

One sky for Europe



Action Plan 5

Validation Practitioners' Workshop

Validation Data Repository - An Update

Presenter: Hans Wagemans
Eurocontrol HQ, Brussels (ESC - Validation Team)

San Jose State University

02-04 November 2004

This presentation covers:

- **Context of the Validation Data Repository (VDR)**
- **A very short overview of the VDR**
- **A brief update on the current VDR development status**
- **An overview of the development themes for 2005**

Action Plan 5 Context of VDR:

- **One of the four OCVSD validation principles is:**
 - **“A tool to communicate all developments and results in a common structure: A shared Validation Data Repository (VDR)”**
- **The OCVSD also identifies the VDR as:**
 - **complementing the validation methodology;**
 - **an important resource for management and planning of validation activities;**
 - **“the centre for capturing, preserving, and making available validation related data, including objectives, procedures, configurations, validation environments, exercise data, results and conclusions”;** and,
 - **an open technical environment for sharing validation information between R&D sites.**

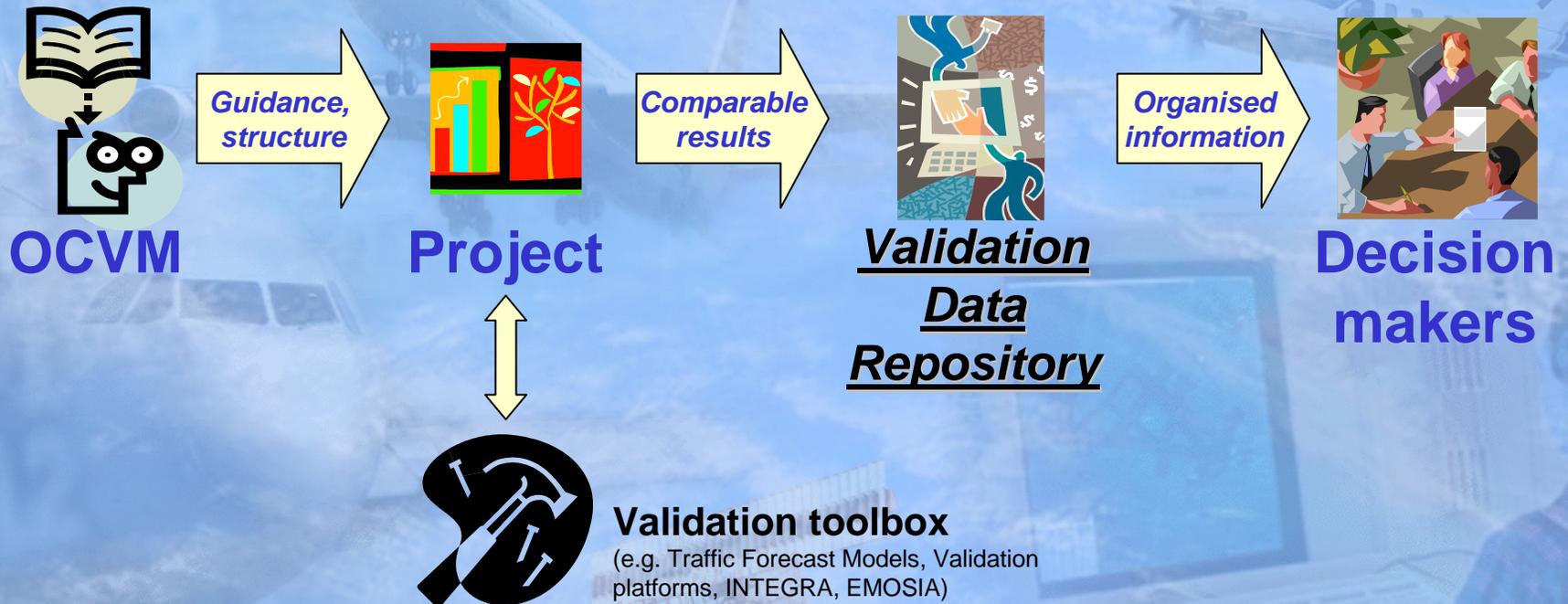
A European view:

- ➔ **Validation supports achieving the next generation ATM System**
- ➔ **Validation means comparable results and better decision making**
- ➔ **Transparent validation results ensure that the wheel is not reinvented**

