



WEATHER RADAR

Radar, short for **Radio Detection And Ranging**, transmits microwaves as a focused signal designed to detect precipitation particles in the atmosphere (rain, snow, and hail).

12" Dish 8' Beam Cessna Aircraft

Phased Array Dish
50-70 miles accurate. Beyond that, it's not reliable.

Forced Standby: STAB 4 times within 5 secs. takes it out of Forced Standby.

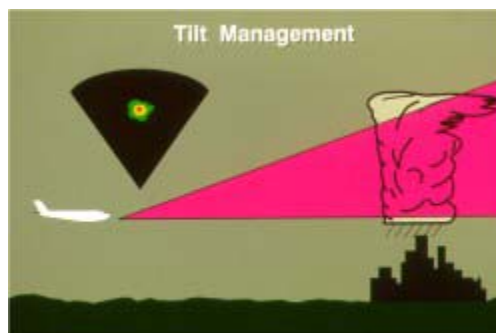
It goes into Forced Standby if left on upon landing by the Weight On Wheels Switch.

Radar Tilt Management

The most frequent question regarding airborne weather radar operations is about antenna tilt selection. Pilots want to know where tilt should be set so that all echoes represent weather and not ground, and so they are certain the radar detects everything that must be avoided.

To make sure that all echoes you see are weather, not ground, simply set the tilt so that the bottom of the radar beam is parallel to the ground - as shown at right.

With the tilt in this position, every echo will represent an object (weather, mountain peak, etc.) extending above your current altitude, because radar obviously does not detect and display objects below the bottom of the beam.



By The Book?

That seems simple enough. But in their pilot operating manuals, radar manufacturers give what appear to be simple answers for tilting the beam parallel to the ground. Their answers are given in degrees of tilt relative to zero tilt. This solution assumes that all radar antennas have been properly aligned and that antenna stabilization systems are perfect. That's where the complication and confusion arises, because neither is necessarily true. Rarely is an antenna installed in proper alignment, and no stabilization system works perfectly 100 percent of the time.

Do-It-Yourself Tilt Calibration

The position of the bottom of the beam can be determined by tilting the beam down, then all we have to do is figure out how to raise it to our altitude. (When tilted down, the display will be blank out to a distance, then the screen will be filled with ground echoes from that point on out, as shown at right).



It's a fact (or close enough to a fact for tilt management purposes) that 100 times the distance in nautical miles equals the number of feet represented by each degree of tilt at that distance. For example, at 3 miles each degree represents approximately 300 feet; at 7 miles, each degree is approximately 700 feet; at 23 miles each degree is approximately 2300 feet.

Tilt Adjustment Method

- Push IN the Auto Knob so the Tilt Adjustment is in Manual.
- Set the display distance on the screen to a value that you can see the return at .001 value.

* example: FLYING AT FL240 adjust the return on the screen with the tilt knob so you see the ground return at 24 miles.

- Look at what the tilt value is.
- Adjust the tilt knob UP $\frac{1}{2}$ the amount of the radar beam (8° beam for Cessna Aircraft)

* Example: if it's showing -3, set the tilt to +1.

This will put the beam horizontal from the flight path and pointing up 8° to show weather at and above the flight path.

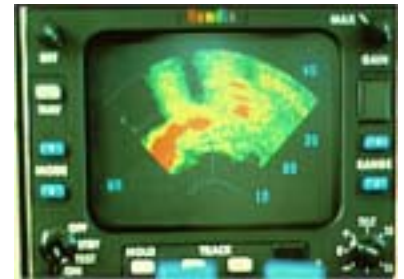
During Level Flight - Leave the tilt in manual. During Climb or Descent, pull the knob out so it's in the auto mode and will display the weather more accurately.

Minus Four

Part of the original question had to do with where the tilt should be set to make certain your radar detects everything that must be avoided. That's easy. Once you've adjusted tilt so the bottom of the beam is at your altitude, as just described, lower the tilt 4 degrees. Now, when you're between 2,000 and 30,000 feet, avoid all echoes that work back to the 5 mile range. That echo is from something only 2,000 feet — or less — below you. It may be a storm or it may be a mountain peak so pay extra close attention to that "or less."

When you're above FL290, be suspicious of every echo at 30 miles or closer. It's a thunderstorm which you'll top by only 10,000 to 12,000 feet - if you top it at all.

When you're at 15,000 or lower, set the displayed range to 50 miles, or as close to it possible. Now keep an eye on the outer edge of the radar display. If a black area forms at the outer edge and begins to work back toward you (as shown at right), turn away fast.



It's a radar shadow, the number one killer in aviation.