



2014 HAIC-HIWC Flight Campaign
(Darwin Australia)
Pilot's Weather Radar

Conclusions

- Radar Reflectivities for IKP events are most often Green or Black (~20dBZ)
- Radar Reflectivities below flight level are often Yellow or Red (>30dBZ)
- Overflight of high reflectivity regions does not always produce IKP event
- Radar Reflectivity statistics do NOT vary greatly with distance (nearly filled beam)
- Higher IKP levels do produce slightly higher mean reflectivities, but more notably higher IKP levels have narrower reflectivity distributions
- IKP versus Reflectivity statistics are consistent with HIWC conditions having:
 - a different (more uniform) drop-size distribution than normal convective cells
 - much smaller particles (on average) than typical for same TWC
- KMZ files for all days are available to all HAIC-HIWC researchers



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For More Information

- NASA Technical Memorandum has been prepared and will be released soon. This report summarizes these analyses, provides additional results, and discusses more aspects of these analyses/results than could be expressed in this single briefing.
- All KMZ files (viewable in Google® Earth) showing aircraft track, preliminary IKP values, and all the weather radar scans (as seen in flight) are being provided to NCAR for archiving.
- Additional weather radar results will be produced as part of the NASA 2015 HIWC Flight Campaign – August 2015 expected to be conducted in the vicinity of Puerto Rico utilizing the NASA DC-8 aircraft.

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**X-band, Airborne, Weather Radar Observations
from the 2014 HAIC Flight Campaign**

A Description of the Data Collected, the Visualization Tools Utilized, and
the Statistical Properties of the Radar Reflectivities Observed

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Pilot's Weather Radar Update since Paris Meeting

No significant technical updates to HIWC-HAIC Sci Team presentation (Paris 2014).
Distribution of our WXR imagery?

In September we submitted, to NASA, our DRAFT of our analyses paper (described at the Paris meeting and based upon WXR Data Collected during the 2014 HAIC-HIWC Flight Tests in Darwin). The review and publication process generally takes 3 months; however, because of changes in personnel and processes we do not expect release of this paper before April 2015.

Another paper, describing a new forward-looking, weather radar detection and measurement of vertical winds process has been prepared. The data used to validate this new WXR application was collected in a short series of NASA flight test conducted in Oct 2014. Release of this paper has also been delayed by the changes in our review and publication process. This paper's release is expected no sooner than May 2015.

At our previous HIWC-HAIC Science Team Meeting (2013), I proposed to collaborate with RASTA researchers to compare and correlate X-band reflectivities with those obtained through RASTA. I would still like to pursue those analyses.

Steven Harrah, NASA Langley Research Center

Other WXR-related Activities

RTCA SC-230 – the primary document describing the Minimum Operational Performance Standards (MOPS) for commercial, airborne, weather radars is RTCA DO-220. This document was developed in the early-mid 90's in response to the new Wind Shear process that had just previously been developed. There have been many changes in airborne weather radar technology since then and a new "enhanced" turbulence detection and assessment process has also been developed and deployed. Consequently, a new "updated" version of DO-220 was needed. This Special Committee has been working on developing this new document. Our first complete draft will be released for review and comment next week. HIWC/HAIC is expected to be mentioned as future WXR applications but without any "firm requirements or performance standards".

EUROCAE WG-95 – this working group is developing/updating icing standards for aircraft-mounted probes. They were asked to consider adding radar detection of the HAIC condition. Information related to WXR detection of this atmospheric condition is being assembled in preparation for a future MOPS.

Other WXR-related Activities

HIWC WXR Workshop – a need for a WXR industry workshop has been identified.

We are trying to identify a set of dates that won't interfere with upcoming flights but occur early enough to incorporate any requirements or research needs to support the avionics industry.

SAFIRE Flights – A series of flight tests using the SAFIRE HU-20 are upcoming (May 2015).

While still limited to recording the WXR display bus, we will perform similar analyses to that produced on the 2014 Darwin Flights.

Honeywell Flights – Honeywell has allocated IRAD to support a series of flight tests to mature a detection concept they are developing. They have requested to join AIRBUS and SAFIRE (HU-20) in their May 2015 Flight Campaign (Cayenne, French Guiana)

NASA Flights – NASA will fly it's DC-8 aircraft in August 2015 to collect fundamental WXR measurements of the HIWC environment. These measurements along with their supporting meteorological probe data can serve as a baseline dataset (non-proprietary) for the avionics industry.