Therefore:

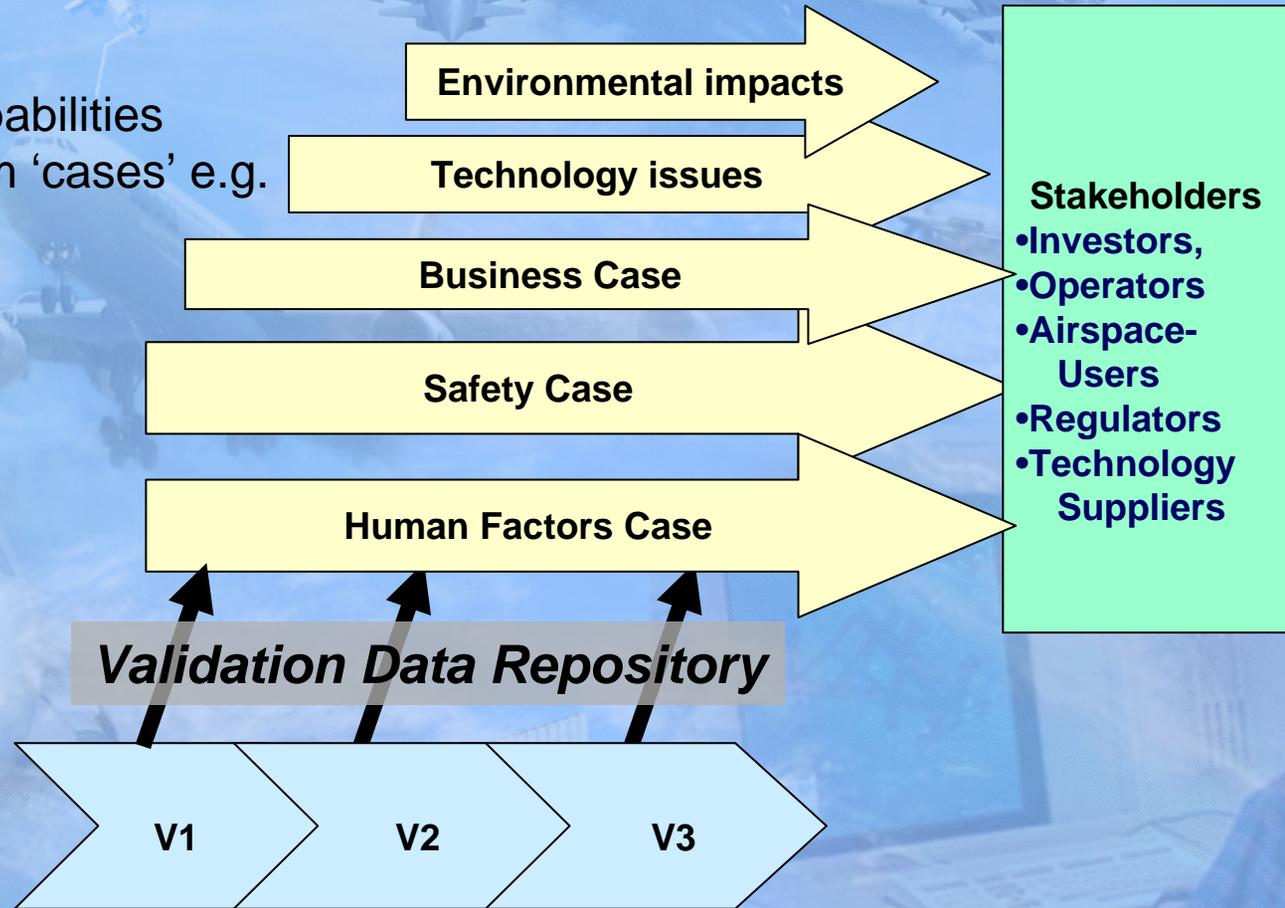
- ➔ **Validate as an ongoing process**
- ➔ **Use a common approach to validation**
- ➔ **Provide free access to validation results**
- ➔ **Promote a common validation methodology**

European view - the role of VDR:



