USE OF GROUND BASED WEATHER RADAR DATA IN AIR TRAFFIC MANAGEMENT PROCEDURES

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FOREWORD

• During 2008 ICAO METG meeting in Paris, attention was focused on the importance of weather radar data for the ATC community, considering the lack of detailed guidance on the use of this data as a major obstacle that prevent harmonization and exchange of these data.

• One of the main problems, identified in final summary of discussions, was the lack of awareness of the ATC/ATM about the capacity of the MET to comply with their requirements, due to the lack of dialogue between the ATC/ATM and the MET communities.

• It was also pointed out that the use of weather radar should be viewed in a broader sense as a major source of information for both forecasting and nowcasting, with benefits to all aviation users.
ENAV S.p.A. Meteorological Service Overview

• Being fully integrated inside ENAV S.p.A., the Italian Company for Air Navigation Service, the Meteorological Service has the primary goal of satisfying the operational requirements of the internal client, that is to say the ATC/ATM community at all levels.

• We guarantee 24-hours-a-day-for-365 days-a-year updated and reliable Aeronautical Meteorological Information and Products, associated with adequate operational assistance, finalized to the optimization of the System Performance, also in adverse weather conditions, maintaining high levels of Air Traffic safety and regularity.
ENAV S.p.A. Meteorological Service Organization

- ENAV S.p.A. Meteorological Service, in agreement with ICAO SaRPs and in a SES and ISO-9001 context, is arranged with:
  - two Forecasting Centres (UPMs), located in Rome Fiumicino and Milan Linate airports;
  - 39 aerodrome meteorological offices, providing aeronautical meteorological observations (meteorological stations) and information (AROs).

- Milan and Rome Forecasting Centres provide aeronautical forecasts and assistance on pertaining airports and air spaces (fully cooperating with related TWRs and the four ACCs), with:
  - Linate responsible for Northern Italy Airports and the ACC of Milan and Padua;
  - Fiumicino for the rest of the Italian peninsula and the major isles and the ACC of Rome and Brindisi).
Operational procedures between METs and ACCs

• In advance to the routine messages emitted in agreement with ICAO SaRPs, ENAV S.p.A. Meteorological Service has developed a sets of operational procedures, finalized to give warnings about critical weather phenomena (detected or forecasted), affecting ATC activity on airports or terminal areas, for which an extensive use of weather radar data is made.

• ENAV S.p.A. owns two Gematronik Meteor 1500C weather radars, sited in Aranova (north of Fiumicino) and Carpiano (south of Linate), which give fully coverage of the related Rome and Milan TMAs.

• Moreover, ENAV S.p.A. Meteorological Central Radar System produces a synthesised image of almost the whole Italian territory, by exchanging radar data with Civil Protection Department and the main Regional Weather Services.
Meteorological Central Radar System
Operational procedures between METs and ACCs

• Rome Fiumicino Forecasting Centre provides 4-hour forecasts, emitted 1 hour ahead and updated every 2 hours, about critical phenomena affecting Rome ACC area (Rome TMA, Sardinia and Sicily) and Rome Fiumicino airport. Forecast are sent to the ATC Managers of Rome ACC and Rome Fiumicino TWR.

• Milan Linate Forecasting Centre provides 6-hour forecasts, emitted 2 hours ahead and updated every 3 hours, about critical phenomena affecting Milan ACC area (mainly Milan TMA) and the three main Milan airports. Forecasts include a probabilistic assessment in terms of occurrence and are sent to the ATC Managers of Milan ACC, Rome ACC (which is in charge for Milan TMA Upper Airspace), Milan Linate TWR, Milan Malpensa TWR and Bergamo Orio al Serio.

• Three times a day, the Senior Meteorologist of Linate MET and Fiumicino MET provide oral briefings to the ATC Managers of, respectively, Milan ACC and Rome ACC.
More on probabilistic assessment in Milan TMA forecasts

• Milan TMA forecast also includes a probabilistic assessment in terms of occurrence, calculated according to the following rules:
  – 40% probability that corresponds to the contextual inclusion of the phenomenon in a "TAF" forecast type, represented by a change group type TEMPO, preceded by a PROB40 probability indicator.
  – 60% probability that corresponds to the contextual inclusion of the phenomenon in a "TAF" forecast type, represented by a change group type TEMPO, without any probability indicator.
  – 80% probability that corresponds to the simultaneous inclusion of the phenomenon in the main body of a "TAF" forecast or in a change group type BECMG or FM, and/or in a forecast TREND type and/or in a Aerodrome Warning.
  – When the probability index is not determined, a major probability is to be considered, whilst the assignment of the probability index for a reported phenomenon outside an airport site will have to be made with reference to the drafting of an hypothetical TAF or Aerodrome Warning.
More on probabilistic assessment in Milan TMA forecasts

• This probability indexes is then assigned by the Meteorologists as a consequence of their general analysis, making the ACC forecasts strictly related to the routine emissions of TAF 9H, TAF24H and Aerodrome Warning for pertaining airports.

• It had to be stressed how this indication of the probability index proved, in Milan ACC Managers’ opinion, itself highly important under an operational point of view, leading to an improvement of the operational ATM performances through a better planning of air traffic flows in adverse meteorological conditions.

• The probability index is, at the moment, applied in Milan ACC procedure only; it will be proposed in Rome procedure too after a deep evaluation of its operational performance.

• Since now, however, the probability index is leading, in Milan ACC Managers’ opinion, to an improvement of the operational ATM performances through a better planning of air traffic flows in adverse meteorological conditions.
Operational procedures between METs and ACCs

• For Rome and Milan TMAs, forecast of convective phenomena is reported using a reference map, which gives a partition of the TMA defined merging ATC sectors having the same climatological characterization.

