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HAIC/HIWC Science Team Meeting

HAIC Prototype Honeywell IntuVue[®] RDR-4000 Validation

Honeywell

HAIC Validation campaign

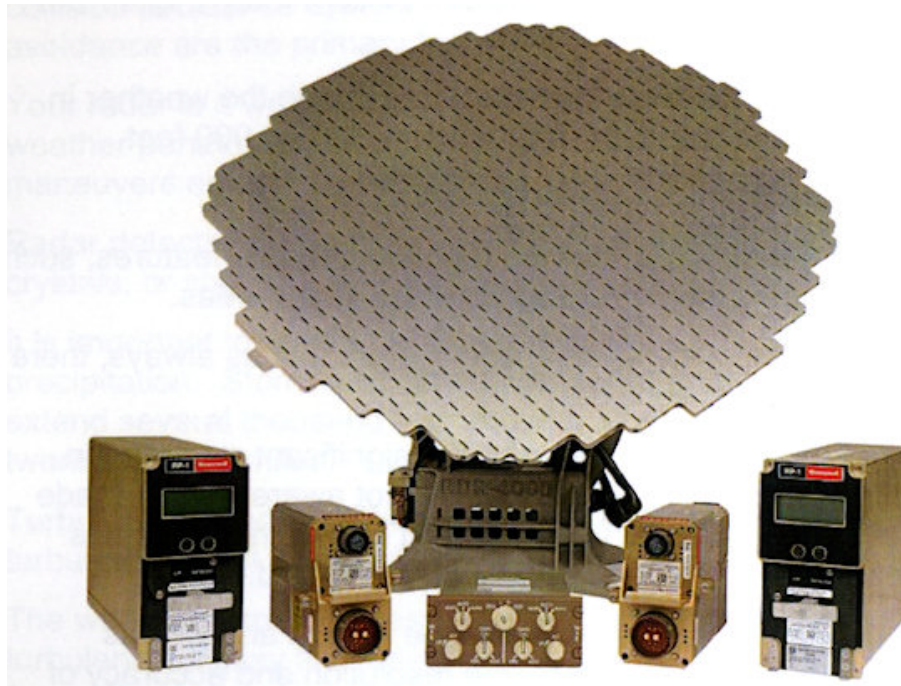
- January 2016 campaign to validate HAIC technologies
- Airbus A340-300 MSN 001 (F-WWAI)



- Darwin, Australia – 3 continental convection flights
- Saint-Denis, Reunion – 3 oceanic convection flights

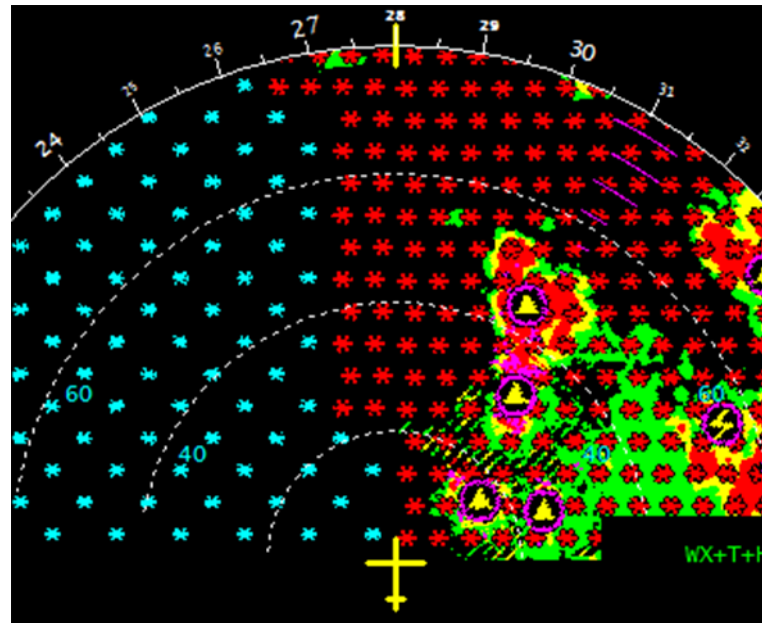
Honeywell campaign participation purpose

- To test and validate Honeywell IntuVue® RDR-4000 3D Weather radar prototype having HAIC awareness function implemented
 - ▶ SW upgrade of the existing certified product



