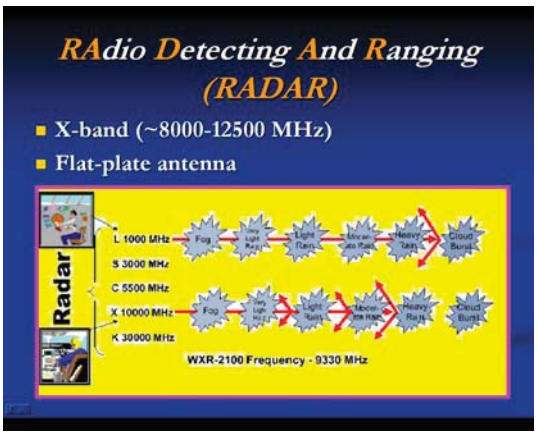
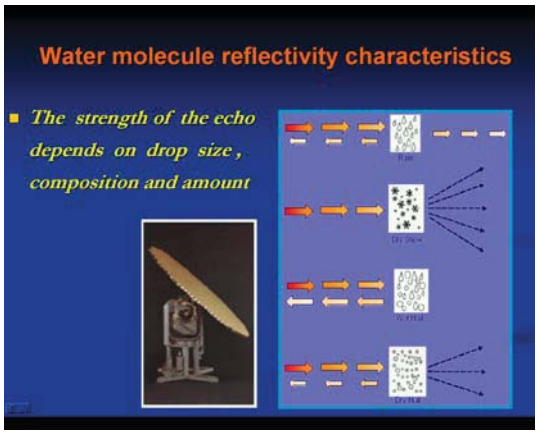
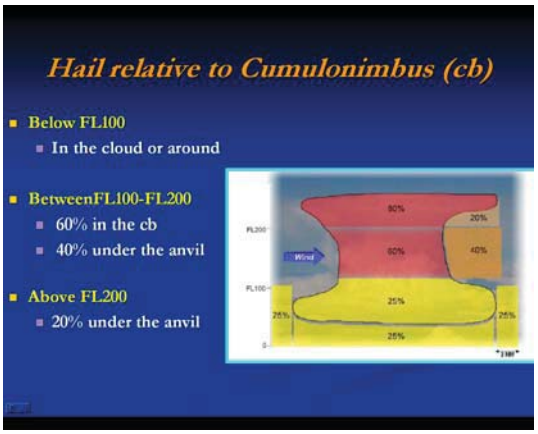
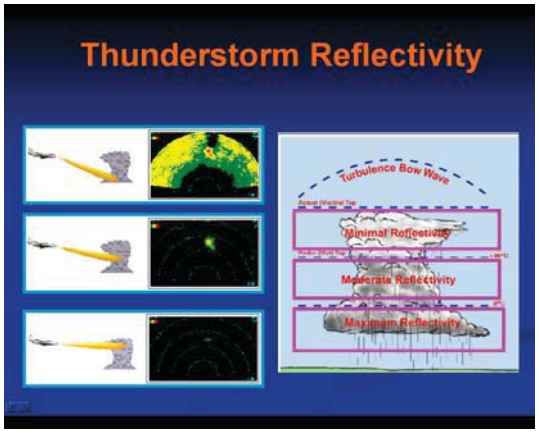
航空安全與氣象雷達之應用

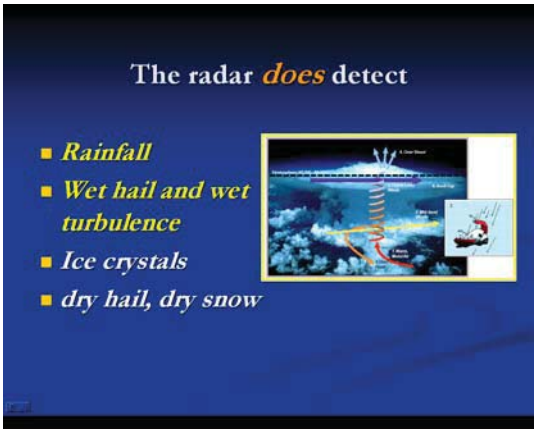
劉美君
台北市敦化北路 340 號之 10











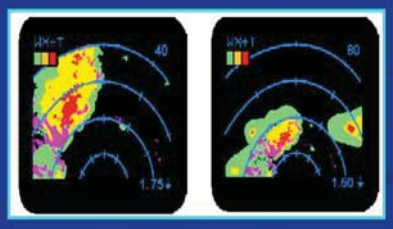
The radar *does not* detect

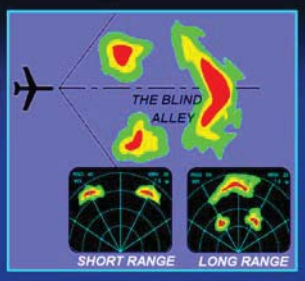
- *Clouds, fog or wind (droplets are too small or no precipitation)*
- *Clear air Turbulence (no precipitation)*

Weather radar control panel

Turbulence

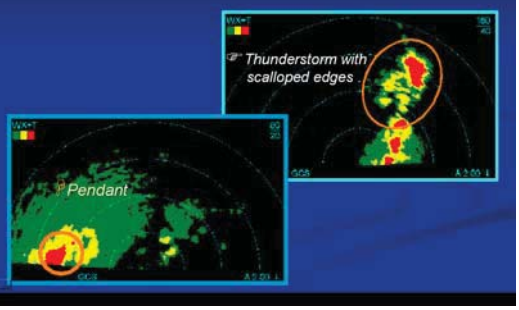
- Doppler effect
- Detect water droplet velocities of 5m/s or greater
- Within range 40 nm





