Pending Beam Blanking/Blocking Issue For WSR-88D At Melbourne, FL

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Information Compilation From:
- WSR-88D Radar Operations Center, Engineering Branch
- NWS Southern Region Headquarters
- NWS Melbourne Forecast Office
Northwest Corner of Airport
KMLB Tower View to South

(January 2012)
Proposed Hangar Complex
(Hangar Design)

Note: Hangar location and orientation has recently changed.
Updated Layout
<table>
<thead>
<tr>
<th>Specification</th>
<th>WSR-88D Details</th>
<th>Hangar Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSR-88D Tower Base</td>
<td>35 ft MSL</td>
<td>~33.0 ft MSL</td>
</tr>
<tr>
<td>WSR-88D Tower Height</td>
<td>65.62 ft AGL; 100.62 ft MSL</td>
<td>~92.0 ft AGL; 123.5 ft MSL ***</td>
</tr>
<tr>
<td>WSR-88D Beam Center</td>
<td>79.62 ft AGL; 114.62 ft MSL ***</td>
<td>~69 ft AGL; 102.5 ft MSL</td>
</tr>
<tr>
<td>Hangar Base</td>
<td></td>
<td>~350 ft ***</td>
</tr>
<tr>
<td>Hangar Ridge (High)</td>
<td></td>
<td>** *** &quot;of particular note&quot;</td>
</tr>
<tr>
<td>Hangar Ridge (Low)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closest Tower-Hangar Distance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boeing 747 Tail Height</td>
<td>63 ft 8 in AGL; 97 ft 2 in MSL</td>
<td></td>
</tr>
<tr>
<td>Construction Crane Height</td>
<td>180 ft AGL; 223.5 ft MSL</td>
<td></td>
</tr>
<tr>
<td>WSR-88D Frequency</td>
<td>2865 MHz</td>
<td></td>
</tr>
<tr>
<td>WSR-88D Transmit Power</td>
<td>750 KW (peak)</td>
<td></td>
</tr>
</tbody>
</table>
Radar Performance Impacts

• Hangar complex will be within 600 ft “safety zone.”
• Radar beam blockage is certain; blanking likely required.
• An appreciable reduction/degradation in base data/quality will occur to the southeast of the KMLB radar.
• It will be a greater challenge for radar operators to assess weather phenomena forming within, or moving through, this area.
• Limiting effect on algorithm performance.
• Unique concerns also exist during the construction phase; a 180 ft crane will be used (e.g., coordinated down time).
Blanked Zones

• Four Different Zones
  – 107 to 131 degrees azimuth
    • Blank everything below 2.3 degrees elevation
  – 131 to 140 degrees azimuth
    • Blank everything below 4.0 degrees elevation
  – 140 to 144 degrees azimuth
    • Blank everything below 3.0 degrees elevation
  – 144 to 150 degrees azimuth
    • Blank everything below 2.3 degrees elevation
Blocked Zone

• Partial Beam Blockage
  – 100 to 107 degrees azimuth
    • Radar transmitter will radiate, but half of the energy will be blocked by hangars (e.g., reduced sensitivity)

Note: Once the hangars are in place, damage to the WSR-88D receiver components is not likely due to employed blanking and that whatever energy strikes the hangar will be reflected away.

Note: The WSR-88D site guidelines state that within 1200 ft of the radar, no structure should block the beam.
Tropical Storm Fay (2008)
(~28 inches of rain – Brevard County)

Original Melbourne, FL 0.5 degree WSR-88D Image of Tropical Storm Fay, 20 Aug 2008 0800Z

Melbourne, FL 0.5 degree WSR-88D Image of Tropical Storm Fay, 20 Aug 2008 0800Z with Simulated Hangar Blockage & Blanking

Legend
Reflectivity 0.5 degree
\[\text{dBZ}\]
- 0
- 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65
- 70
- 75

Before

After
Tropical Storm Fay (2008)
(~28 inches of rain – Brevard County)
Major Hurricane Jeanne (2004)
(~100 knot winds)

Original Melbourne, FL 0.5 degree WSR-88D Image of Hurricane Jeanne, 26 Sep 2004 0010Z

Before

After

Legend
Reflectivity 0.5 degree dBz

0.5

Legend
Reflectivity 0.5 degree dBz

0.5

Legend
Reflectivity 0.5 degree dBz

Prepared 27 February 2012

Prepared 27 February 2012

Area of decreased reflectivity due to partial blockage
Mitigation Strategies

• Airport/MidAir
  – Shorten the hangar height
    • Unlikely since business intent is to work on 747 aircraft
  – Move the hangars farther away; preferably beyond 1810 ft
    • Will disrupt development plans for the rest of airport
  – A combination of the two aforementioned
    • A design challenge
Mitigation Strategies

- NWS/NEXRAD
  - Raise the KMLB tower
    - Raise tower to 30 meters
      - Cost $0.87M; 7 weeks down time
    - Build new tower next to existing one
      - Cost $1.25M; 4 weeks down time
  - Move the KMLB radar
    - Relocate radar to new site
      - Cost $1.66M to $2.11M; 6 weeks down time
  - Employ supplemental radar data
    - WSR-88D multi-radar/multi-sensor approach (manual; automated?)
    - Exploit nearby TDWRs
    - Secure data from nearby USAF/PAFB/45WS Dual Pol (DWR)
      - Base data line; cost $129K with recurring line costs
      - SMG image relay (*.tif)
DWR Example Images

- Displayed on PC
- Limited Product Suite
- No Interrogation Functionality