

Future information system on weather hazards for safe operations - requirements, deficiencies, options and challenges -

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The problem of today's insufficient weather information for pilots, especially in commercial air transport, can be summarized in the following:

- Pilots have access to weather charts only before take-off
- No update during flight (textual messages only)
- Severe weather hazards have short time scales, e.g. thunderstorms develop and decay within 30 minutes
- Weather forecasts from numerical models are outdated when used
- Numerical model forecasts of severe hazards like thunderstorms, turbulence, icing, are inaccurate and provide only a rough estimate of the phenomenon
- The on-board radar has limited reach and cannot see „behind“ (radar shadow)
- At cruise level on-board radar might not see the storm (ice crystals only)

Furthermore, aviation stakeholders have no common view of weather situation which makes collaborative decision making (CDM) difficult among pilots, airport operators and air navigation services.

However, today the opportunity exists to get out from this unsatisfactory situation if recent technological developments in various areas are exploited:

- Remote sensing instruments onboard of geostationary weather satellites, ground based radar, lightning and lidar, all of which have become operational during the last years, can provide high resolution observations of weather hazards in near real time, some even globally
- New in real-time working algorithms are being developed by research centers and weather services which use the new data sources in order to detect, monitor and, very importantly, also nowcast severe weather phenomena like thunderstorms, icing conditions, volcanic ash, turbulence
- Aviation industry has started with new information systems for pilots also in commercial air transport. So-called electronic flight bags (EFB) in the form of tablet computers have been developed which can upload flight relevant data prior to take-off and, since very recent, also during flight using data link technology via communication satellites.

Combining the developments a solution is therefore proposed as follows:

- Describe the observed and nowcast weather hazards in simple unambiguous objects (polygons) with low file sizes
- Uplink these weather hazard objects into the cockpit EFB during flight in near real time
- In parallel disseminate these data also into displays of dispatchers, air navigation providers, airport operators

with the following benefits:

- Safe flying in severe weather conditions through provision of the “big picture” to the pilot
- Fuel savings through optimized route planning and re-routing during flight
- Allowing for common information sharing and integrating into common decision making processes for all aviation stakeholders