Decision Makers – VDR & Information consolidation

Performance capabilities
extracted from 'cases' e.g.
Safety



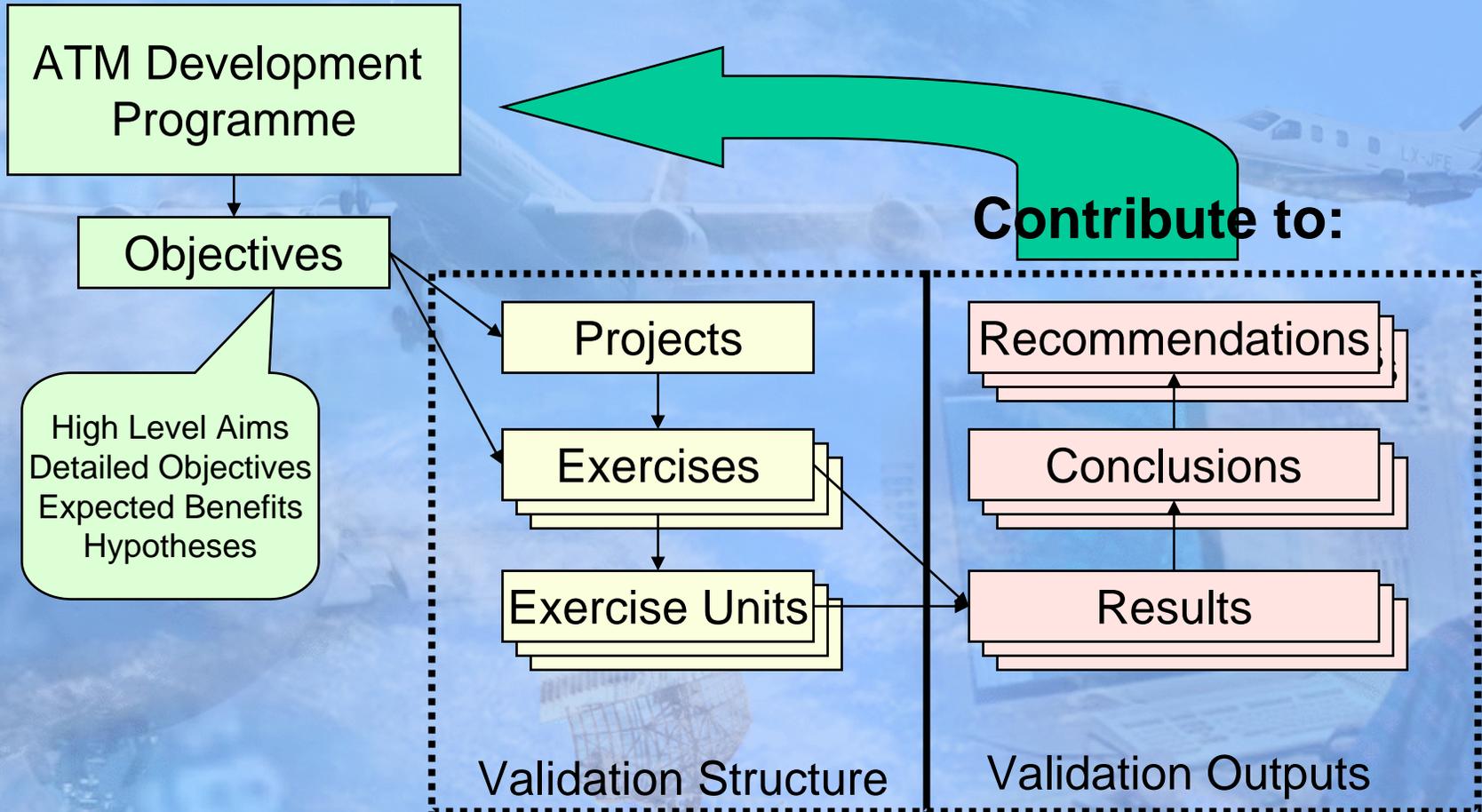
Workload, usability, hazard analysis, etc.

In summary, the VDR:

- **Supports the use of a common methodical approach to ATM validation:**
 - **A repository of validation activities (i.e. objectives, exercises, inputs, outputs)**
 - **Common reference structures**
 - **Operational context - concepts and scenarios**
 - **Technical - indicators/metrics, techniques, tools etc**
- **Is intended to be a source of validation information for all**

VDR organises validation information (1).....

