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Primary ATC – Radar Weather Extractor – Weather Signal Processor

GWSP

An alternative to weather radar?

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Introduction

The GWSP weather Extractor concept has been implemented in conjunction with primary air traffic control (ATC) radars. These radars are typically operated at airports for a 60nm / 100km approach range, called also airport surveillance radars (ASR). This is also the range where severe and dangerous weather is affecting heavily the flight operations like final approach, takeoff and landing.

In many cases, such airports do not have dedicated weather radars available for detection of these phenomena in real time and with sufficient resolution of measurement.

Original manufactures of ATC – ASR radars had weather extractors built into their systems but those are mostly giving very coarse and limited data (6 - dBZ levels and no Doppler wind measurements).

The GWSP technical concept is based on well proven signal and data processing technology originating from conventional weather radar systems. This technology has been adapted to the ATC radar sensor interfaces and measurement concept.

Such systems now have been successfully tested and operated in different airport scenarios.

The GWSP is designed to provide fast and precise weather data extraction and display of all weather parameters (Rain, Reflectivity, Doppler Velocity and Turbulence) up to 60nm. (100km) as available from the Primary ASR receiver.

It can be either implemented as modernization, retrofit or improvement of the existing or new ASR systems supporting aviation commerce world wide. ASR radars serviced are Magnetron, TWT, Klystron and Solid State.

Weather and warning data are sent to the ATC controller workplaces in ASTERIX CAT 8 format. Other high resolution formats are available.

The main objectives of the FROG_ATC weather extractor are:

- Use the primary weather radar signal from the ATC radar sensor to extract the predefined precipitation levels.
- Output a digital weather data stream in the ASTERIX Cat008 contour format
- Provide real time "weather radar like" data displays and products
- Generate advanced products for severe weather detection like shear, severe rainfall etc.
- Use the primary radar control signals for timing.
- Include remote control and monitoring via a suitable local and remote HMI for the local and remote operator.
- Include a remote control agent, based on SNMP, to control and monitor the FROG_ATC weather extractor system operator.

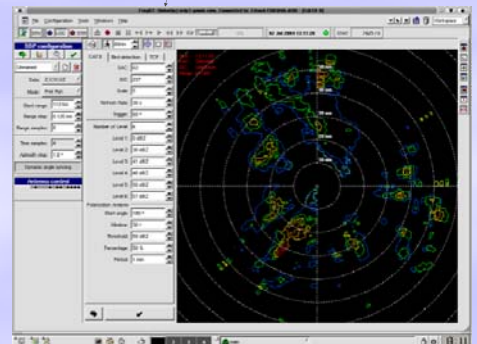
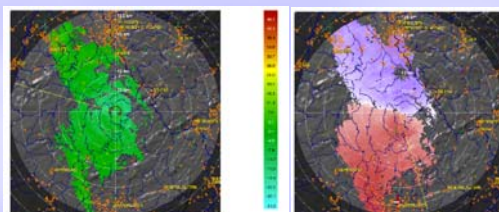
The GWSP weather signal and data processing consist of the following standard Gamic products:

- Adaptation box -- ADAP ENIGMA III
- Weather signal processor -- WSP ENIGMA III
- Weather data processor -- WDP FROG RT – ATC version



ATCR-33K without radome.
 ASTERIX CAT 8 weather contours

Raw Z (dBZ) and V radial velocity
 Screens from ASR-E



Case Studies

ASR-E, Germany

The Gamic ATC weather channel has been realized within in the ASR-E project for the German Air force together with EADS (1996-today). The ASR-E is a fully solid state S-Band radar using pulse compression technique. Currently ASR-E is in operation at the first air force airfields and certified for flight operation support. The series deployment of >20 units is planned for Germany military airfields from 2008 to 20014.

LVNL – Schiphol Airport, The Netherlands

LVNL formerly had displays of analogue weather information (precipitation) on the air traffic controller displays. The source of this weather information is a combined terminal approach radar, named TAR-4. It is located near Schiphol-East and equipped with a separate primary weather channel receiver. Schiphol's primary radar is an Alenia ATC-33K, with a G-33 antenna. This is a relatively modern radar even though it is Klystron-based (not solid state) version of the ATC-33, which has less capability in eliminating clutter. The ATC-33 employs MTD processing and incorporates several clutter maps.

The additional GWSP weather extractor has been installed and fully accepted for ATC use in 2007-2008

Important reasons to use the ASR- GWSP:

Cost saving: No additional airport weather radar (TDWR) is needed in most cases. The ATC radar + GWSP can do the job reasonably well if the requirements on quantitative rainfall estimate is less important compared to real time data update rate. Additionally these data can be used: A) For weather radar network gap filling B) As complementary data source to existing radars or radar networks; C) High speed data update rates are desired