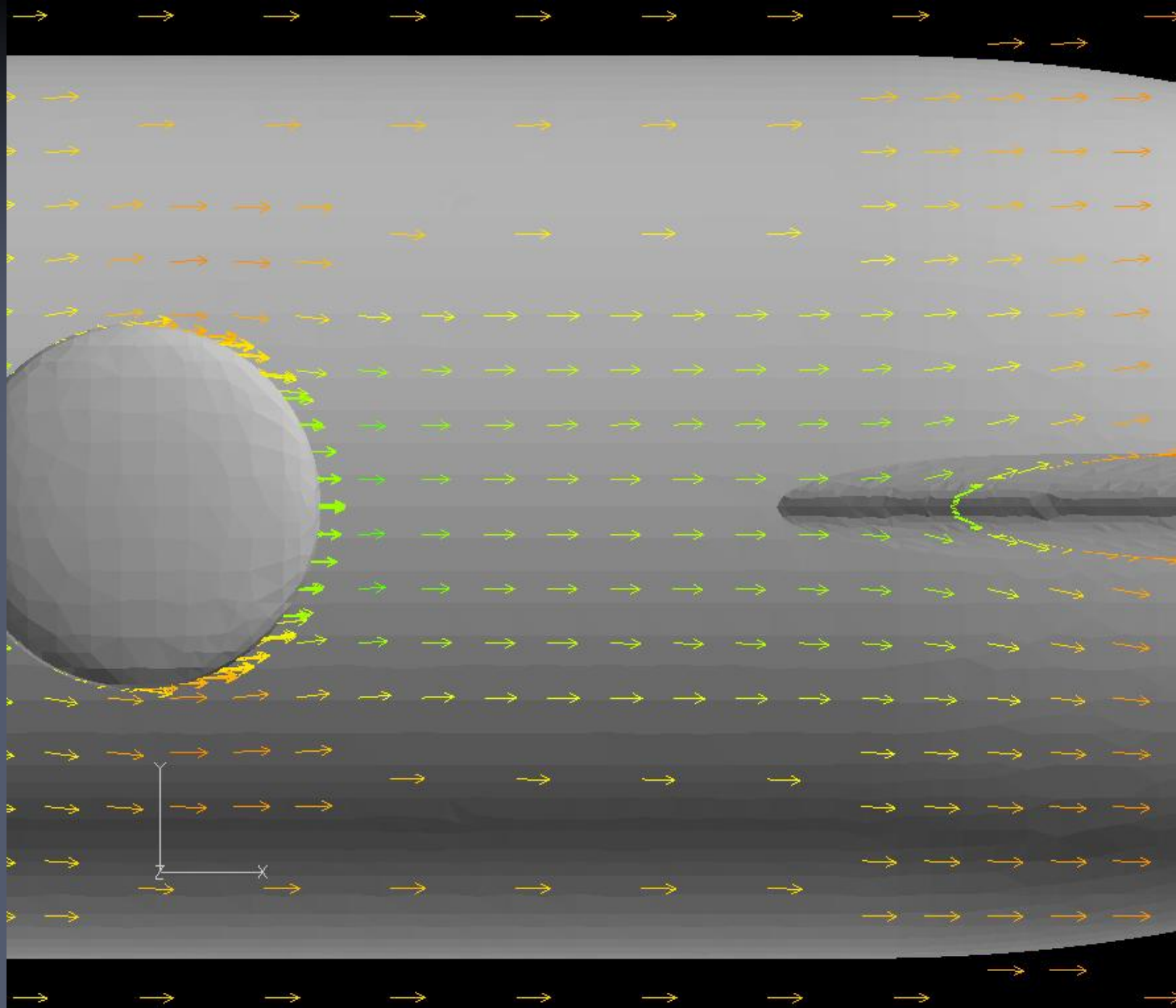
NASCART-GT





# Why mount the Radome above the fuselage?

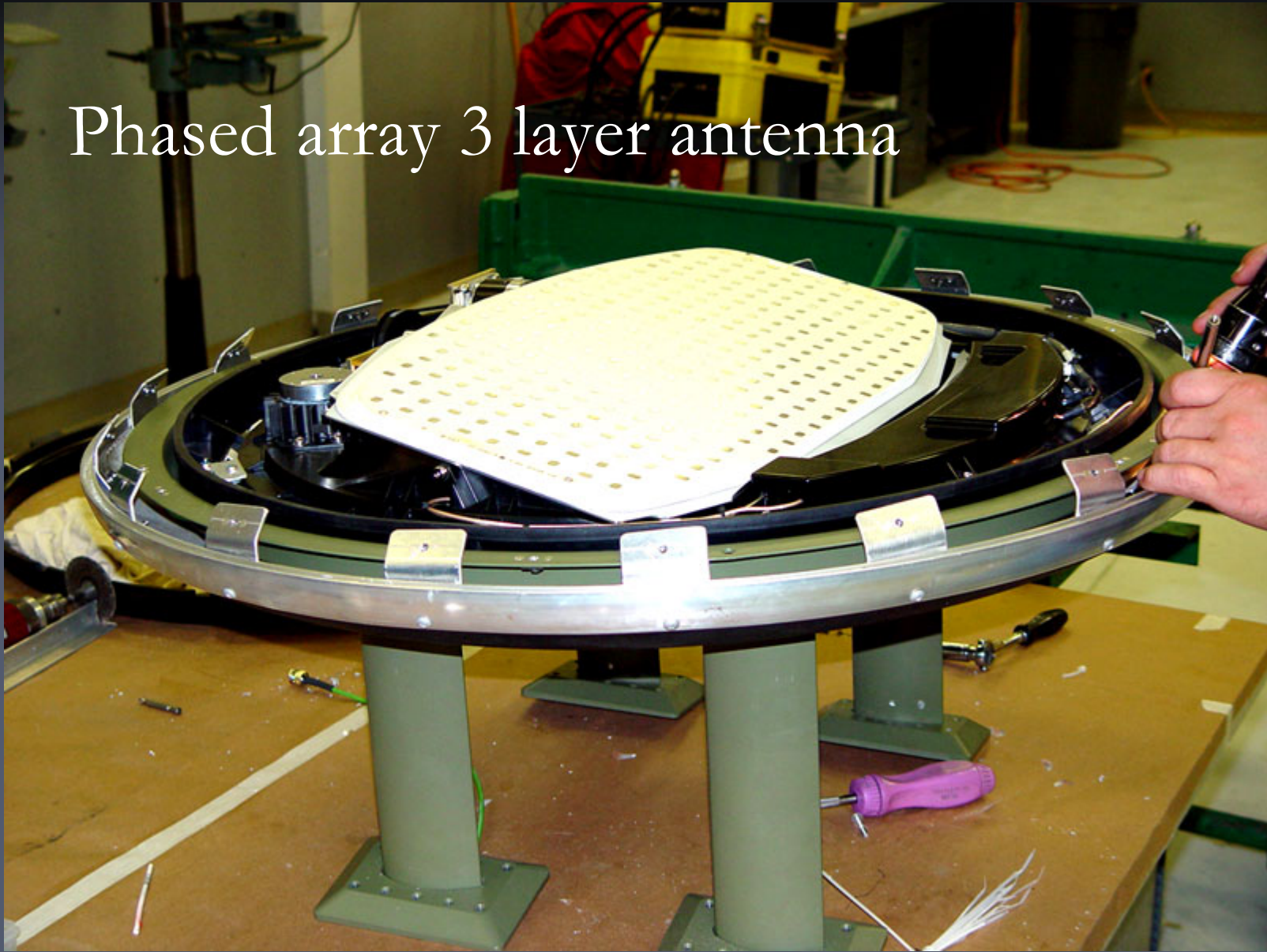
- Testing proved that the Radome needed to be mounted approximately 10 inches above the fuselage to permit free flow of air below.
- This cut down on lift , drag, and noise.
- The airflow is back to its original flow 3 inches after it passes the rear of the Radome.



# Antenna

- What does the antenna look like inside the Radome?

# Phased array 3 layer antenna



# Improved TV Performance

- Unique Features
  - Ability to change heading up to  $40^\circ$  per second without losing satellite tracking
  - The antenna rotates 360 degrees and tilts 16 degrees either side of horizontal. Performance matches a 24" dish antenna
  - Ability to acquire satellite without need for GPS or aircraft navigation system

# Antenna Performance

- Because the Antenna was developed for surface use, the signal strength and performance is greater than the aircraft competition. (22.5 x 14 inches). Three layer antenna.
- Great reception on the ground and while taxing.
- A ground based system adapted to the sky means excellent reception at all times.

# Interface Control Unit (ICU)

- The ICU must be mounted inside the aircraft pressure vessel.
- The ICU has two receivers that permit watching two different TV channels at the same time.
- Additional receivers can be added.
- The next slide shows the ICU.