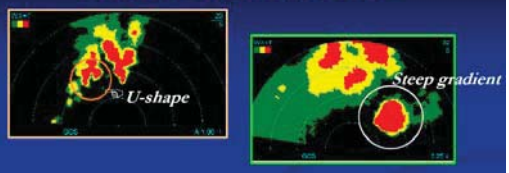
☞ *When viewing the short ranges , periodically switch to longer-range displays to observe distant conditions .*

Adverse Weather Shape



Adverse Weather Shape

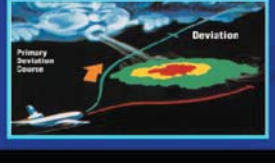
Adverse Weather Shape



☞ The best way to identify hail-containing storms is to recognize their characteristic shape as seen on the display .

Weather Avoidance

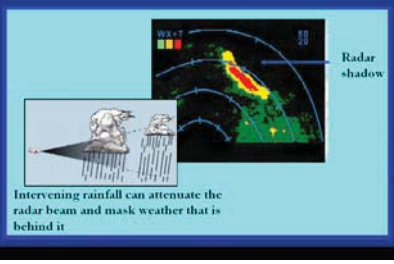
1. Avoid magenta and red area
2. 10 nm lateral separation on the up wind side
3. 20 nm down wind side
4. 5000ft clear top of cloud



Radar Attenuation

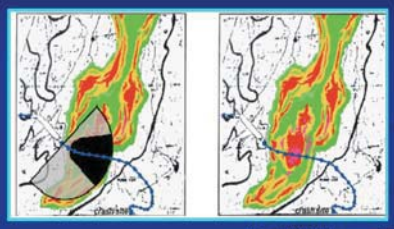
✓Lack of green on the back side

✓The concave shape ✓Lack of ground clutter



Intervening rainfall can attenuate the radar beam and mask weather that is behind it

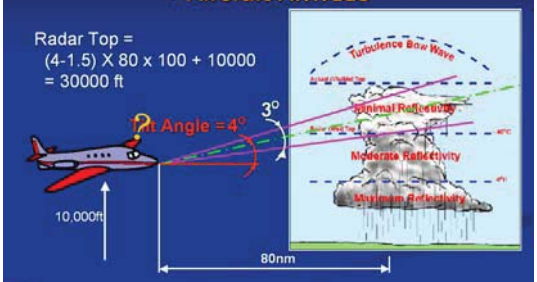
IN 1977 SOUTHERN AIRWAYS DC-9 CRASH INTO THE RADAR SHADOW



- Top 55000ft, tornadoes
- 3 inch hail

Radar Top = (Tilt Angle-1.5) X Range X 100 + Aircraft Altitude

Radar Top =
(4-1.5) X 80 x 100 + 10000
= 30000 ft



Taxi and Takeoff

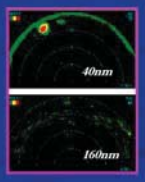
1. Set ND 10nm
2. Tilt down until grand echo then up (confidence check)

1. Scan up to 15 up
2. Select tilt at 4 up for takeoff

Climb- out

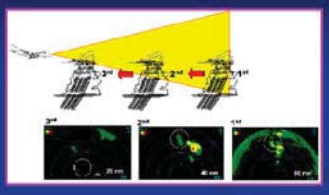
1. *Scan up to 15 then back +4*

1. *Select tilt maintain ground returns on top of ND*



High altitude tilt control

(FL 250 and above)



- Over-scanning and subsequent inadvertent thunderstorm top penetrations is a significant threat during high altitude operations

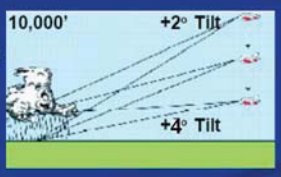
Cruise

- *Maintain ground return on top of ND*
- *WHEN APPROACHING WEATHER*
  1. *-Decrease ND range*
  2. *-Tilt down*
  3. *-Use TRUB Mode*
  4. *-Gain to AUTO*

Altitude	Range (nm)	Tilt Angle
40,000'	40 nm	7°↑
	80 nm	3°↑
	160 nm	2°↑
35,000'	40 nm	6°↑
	80 nm	2°↑
	160 nm	1°↑
30,000'	40 nm	4°↑
	80 nm	1°↑
	160 nm	0°
25,000'	40 nm	3°↑
	80 nm	1°↑
	160 nm	0°
20,000'	40 nm	2°↑
	80 nm	0°
	160 nm	1°↑

Descent and Approach

- Above FL150
  - Every 10000 ft ~ tilt +1 up
- Below FL150
  - Every 5000 ft ~ tilt +1 up
- Approach
  - Select tilt at +4 up



- Do not turn on at the gate
- Turn on after leaving terminal area
- Do not turn on during refueling

Weather radar is for avoiding severe weather not for penetrating it

Reference Document

- *Rockwell Collins WXR-2100 Multi-Scan Radar Pilot's Guide*
- *Honeywell RDR-4B User's Guide*
- *AIRBUS Flight Operations Briefing Notes*
- *CAL WX Radar CBT*

THE END .....