

The CASCADE Programme

From Concept to Operations

LFV- EUROCONTROL

Live Trial and Workshop, Norrköping

26 October 2005

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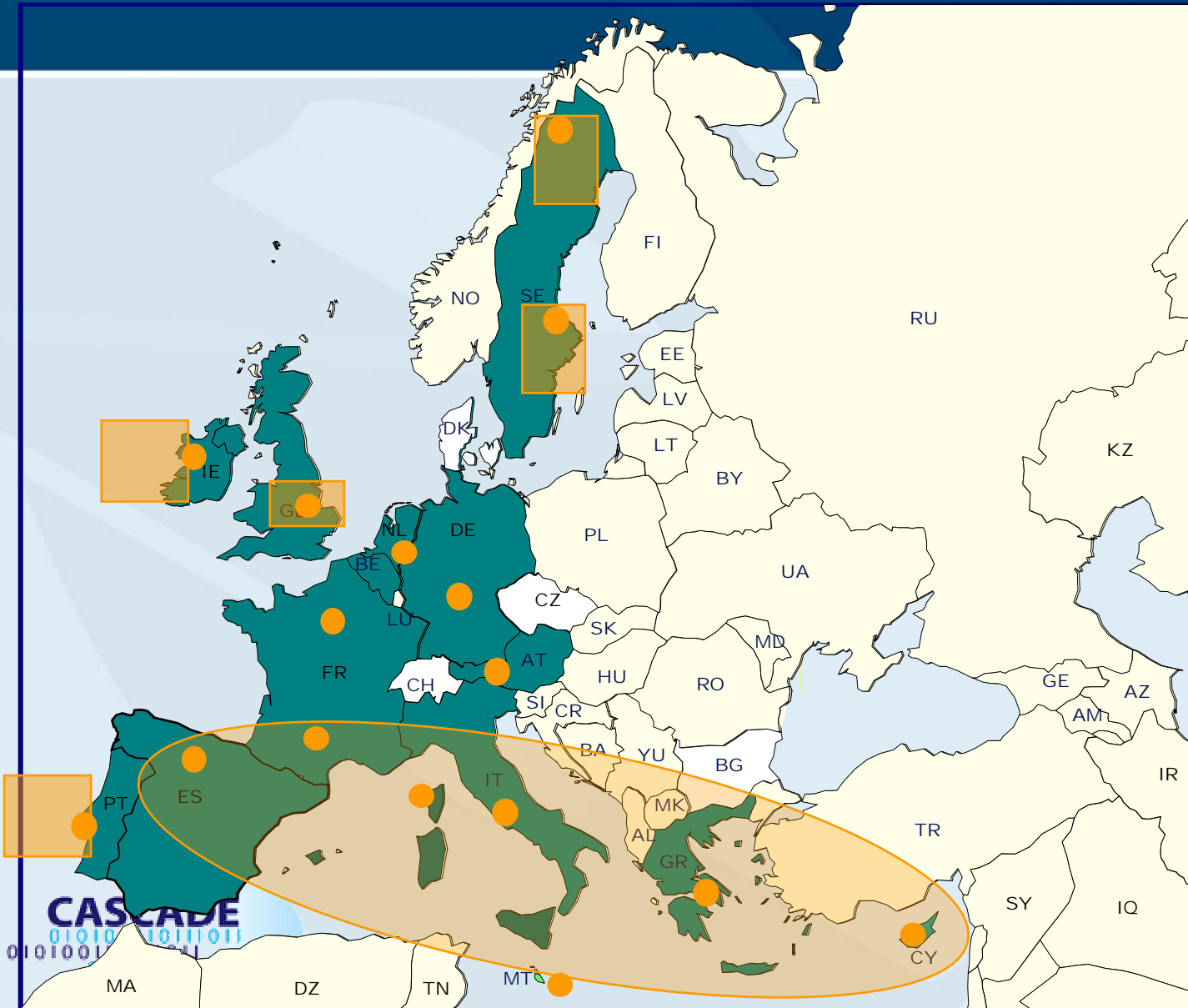
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CASCADE Validation Approach

- **Trials and Simulations** for the ADS-B and CPDLC/D-FIS applications and infrastructure
- **Trials Characteristics:**
 - In an environment where the need exists
 - Integrated in operational systems (air and ground)
 - With involvement of controllers and pilots where possible
 - Using state-of-the-art infrastructure components and validation tools (such as the ADS-B Validation Testbed at EEC and locally)
 - No technology limitation (1090 is the mainstream choice, but VDL Mode 4 is used where there is a local need)
- **CRISTAL projects:** Partnerships with the local stakeholders (common contribution of resources) to perform validation on site
 - More than 12 countries currently in CRISTAL local trials with CASCADE
 - “Crystallisation” effect: from “pocket” areas to wider regions