# Interface Control Unit (ICU)

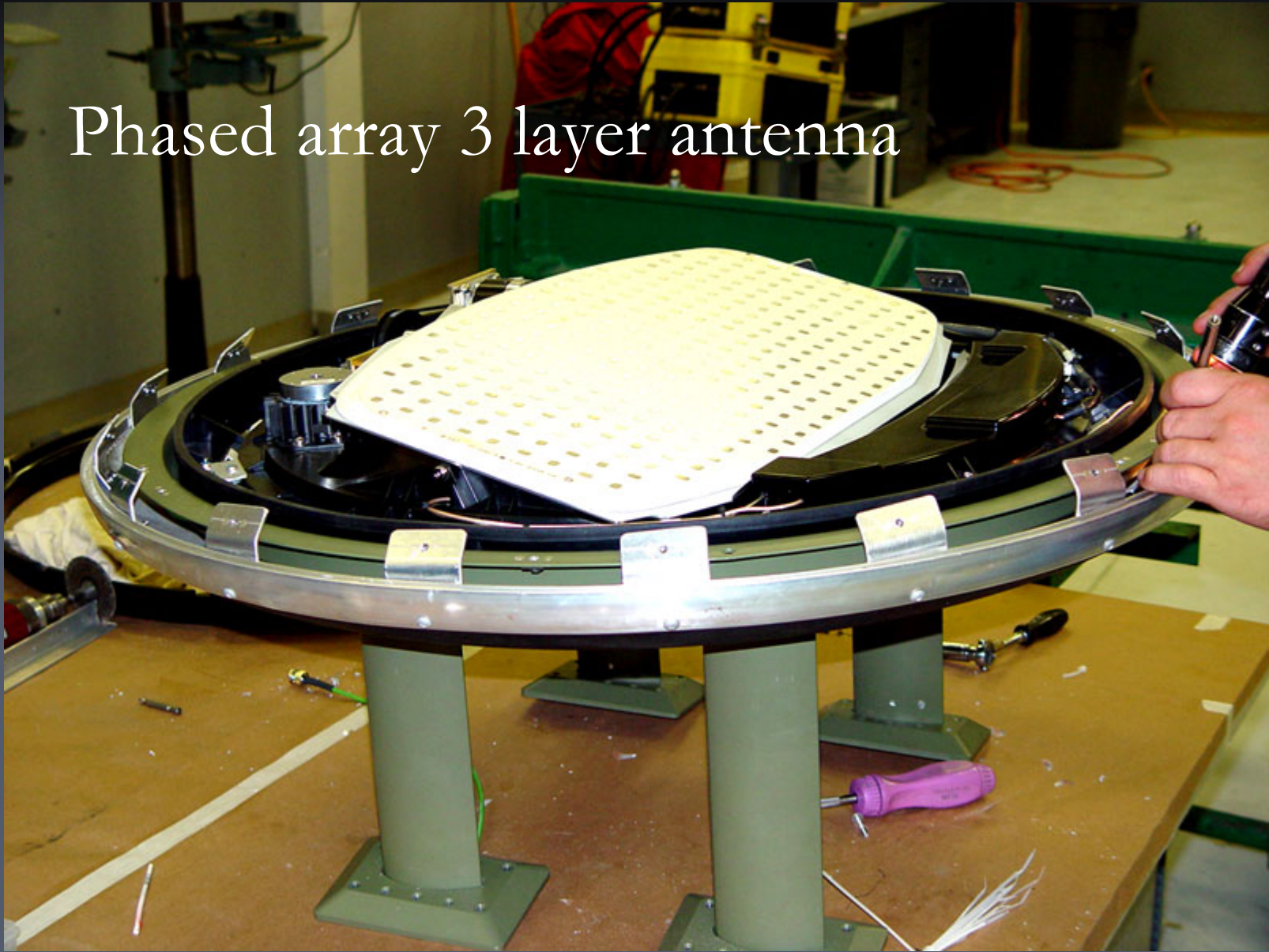
## Two Receivers



# What is involved in connecting the antenna with the Interface Control Unit (ICU) which is the receiver box mounted inside the aircraft?

- If you look at the next slide notice the small green cable by the left front leg. This cable provides the power to run the antenna and it also sends the signal down to the receiver.
- A very simple interface and installation.

# Phased array 3 layer antenna



# Changing Channels

How do I change channels?

- The system comes with two RF remote controls than are used with the individual receivers.

# RF Remote Control (2)



# Specifications of the entire system

- Radome 34 x 9 inches, Wt. 57.0
- Antenna dimensions 22.5 X 14
- Interface Control Unit (ICU)
- Dimensions 12.25 x 5.75 x 10.5 , Wt 10.5
- Inputs: 75 ohm coax, 28volt power, remote RF
- Outputs: (2)composite video,(2)S-video,(2) TNC/VHF

# Maintenance

How long will it take to replace the antenna or Radome should I have a problem?

- You can replace the Radome in an hour. Or, take off the top of the Radome and replace the antenna in 30 minutes.
- If you wish you can remove the screws on each foot and take the Radome into the shop to work on a bench.

# Where do I purchase the system?

- Ellipse Direct is sold through a network of avionics dealers and service centers.
- Most of the major facilities you currently use for maintenance and avionics installations can install our system.
- For additional information contact Jay Healey at 702-361-0958. [jay@ellipsedirect.com](mailto:jay@ellipsedirect.com)