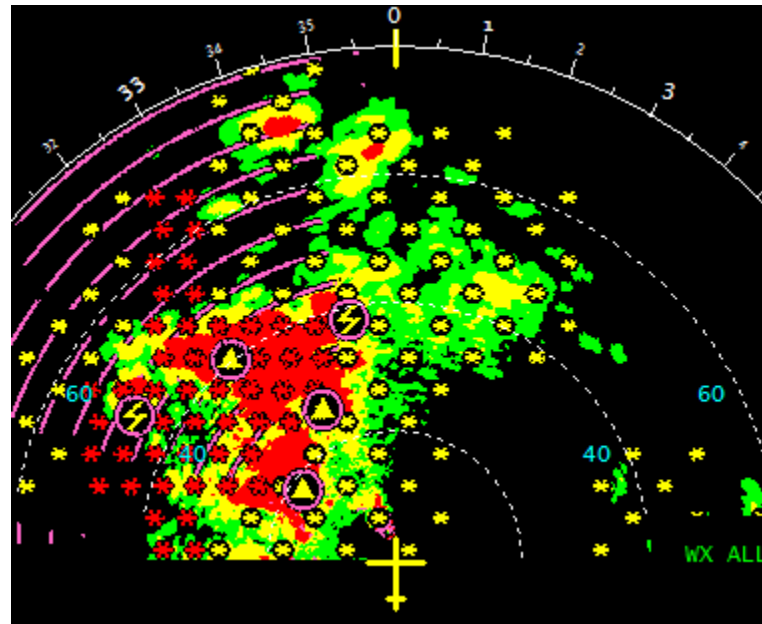
Campaign HMI

- Small cyan flakes with black contour to mark moderate IWC area ($> 1\text{g/m}^3$)
- Medium red flakes with black contour to mark severe IWC area ($> 3\text{g/m}^3$)



Campaign HMI - continued

- Cyan flakes not available with other OEMs
- Yellow flakes version also implemented (for IWC low concentration area) but not flown



Campaign HMI

Explanation of 1g/m³ and 3g/m³ thresholds

Moderate ice crystal concentration (**1g/m³ threshold**):

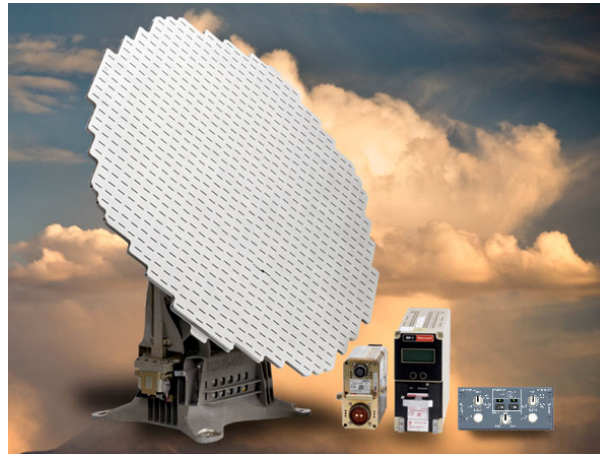
- Provide basic situational awareness
- Could help for route optimization as an advisory Standard Operating Procedure (SOP) approach: « **As far as possible avoid flying in this area more than 10 minutes (TBC) consecutively** »

Severe ice crystal concentration (**3g/m³ threshold**):

- **Indicate an area to be avoided by 20nm** (distance to be confirmed)

Honeywell RDR-4000 prototype

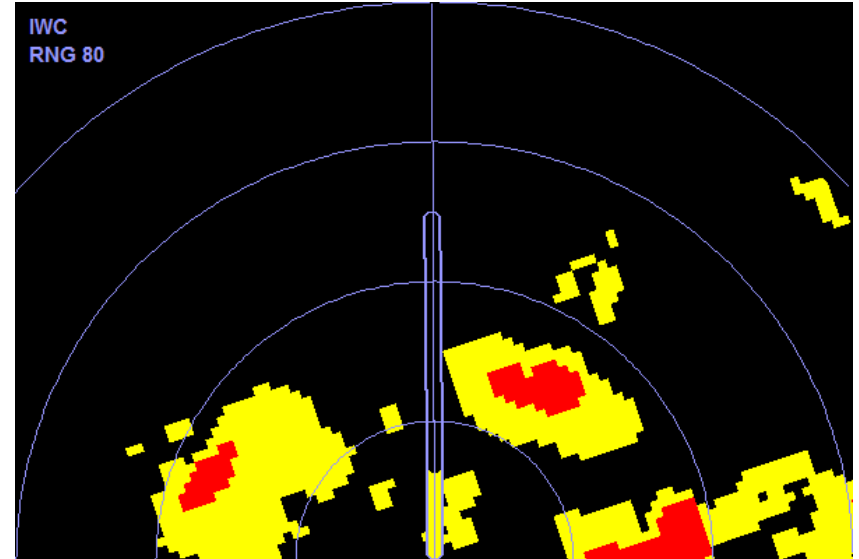
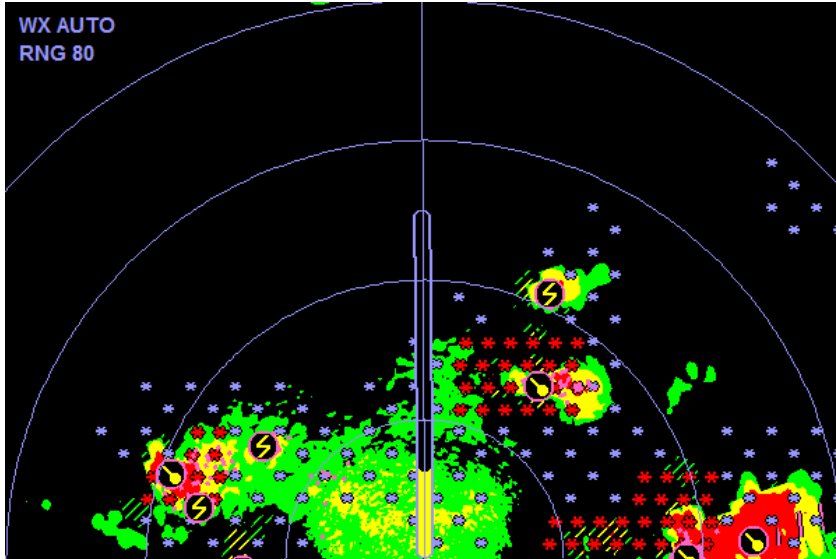
- SW update of standard certified RDR-4000
- IWC prediction model utilizes RDR-4000 3D capability
 - ▶ No suitable IWC prediction model found in literature
 - ▶ Computer-built IWC prediction model used
 - ▶ Prediction up to 80 NM
 - ▶ Function implemented for cruise conditions -above 30,000 ft OR below -30°C (assuming no mixed phase)