A "Project" Perspective



EUROCONTROL - EATMP - VDR (Validation Data Repository) - Microsoft Internet Explorer

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Projects

- A-SMGCS - Advanced - Surface Movement Guidance Control System
- ACP - ASAS Crossing Procedure (CENA)
- AMAH DMAN - Arrival Manager and Departure Manager
- APPROVE - Advanced Airport Approach Procedures including Validation and Elaboration
- ATC Sector Productivity 2011 - Overall benefit analysis for ATC Sector Productivity 2011
- BETA - Operational Benefit Evaluation by Testing an A-SMGCS
- CTPC - Common Trajectory Prediction Capabilities
- DADI-1 - Datalinking of Aircraft Derived Information**
- DADI-2 - Datalinking of Aircraft Derived Information
- DOVE - Datalink Operational

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PROJECT : DADI-1

Datalinking of Aircraft Derived Information

The EC DG XIII project DADI ("Datalinking of Aircraft-Derived Information") has evaluated the concept of the use of airborne derived data in ground systems.



DADI has explored the general concept of the "Datalinking of Aircraft-Derived Information" (DADI) to ensure it meets the user requirements of ATC providers, airlines and other airspace users. DADI has been concentrating on the type of information needed to be exchanged between the ground and air systems, and subsequently a comparative analysis has been undertaken to demonstrate the capability of the pre-operational technologies and data link services to provide the information.

It has long been recognised that digital systems in modern aircraft could provide a great deal of information of significant value to ATM applications on the ground. The development of ADS and its exploitation in the Atlantic and Pacific oceanic areas has already proved the value of this approach in areas of low aircraft density. However, although a lot has been said about the possibilities of exploiting aircraft data in order to improve both capacity and safety in high density continental airspace, and a few practical demonstrations of specific uses have been made, little has been done to assess the practicalities and benefits of implementation in near-operational environments. The "DADI" (Datalinking of Aircraft Derived Information) project has attempted to fill this gap, and has achieved some notable progress.

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- ▶ EACAC - Evolutionary Air-ground Co-operative ATM Concept
- ▶ EATM-ASA CR - Conflict Resolution
- ▶ EMERALD - EMERging RTD Activities of reLevance for ATM concept Definition
- ▶ EMERTA - EMERging Technologies opportunities, issues and impact on ATM
- ▶ EOLIA - European pre-Operational data link Applications Project
- ▶ FARAWAY - Fusion of Radar & ADS-B data through two WAY data link
- ▶ FREER-3 - Free Route Experimental Encounter Resolution - An Experimental Airborne Separation Assurance System
- ▶ GtG - Validation of a European Gate to Gate Operational Concept for 2005-2010
 - ▶ GtG WP1 - Gate to Gate Work Package 1
 - ▶ GtG WP2 - Gate to Gate Work Package 2
 - ▶ GtG WP3 - Gate to Gate Work Package 3
- ▶ ICAC - Intelligent Challenger Aircraft Concept White Paper
- ▶ INITENT - The Transition towards Global Air and Ground Collaboration In Traffic Separation Assurance
- ▶ LEONARDO - Linking Existing On Ground, Arrival and Departure Operations
- ▶ Link 2000+ - The Link 2000+ Programme

A review of how user expectations can be met in a cost effective way. The improvements expected through the data linking of aircraft-derived information will have a major impact on controllers' situational awareness and on conflict management within the continental European airspace. These improvements will reduce controllers' workload and will enable a significant increase in the ATM capacity while maintaining safety.

The communication technologies addressed within DADI are Mode S Specific Services and the ATN.

[Description Details](#) [Planning Details](#) [Interaction Details](#) [Copyright Details](#)

Strategic Improvements

Description	Details
Sector Operations Performance Level 1	More Details

Objectives

Description	Details
DADI-1 Project Objective	More Details

Leader

Name
T.H.M. HAGENBERG

Conclusions

Description	Details
DADI-1 CAADI Aircraft Parameter request/report management	More Details
DADI-1 CAADI Analysis General	More Details
DADI-1 HAADI Analysis	More Details