• Within each sector some "major points" (airports or radio aids) are defined and they should, as far as possible, be used to determine the forecasted localization of the reported phenomena and the expected flight level affected.

• These short term forecasts require Meteorologists making an extensive use of ENAV’s own weather radar data.

• Data coming from the synthesised radar image are used for less critical forecasts outside the TMAs, i.e. over areas outside ENAV’s weather radars coverage (e.g.: Sicily and Sardinia). Areas are still divided into sectors, but the forecasted localization is given in term of sector interested, without any internal reference.
Rome TMA area divided in 5 sectors. Inside each sector are marked with red arrows from one to four “major points”, used as a reference for reporting forecast of convective phenomena.
Sicily area divided in four sectors, without internal reference. Forecast of convective phenomena is reported just in term of sector interested.
• Forecasts are at the moment transferred via fax to the ATC Managers, by mean of form directly fulfilled by the Meteorologists on duty.
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• By the end of 2009, information will be transferred via software, by mean of the new **IWS** (*Integrated Weather System*) platform, whose client will be available inside all ATC operational rooms.

• In the next two slides, a quick outlook at the IWS and its main future development, the **IWDPS**.
IWS - Integrated Weather System
Integrated Weather Data Processing System

The IWDPS, considered an important enabler for SESAR and CoFlight programs, will be integrated in the CNS/ATM architecture and will guarantee the integration of meteorological data directly into ATC environment. Weather data coming form IWDPS shall be integrated as flight parameters in all phases of flight, providing real time update.
Operational procedures between METs and ACCs

• Moreover, observed radar data are directly transferred to the ATC Managers using a new kind of weather radar report, created by ENAV S.p.A. Meteorological Service (first operational issue in March 2009).

• The new routine report, called TAD (Thunderstorm Area Detection) is also distributed outside ENAV S.p.A (operators, flight crew members,…).

• TAD provides the following elements:
  - ICAO reporting station and sequence number;
  - validity;
  - echo intensity;
  - echo extension;
  - associated phenomena (present weather);
  - echo position;
  - top of clouds;
  - movement forecast;
  - intensity forecast;
  - remark.
TAD examples

ZCZC MD3427
FF LIIBAOIS
111238 LIRFMYX
SDIY61 LIRF 111238
TAD
LIRF MET RADAR 10 VALID 111300/111500Z BKN ECHOES LINE WID 020KM FM
43DEG 55MIN E 12DEG 54MIN N TO 42DEG 57MIN E 13DEG 88MIN N TOP 7000M
INTST NC=
NNNN
*Tad*

LIRF MET RADAR 01 VALID 120200/120500Z ECNIL=
LIRF MET RADAR 16 VALID 112300/120200Z ECNIL=
LIRF MET RADAR 15 VALID 112100/112300Z HVY ISOL ECHOES RAD 010KM
TSRA OVER PONZA TOP 7000M WKN=
LIRF MET RADAR 14 VALID 112010/112100Z MOD CNS ECHOES LINE WID 010KM
FM 11.63E 41.68N TO 12.61E 41.33N TOP 5000M MOV S 10KT WKN=
LIRF MET RADAR 14 VALID 112010/112100Z MOD CNS ECHOES LINE WID 010KM
FM 11.63E 41.68N TO 12.61E 41.33N TOP 5000M MOV S 10KT WKN=
LIRF MET RADAR 13 VALID 111900/112000Z MOD/HVY CNS ECHOES LINE WID
010KM TSRA FM 11.63E 42.04N TO 12.71E 41.36N TOP 6000M MOV S 15KT
WKN=
LIRF MET RADAR 12 VALID 111700/111900Z OCNL ECHOES AREA RAD 030KM
MOD/HVY TS 12.66E 42.23N TOP 6000M MOV S WKN=
LIRF MET RADAR 11 VALID 111500/111700Z SCT ECHOES LINE MOD WID 020KM
FM 12.16E 42.79N TO 14.04E 41.48N TOP 7000M STNR INTST NC=
LIRF MET RADAR 10 VALID 111300/111500Z BKN ECHOES LINE WID 020KM FM
43DEG 55MIN E 12DEG 54MIN N TO 42DEG 57MIN E 13DEG 88MIN N TOP 7000M
INTST NC=
LIRF MET RADAR 09 VALID 111100/111400Z ECNIL=
LIRF MET RADAR 08 VALID 110900/111000Z ECNIL=
More…

• More details about our MET-ACC operational procedures are given in the ENAV S.p.A. document “Use of ground weather radar data in Air Traffic Management procedures” Ed 2.0 - April 2009

• Available here or via email at marco.tadini@enav.it
More…


- AIC is available here or via email at marco.tadini@enav.it

- TAD code details also given in this [TAD code](#) file.
ACTIONS SUGGESTED

ATM
• Evaluated the feasibility of a ENAV-alike operational procedure for your TMAs or other areas of interest
• Evaluate the new TAD routine report as an answer to your need of a better weather radar information.

MET
• Evaluate your possibility of issuing a TAD routine report for satisfying the need of your ATM counterpart, in term of a better weather radar information for ATC Managers.

LIML MET RADAR 15 031400/031500Z HVY OCNL ECHOES AREA RAD050KM TS 09DEG 51MIN E 46DEG 13MIN N TOP 8000M STNR WKN ./. HVY ISOL ECHO RAD030KM TS OVER MEDAM TOP 11000M MOV E 13M/S NC=
ANY QUESTION?

THANKS FOR YOUR ATTENTION