Campaign observations

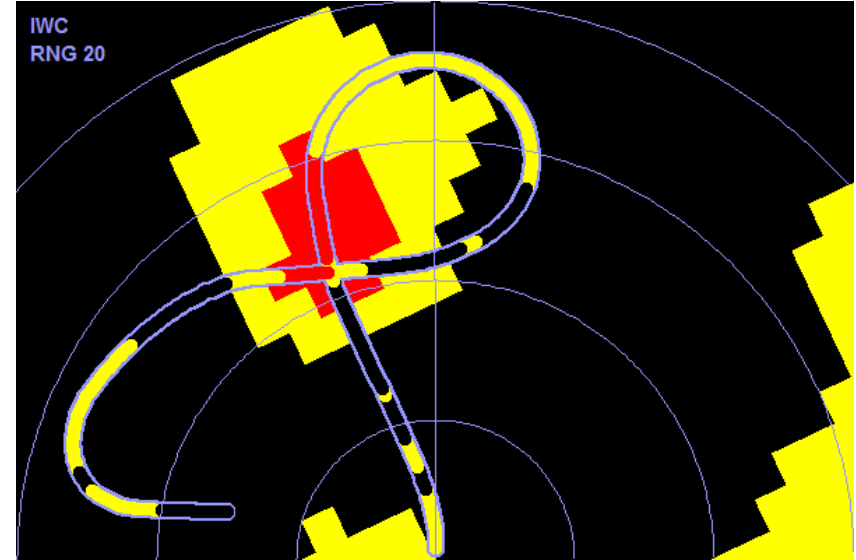
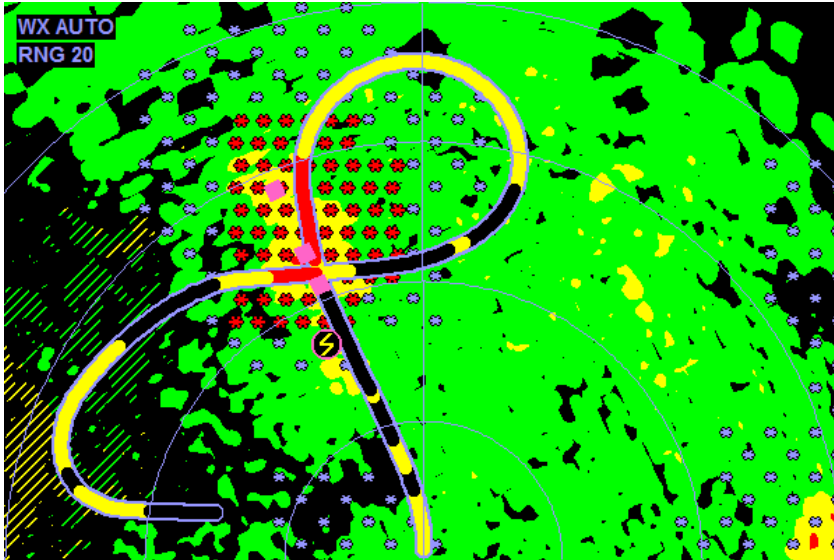
- Generally good behavior of HAIC function, particularly for severe IWC
- Rated as overestimating for moderate IWC level
- False alarms for moderate IWC at non-icing atmosphere
 - ▶ Being reworked
- False alarms for moderate IWC at high altitudes above the aircraft
 - ▶ Being reworked

Continental convection example



- Frequent cause of on-path moderate IWC overestimation is due to HMI implementation in tiles (2 cyan flakes or 4 red flakes per one tile)

Oceanic convection example



- As previously, frequent cause of on-path moderate IWC overestimation is HMI implementation in tiles (2 cyan flakes or 4 red flakes per one tile)

Conclusion

- High Altitude Ice Crystals prediction with 3D X-band weather radar is possible
 - ▶ Encouraging results for detection of severe IWC up to 80 nm
 - ▶ Overestimation of moderate IWC
 - ▶ Detail analysis of the campaign data for final performance assessment in progress

High Altitude Ice Crystals (HAIC, 314314)

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