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- ▶ **HITEIT** - The Transition towards Global Air and Ground Collaboration in Traffic Separation Assurance
- ▶ **LEONARDO** - Linking Existing On Ground, Arrival and Departure Operations
- ▶ **Link 2000+** - The Link 2000+ Programme
- ▶ **MFF** - Mediterranean Free Flight
- ▶ **MTCD** - Medium Term Conflict Detection
- ▶ **NASA ILR Free Flight with ASAS** - NASA/ILR Free Flight with Airborne Separation Assurance
- ▶ **NATS ASAS LSK** - Towards an Operational Scenario for Longitudinal Station Keeping: an ASAS application
- ▶ **NEAN** - North European ADS Broadcast Network
- ▶ **NEAP** - North European CNS/ATM Applications Project
- ▶ **NIUP I** - Near Update Programme, Phase 1
- ▶ **ONESKY** - One Non-National European Sky
- ▶ **PETAL I** - Preliminary EUROCONTROL Test of Air/ground data Link
- ▶ **PETAL II** - Preliminary EUROCONTROL Test of Air/ground Data Link Phase 2
- ▶ **PHARE** - PROGRAMME FOR HARMONISED AIR TRAFFIC MANAGEMENT RESEARCH IN EUROCONTROL
- ▶ **SCS-M-21 FAST** - Full Aircraft Separation Transfer

Conclusions

Description	Details
DADI-1 CAADI Aircraft Parameter request/report management	More Details
DADI-1 CAADI Analysis General	More Details
DADI-1 HAADI Analysis	More Details
DADI-1 Overall Conclusions	More Details

Recommendations

Description	Details
DADI-1 Further evaluation trials required for Impact Analysis	More Details
DADI-1 Improvements in Quality of Data	More Details
DADI-1 Operational Evaluation of User Requirements	More Details

References

Title
DADI-1 Final Report (3.486KB)
DADI-1 Verification Report (1.514KB)

Exercise

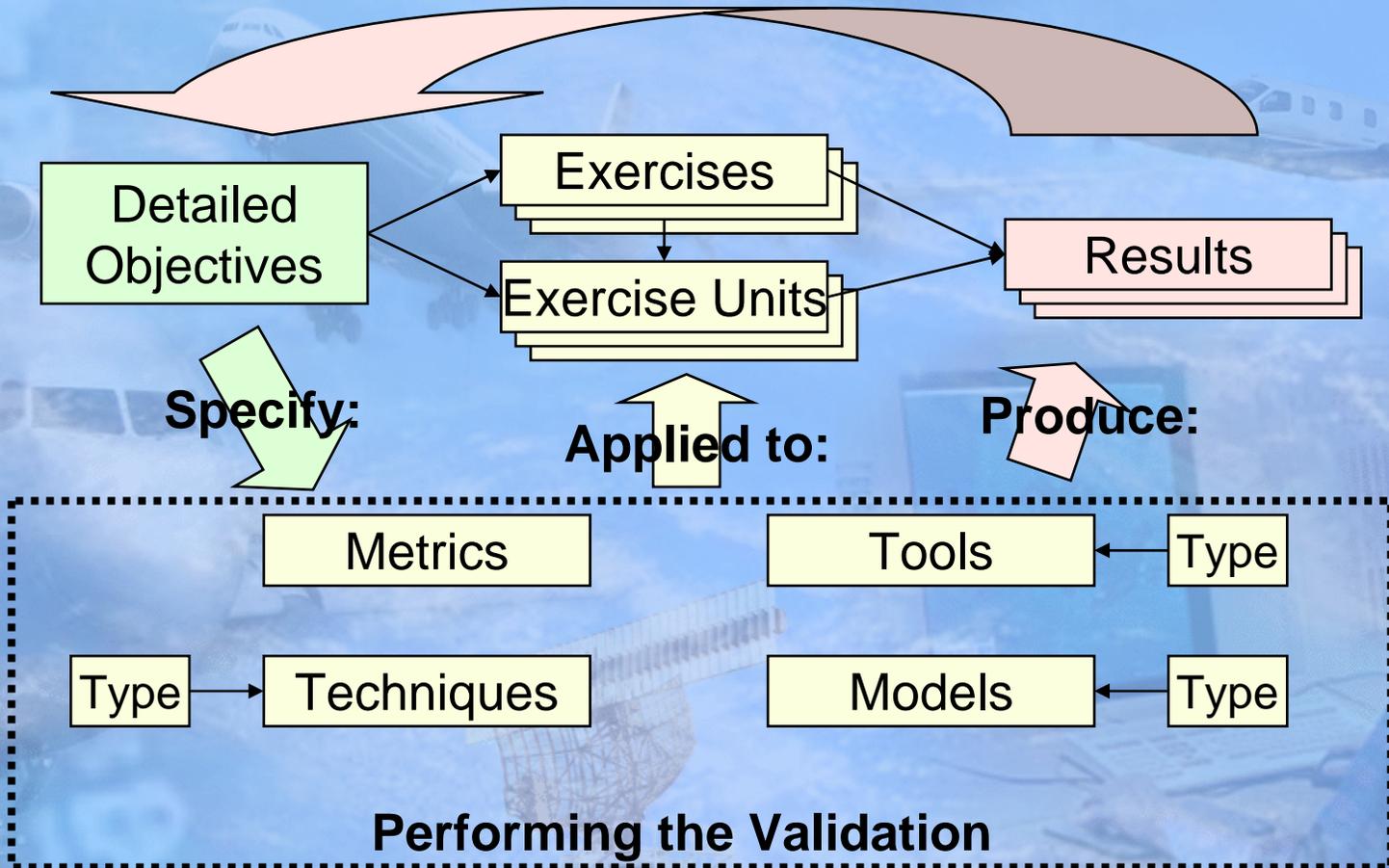
Description	Details
DADI-1 Assessment of safety/capacity trade-offs of DAP enhanced ATM	More Details
DADI-1 DAP verification in core area (France)	More Details
DADI-1 M- ADS verification for offshore helicopters (Norway)	More Details
DADI-1 Strategic DAP verification in core area ATC (NL)	More Details

