WSR-88D
Supplemental Adaptive
Intra-Volume
Low-Level Scan
(SAILS)
DQ Decision Brief

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Supplemental Adaptive Intra-Volume Low-Level Scan (SAILS)

- Concept
  - Add a new Low-Level* scan to existing severe weather VCPs 12 and 212
  - Insert this new low-level scan into the “middle” of the volume scan
  - The “middle” is adaptive because volume scan completion times vary due to AVSET*

*Low-Level* – *the lowest elevation angle for the active VCP, usually 0.5°*

*AVSET* – *Automated Volume Scan Evaluation and Termination*
How Does SAILS Work?

In the example illustrated by the three figures to the right, the radar is operating in VCP 12 with a termination angle of 19.5° (either AVSET is not active or AVSET is active and there are storms near the RDA). In this scenario, the “middle” of the volume scan is ~140 seconds which results in collecting the Supplemental Low-Level scan after completion of the 3.1° elevation cut.

When SAILS is active:
• the radar scans up through the middle of the volume scan, 3.1° elevation cut in this example (Figure 1)
• transitions down to collect the supplemental 0.5° split cut data (Figure 2) then
• elevates to 4.0°, in this example (Figure 3), to resume collecting data to complete the volume scan.
# VCP 12 with SAILS Insertion Points

<table>
<thead>
<tr>
<th>Elevation Angles (VCP 12)</th>
<th>VCP 12 Elevation Duration</th>
<th>Termination Angle = 19.5</th>
<th>AVSET Termination Angle = 15.6</th>
<th>AVSET Termination Angle = 12.5</th>
<th>AVSET Termination Angle = 10.0</th>
<th>AVSET Termination Angle = 8.0</th>
<th>AVSET Termination Angle = 6.4</th>
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<td>0.5°</td>
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<td>Duration</td>
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<td>274 Sec</td>
<td>261 Sec</td>
<td>248 Sec</td>
<td>235 Sec</td>
<td>222 Sec</td>
<td>209 Sec</td>
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<tr>
<td>0.5 Elevation Update Times</td>
<td>243 Sec *</td>
<td>136 Sec and 138Sec *</td>
<td>136 Sec and 125 Sec *</td>
<td>122 Sec and 126 Sec *</td>
<td>122 Sec and 113 Sec *</td>
<td>108 Sec and 114 Sec *</td>
<td>108 Sec and 101 Sec *</td>
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</table>

* Plus Retrace Time
SAILS Implementation

• Insert a Split Cut into the “middle” of VCP 12 and VCP 212
  – Split Cut is a technique that scans an elevation twice
    • First, using a low PRF to measure power and accurately place targets in range
    • Second, using a high PRF to collect accurate velocity data
  – Split Cut Completion Time ~31 seconds
    • Surveillance scan = ~17 sec
    • Doppler scan = ~14 sec

• Split Cut Supports
  – Best GMAP clutter filtering
  – Super Resolution data processing
  – Range unambiguous Reflectivity
  – Best Doppler ambiguity mitigation
SAILS Implementation (Cont)

• Initially the new Supplemental Scan data
  – Will be used to generate Z/V/W base products
  – Will be included in Level II data stream
  – Will NOT be used by RPG algorithms

• Supplemental Scan data will ONLY be provided to tasks/algorithms upon request

• Supplemental Scan products ONLY sent to users in response to special RPS list option flag
  – Not automatically distributed
  – Same RPS list option flag used for SPG/TDWR
SAILS Implementation (Cont)

• SAILS software included in RPG Build 14 development baseline
  – Executed on ROC test bed radar several occasions in 2012
  – Level II data collected and available
  – No problems noted

• Future
  – Algorithm developers can use the Level II data to enhance/correct/rewrite algorithms to incorporate new low elevation data, if desired/appropriate
  – Algorithm updates can be included in future RPG builds
Benefits of SAILS

• Significantly reduces low-level scan update interval
• Provides more low-level “looks” during severe weather operations

<table>
<thead>
<tr>
<th></th>
<th>Number of 0.5° Product Updates per Hour</th>
<th>Volumetric Product Updates per Hour</th>
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<tbody>
<tr>
<td><strong>VCP 12</strong></td>
<td></td>
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<tr>
<td>Standard Operation</td>
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<td>14</td>
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<tr>
<td>AVSET</td>
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<td>14 - 19</td>
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<tr>
<td>SAILS</td>
<td>24</td>
<td>12</td>
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<tr>
<td>SAILS and AVSET</td>
<td>24 - 32</td>
<td>12 - 16</td>
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<tr>
<td><strong>VCP 212</strong></td>
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<tr>
<td>Standard Operation</td>
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<tr>
<td>AVSET</td>
<td>13 - 17</td>
<td>13 - 17</td>
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<tr>
<td>SAILS</td>
<td>22</td>
<td>11</td>
</tr>
<tr>
<td>SAILS and AVSET</td>
<td>22 - 28</td>
<td>11 - 14</td>
</tr>
</tbody>
</table>
Benefits of SAILS (Cont)

• Only extends VCP 12 volume scan completion time by ~33 seconds
  – VCP 12 still executes in less than 5 mins (~282 sec)
• Only extends VCP 212 volume scan completion time by ~40 seconds
  – VCP 212 executes in just over 5 mins (~310 sec)
• Does not impact the quality of the base data estimates
  – Same antenna rotation rates
  – Same data acquisition schemes
  – Same moment estimation methods
  – Same data processing techniques
• No Hard Costs
Concerns

• SAILS will increase bandwidth usage
  – Overhead at NWS sites adequate
  – SAILS not available on DOD radars until comms upgrade complete

• External user systems must make changes to see benefit of SAILS
  – No negative impacts expected

• Another VCP selection (option)
Summary

• Operating in VCP 12, SAILS will scan 0.5° every 110 - 144 seconds, depending on the AVSET termination angle (118 - 162 seconds in VCP 212)

• During severe weather operations, the frequent low-level “looks” provided by SAILS will significantly enhance WSR-88D forecast and warning support, while not impacting WSR-88D data quality or hardware operations

• SAILS is targeted for release with RPG Build 14
DQ Approval

• Request DQ approval for SAILS to be Operational in RPG Build 14
Questions
????
Backup Slides
BACKUP

**Split Cut**
- Completion time ~31 Sec
  - Surveillance = ~17 Sec
  - Doppler = ~14 Sec
- Supports GMAP Filtering
- Super Resolution
- Range unambiguous R data available
- Range unambiguous Dual Pol variables

**Batch Cut**
- Completion time ~30 Sec
  - Slow rotation to allow adequate Z samples to support GMAP filtering
- Azimuthal spacing does not support Super Res
BACKUP

**Z only Cut**
- Completion time ~17 Sec
- Supports GMAP Filtering
- Super Resolution Reflectivity only
- Dual Pol variables
- No Doppler data

**V Only Cut**
- Completion time ~14 Sec
- Supports GMAP Filtering
- Range unfolding relies on ~2 minutes old power data
- Range ambiguous R data
- Super Resolution Reflectivity and Doppler data
- No Dual Pol variables
SAILS – 0.5° VCP Updates Rate: Every ~140 seconds (~105 seconds w/ AVSET)

SAILS VCP Completion Times ~282 seconds (~210 seconds w/ AVSET)

VCP 12
Completion Time ~ 180 to 250 Seconds