Validation sites and ground station deployment



-  CASCADE trials countries
-  Trial sites & areas
-  ADS-B Ground Station

Validation main priorities in 2005

- ADS-B in non-radar airspace (NRA)
 - Ops usability in continental airspace (Kiruna, Sweden)
 - Technical feasibility in non-continental airspace (Ireland)
- ADS-B in radar airspace (RAD)
 - Ops usability and technical feasibility (London TMA)
- ATSAW
 - Ops usability (Norrköping, Sweden)
- Sequencing & Merging
 - Ops usability and benefits (Paris, Frankfurt)
- SUR Infrastructure
 - Fleet monitoring report (various sites)
 - 1090 ES datalink capacity assessment (update)
 - Intermediate results of ADS-B/radar etc. data fusion (ARTAS evaluation)
- CPDLC/D-FIS
 - Ops usability, technical feasibility & benefits of Auto-CPDLC (EEC, Maastricht UAC)
 - Ops usability & technical feasibility of D-OTIS (Brussels)
 - Ops usability & technical feasibility of D-TAXI (Brussels)

CRISTAL Sweden overview

- Partnership between LFV and EUROCONTROL CASCADE
- Applications to be validated
 - ADS-B NRA (Kiruna, in co-operation with the local implementation project)
 - ADS-B RAD (Arlanda and Bromma TMA)
 - ADS-B for Airport Surveillance (Arlanda)
 - ADS-B for Aircraft Derived Data (Arlanda)
 - ATSAW (Norrköping, in co-operation with EGOA and later at the Arlanda airport)
- Project duration: Dec 2004 – Dec 2006
- Focus
 - Operational usability (main objective)
 - Technical Interoperability
- Addressing the local needs towards implementation
- Building on the strong local expertise

ATSAW status

- ATSAW applications receive an increasing interest by the aviation community
 - ATSAW during flight operations (AIRB)
 - ATSAW visual separation in approach (VSA)
 - ATSAW on the airport surface (SURF)
- Standardisation material is expected by the Requirements Focus Group in 2006
 - Basis for certification
- Validation will grow in 2006-2008
 - Various CRISTAL sites to be involved
 - Validation objectives currently being defined
- Implementation could start from 2009 onwards
 - If ATSAW business case will be convincing

Trial of ATSAW for GA in Ostgota TMA

- ATSAW use by GA is a primary objective of CRISTAL Sweden
 - ...and today's trial
- Main focus of the trial in Norrköping
 - Operational need (SSR gaps at low altitude, mixed traffic etc - safety is the main issue)
- Other CASCADE trials or simulations will follow in Sweden and other countries, addressing the key questions
 - Operational need (additional validation objectives)
 - Technical feasibility (ADS-B performance, role of TIS-B etc.)
 - Economic viability (e.g. impact on runway capacity)

CASCADE Validation: Upcoming highlights

- ADS-B for Ground Surveillance in South Europe
 - CRISTAL Mediterranean (Italy, France, Malta, Greece, Cyprus)
 - CRISTAL Iberia (Spain, Portugal)
- Pre-operational trials of “ADS-B out” in a hub (or hubs)
 - Participation of at least one airline with certified equipment onboard
 - CRISTAL Toulouse Phase 2 (tbd)
- ADS-B RAD in London TMA (CRISTAL UK Phase 2)
- ADS-B RAD and APT in Arlanda (CRISTAL Sweden)
- ADS-B NRA for North Sea (CRISTAL Netherlands)
- ATSAW simulations/trials (CRISTAL Sweden)
- S&M Fast-Time-Simulations for the Paris airspace (CRISTAL Paris)
- ADS-B Certification Roadmap (CRISTAL Toulouse)
- Evaluation of TIS-B over 1090 (CRISTAL Germany/TIS-B in support of ATSAW)
- Auto-CPDLC trials (Maastricht ATC Centre)
- D-TAXI trials in Brussels (SN Brussels airlines, Belgocontrol, SITA, NLR etc.)
- D-OTIS trials in Brussels (SN Brussels airlines, Belgocontrol, SITA etc.)

Conclusions

- CASCADE continues its intensive efforts towards validation of its applications and infrastructure
 - Based on the local operational needs
 - In partnership with its stakeholders (such as LFV) at various ECAC sites
 - Using the current state-of-the-art infrastructure components and validation tools (at EEC or locally)
- Pre-operational trials for some of the Stream 1 applications (e.g. ADS-B NRA, RAD, CPDLC/D-FIS) expected from 2006-07 onwards
 - Early pre-operational trials of Auto-CPDLC already taking place at Maastricht ATC Centre
 - Emphasis will shift from GSA to ATSAW applications and infrastructure
- Operational use of some Stream 1 applications could be expected to start from 2008-09 onwards, depending on the local plans
 - Early local implementation of ADS-B NRA expected in Kiruna from late 2006