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VDR organises validation information (2).....

A "Technical" Perspective



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Techniques

- ED 78A Safety Assessment
- Economic Appraisal
- Fast-Time Technique**
- Judgemental Technique
- Literature Study
- Real Time Technique - Live Trials
- Real-Time Technique - Simulations

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TECHNIQUE :

Fast-Time Technique

For a fast-time technique (alternatively called 'compressed time technique') the behaviour of the real world element that is being validated is expressed in some mathematical model that defines the relationships between the input and output variables. For testing the hypotheses related to the higher and lower level objectives the performance of the real world element is assessed mathematically for some characteristic quality (e.g. accuracy). Operational subject matter experts are not required to perform this assessment. An experimental design often used in combination with fast-time techniques (and normally only possible with fast-time techniques) is a Monte Carlo simulation, in which a large series of fast-time assessments is performed with random input.



Can be used to investigate Safety, Economics, Capacity, Environment and National Security/Defence Requirements Objectives.

Fast-time techniques may be used throughout the development life cycle, but are especially suitable for a preliminary assessment of a great number of options within a new ATM operational concept. The models of the concept and the associated tools can range in complexity from a simple spreadsheet to complex mathematical models or 'fast-time simulators'.

Since fast-time techniques can never completely represent the actions of a human operator their application lies mainly in the earlier stages of the validation life cycle.

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Analytic Modelling Technique.
Analytical modelling is the name used for fast-time techniques whereby the assessment of the performance of the real world element is performed by mathematical analysis of the model used. The mathematical analysis can e.g. be to find a solution for a set of differential equations or to analyse the behaviour of a Dynamically Coloured Petri Net model [4]. While the model will normally be an approximation of the real world, the mathematical analysis of this model is normally not based on approximation techniques and is of deterministic nature. In general, with analytical modelling techniques the model used in a specific assessment is specifically made for that assessment. Assessing a different scenario normally involves building a new model.

Fast-time simulation.
Fast-time simulation is an expression that is mostly used in relation to the analysis of (air) traffic movements based on an analytical model that represents the stepwise displacement of traffic over time⁴. The models usually incorporate rule based decisions that control the interactions between various actors being simulated and also with the events that take place. In general a fast-time simulation uses a model that can be adapted to the specific scenario that is being tested by changing the input parameters. The model itself does not need to be changed. With a fast-time simulation model, randomisation can usually be introduced either through the input data or through certain model settings. The randomisation is linked to the application of Monte Carlo simulations.

Technique Type: Validation Approach

Tools

Description	Details
CAPAN - Capacity Analyser - Fast Time Model Based Simulation	More Details
COSAAC - Common Simulator to Assess ATMF Concepts - Fast Time simulation tool	More Details
FAP - Future ATM Profile - Fast Time simulation tool	More Details
OPAS - Outil de Planification ATM et Simulation	More Details
PUMA analysis	More Details
RAMS - Reorganised ATC Mathematical Simulator - Fast Time simulation tool	More Details
TAAM - Total Airspace & Airport Modeller - Fast Time simulation tool	More Details
TOPAZ - Traffic Organization and Perturbation AnalyZer	More Details

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TAAM - Total Airspace & Airport Modeller - Fast Time simulation tool	More Details
TOPAZ - Traffic Organization and Perturbation AnalyZer	More Details

Exercises

Description	Details
A-SMGCS Level I Fast Time Simulation	More Details
APPROVE - Fast Time Simulation	More Details
DADI-1 Assessment of safety/capacity trade-offs of DAP enhanced ATM	More Details
DMAN - Departure Manager Feasibility Study	More Details
DOVE1 - Fast Time Simulation	More Details
INTENT - Fast Time simulation	More Details
INTENT - Ground Real-Time Full-Task simulation	More Details
INTENT - Ground Real-Time Part-Task simulation	More Details
Link 2000+ Fast Time Simulation	More Details
ONESKY FTS - Fast Time Simulation	More Details
PHARE: PD/1++	More Details
SOURDINE II FTS - Fast Time Simulation	More Details

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About The VDR

VDR Repository

Restricted Login

Select an Entry Point

- Projects
- Techniques
- Methods
- Key Performance Areas
- Scenarios
- Strategic Improvements

THE VALIDATION DATA REPOSITORY VDR

Related Documents

	PDF File	Size
VDR Overview		680 KB
User Guide		1.5 MB
User Guide Annex I		89 KB
User Guide Annex II		350 KB

Public Login: all can access information. Public data is Read Only.

Users are invited to select from the list one entry point at a time in order to see the data available for any of the Projects and related data. Each entry point gives the opportunity to navigate through the same quality of data seen from a different point of view: i.e. Project, Technique, Method, Key Performance Area and Scenario.

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The VDR Implementation Project

- **Started in June 2001 covering the development and support of the VDR system.**
- **4 phase implementation planned over 5 years using Rapid Application Development techniques, 3 phases are complete**
- **Entering into final year of development**
- **Commitment to provide on-going maintenance and support of the VDR beyond the end of the implementation project**

Where the VDR is being used:

•Exercises:

- >150 validation exercises captured at various levels of detail (level dictated by project) featuring projects funded by:
 - EUROCONTROL EATM
 - European Commission 5th/ 6th Framework
 - FAA/EUROCONTROL R&D Co-ordination Action Plan 5
 - FAA

•Project/Programme:

- MFF, NUP-2 for general co-ordination of objectives, exercise scope etc. within project.
- FAA to co-ordinate research activities – use in Trajectory Predictor project – interface with V2MP management tool

•Strategic

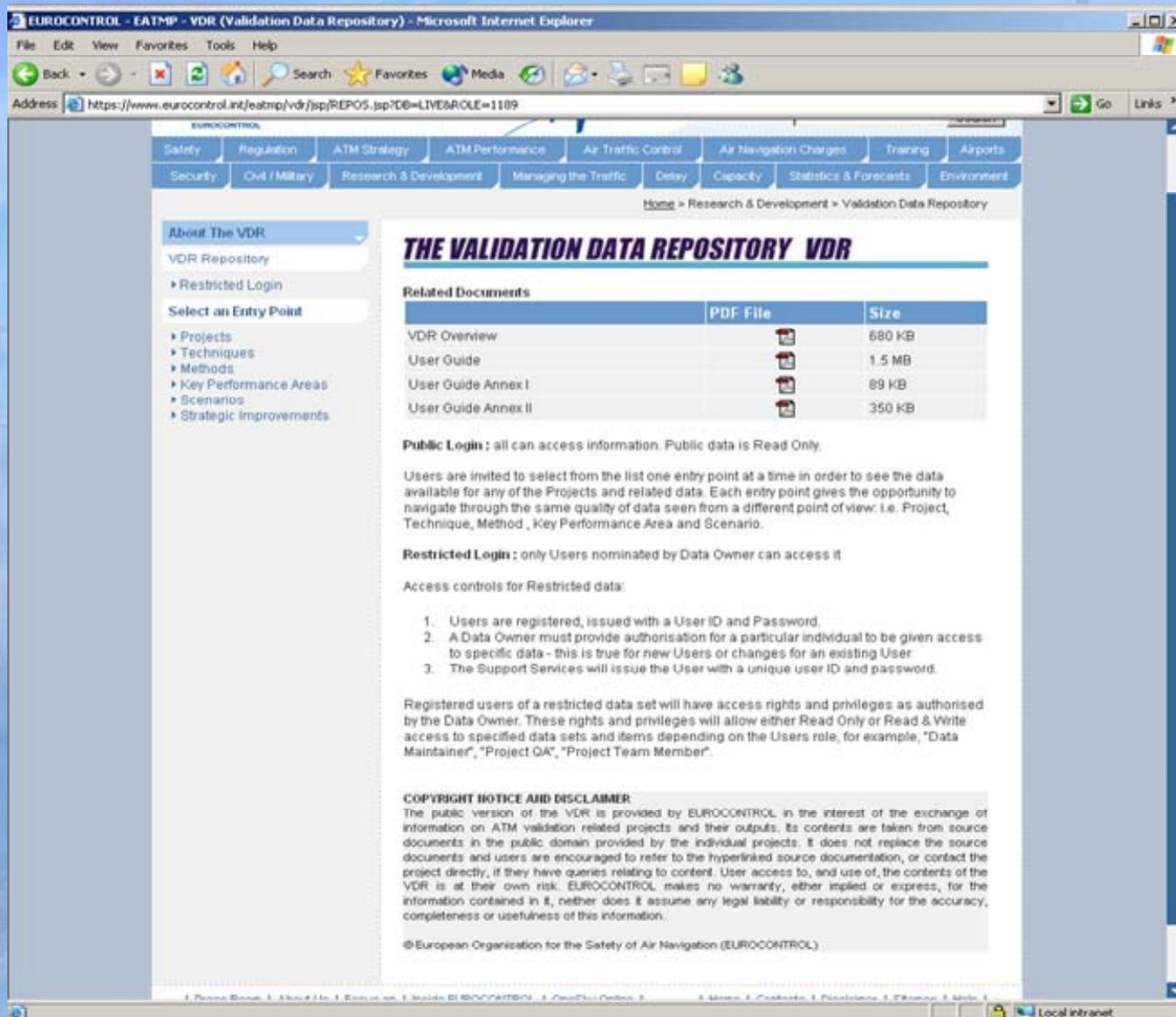
- European Commission – portfolio management
- Strategic Performance Framework and ATM Master Plan in EUROCONTROL

Progress in 2004 - Highlights

- **Significant number of projects have been captured**
- **New reports supporting management analysis and project deliverables**
- **Improved HMI of data maintenance web pages**
- **Improved navigation of project hierarchies**
- **Introduction of classification schemes for projects, objectives, scenarios and scenario parameters to aid filtering and reporting of information**
- **FAA specific enhancements to enable remote administration of user roles**

2005 Development Aims

- **Complete all immediate developments to support strategic and programme level management analysis requirements (e.g. ATM Master Plan, SPFv3)**
- **Continue to provide ad-hoc development in support of specific project needs (i.e. reports)**
- **Improve the data retrieval facilities through the implementation of more sophisticated filter and search functions based on the classification schemes**
- **Enhance the technical reference framework, especially for metrics**



The screenshot shows a Microsoft Internet Explorer browser window displaying the EUROCONTROL VDR website. The address bar shows the URL: <https://www.eurocontrol.int/eatmp/vdr/jsp/REPOS.jsp?DB=LIVE&ROLE=1109>. The website features a navigation menu with categories such as Safety, Regulation, ATM Strategy, ATM Performance, Air Traffic Control, Air Navigation Charges, Training, Airports, Security, Civil / Military, Research & Development, Managing the Traffic, Delay, Capacity, Statistics & Forecasts, and Environment. The main content area is titled "THE VALIDATION DATA REPOSITORY VDR" and includes a "Related Documents" table with columns for "PDF File" and "Size".

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San Jose State University

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