PROGRAMME FOR HARMONISED AIR TRAFFIC MANAGEMENT RESEARCH IN EUROCONTROL

PHARE

EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION EUROCONTROL

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# PD/2 DEMONSTRATION PROJECT PLAN

PHARE/DLR/PD2-2.4/DPP;1

EUROCONTROL

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## REVISION HISTORY

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|---|---|---|---|
| September 1994 | Draft Version 0 | | PRT/6 members<br><br>M. van Gool (Chairman)<br>R. M. Gingell (PD/1)<br>J. Reichmuth (PD/2)<br>P. Huet (PD/3)<br>E. Petre (PATs)<br>P. Jorna (GHMI)<br>J.-R. Velten (CMS) |
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# PD/2 DEMONSTRATION PROJECT PLAN

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# 1 SCOPE

The project plan contains a description of all elements applicable to the PD/2 project, including an Annex with a full Work Breakdown Structure (WBS) with work package descriptions, resource allocations and project schedule. The document forms the deliverable of task PD2-2.4. Details of certain elements are provided in specific elements, where this is the case outline descriptions are given in this documents and reference made to the prerequisite elements. Related documents are outlined in section 14.

Where reference is made to related documents the version and issue of such documents will be the most recent as specified in the Configuration Control document ( see related documents).

# 2 INTRODUCTION

Whilst the non uniform development of economic conditions over recent decades has resulted in fluctuations in the growth rate of air traffic, there has been an underlying trend to an increase in demand. Whilst economic forecasts do not lead to the expectation of an early repeat of conditions experienced at the end to the 1980s when annual growth rates of the order of 10% per annum were experienced over a number of years, estimates continue to predict demand doubling from the 1993 level by the early years of the 21st century.

Considerable gains in ATS capacity have been achieved during the late 1980s and early 1990s as a result of a coordinated programme of improvements with, for example, improved inter-centre communications, improved radar coverage etc. However, there have been few ATC centres where significant changes have been made to the level of external assistance being provided to controllers in the prediction and resolution of conflicts. Thus this growth has for the most part resulted in greater demands being placed upon controllers which has been alleviated where necessary by modifications to the structure of the airspace. Whilst further gains appear possible in the medium term by, inter alia, changes in sectorization, improvements to the controller communications and display facilities etc., the potential for further significant capacity increases by these means is becoming small and unlikely to be sufficient to meet the forecast demands.

A means has to be found by which the controller can be enabled to handle a larger number of aircraft in a given airspace without significant increase in workload. This will have to be achieved whilst maintaining or improving system safety. One proposed method is by providing automated assistance to both the planning and tactical controllers and by application of data links to communicate between the airborne systems providing the aircraft trajectory predictions and those of the ground system which could support the controller in the resolution of conflicts and planning the efficient use of airspace.

In providing such support and removing from the controller and pilot certain executive tasks by means of direct computer to computer communication, it is necessary to ensure that the tasks removed for the pilot and controller are those which are best executed by computer and those which are best executed using the flexibility and adaptability of human skills are those which remain their responsibility.

The areas where computer support is expected to yield improvements are those which make use of their ability to provide accurate predictions of future aircraft profiles, analyse potential options for the resolution of conflicts and sequence aircraft for optimum use of airspace and runways. These together with the monitoring of flight execution, could provide a support environment which would allow a safe reduction in aircraft separation. To achieve this, detailed aircraft performance data, meteo condition information and criteria concerning aircraft operational requirements would need to be made available using data link communications.

These proposals raise a number of questions concerning the resulting division of responsibility and tasks between the aircraft and the ground. This will need to take into account, inter alia, the relative small bandwidth of available data links and the differing strengths and weaknesses of the human and the computer. It is to answer some of these questions that the developments within the PHARE Programme have been undertaken.

Within PHARE, the necessary ground and airborne tools are being produced and will be evaluated initially as individual components. The culmination of this work will be the execution of a series of real time simulations entitled „PHARE Demonstrations“. These will allow the developments to be evaluated not just on the basis of their individual capabilities but rather to establish how the elements work when combined into a proposed operational system. Different options will be assessed and

recommendations made on the contribution such automated support could make to the future European ATM system.
The PHARE Demonstrations will be initiated by separate simulations of the enroute and TMA environments. The subject of PD/2 is the initial demonstration of the TMA environment which will take place subsequent to the evaluation of the enroute environment. The results from both will be used to guide further development and adaptation of facilities which will in turn be evaluated in subsequent demonstrations covering the full flight regime.

# 3 OBJECTIVES

The PHARE Demo PD/2 will be a measured exercise which aims to prove concepts and tools developed within PHARE. The most important objectives are to demonstrate the enhancements of:

Computer Assistance to the ATCO to handle increased arrival traffic,

Introduction of computer generated 4D-profile-Planning and Sequencing,

to support the ATCO to plan and establish a conflict free trajectory covering all flight phases from Entry Fix to the airport,

Experiences with usage of full duplex Data Link in addition to R/T for Exchange of Constraints and Trajectory Data,

and to evaluate the enhancements with respect to:

Performance (quantitative traffic handling)

Controller workload

Acceptance (controller approval)

So the effects of foreseen ATC enhancements will be measured in a scenario which provides a set of analysis and planning functions to assist the work of the planning controller and further automation of data coordination air/ground and ground/ground to optimise workload of both planning and executive ATC controllers.

The area to be considered will be an extended TMA. That means a combination of approach and enroute sectors within and around a selected TMA. This covers the time horizon of about 20 - 30 minutes or more of both arrival and departure flights, in which for arrivals the top of decent (TOD) out of cruise level is included.

Since PD/2 concerns a system to be used in 2000 timeframe it is assumed that the controller working procedures, the working environment and the airspace structure will have no major changes. The following planning and control procedures are still based on current ATC practices.

# 4 AUTHORITIES, ACCOUNTABILITIES AND RESPONSIBILITIES

Within PHARE two management bodies exist:

PHARE Management Board, PMB, consisting of high-level representatives of the PHARE partners, taking decisions on a political level concerning the execution of the PHARE Agreement, reporting to the EUROCONTROL Committee of Management.

PHARE Coordination Committee (PCC), chaired by the PHARE Programme Manager, taking decisions on progress of planned activities and priorities between activities and reporting to the PMB.

For PD/2 a Project Management Structure as indicated in Figure 4.1 is foreseen:

The different bodies visible in the figure have the following responsibilities and reporting channels:

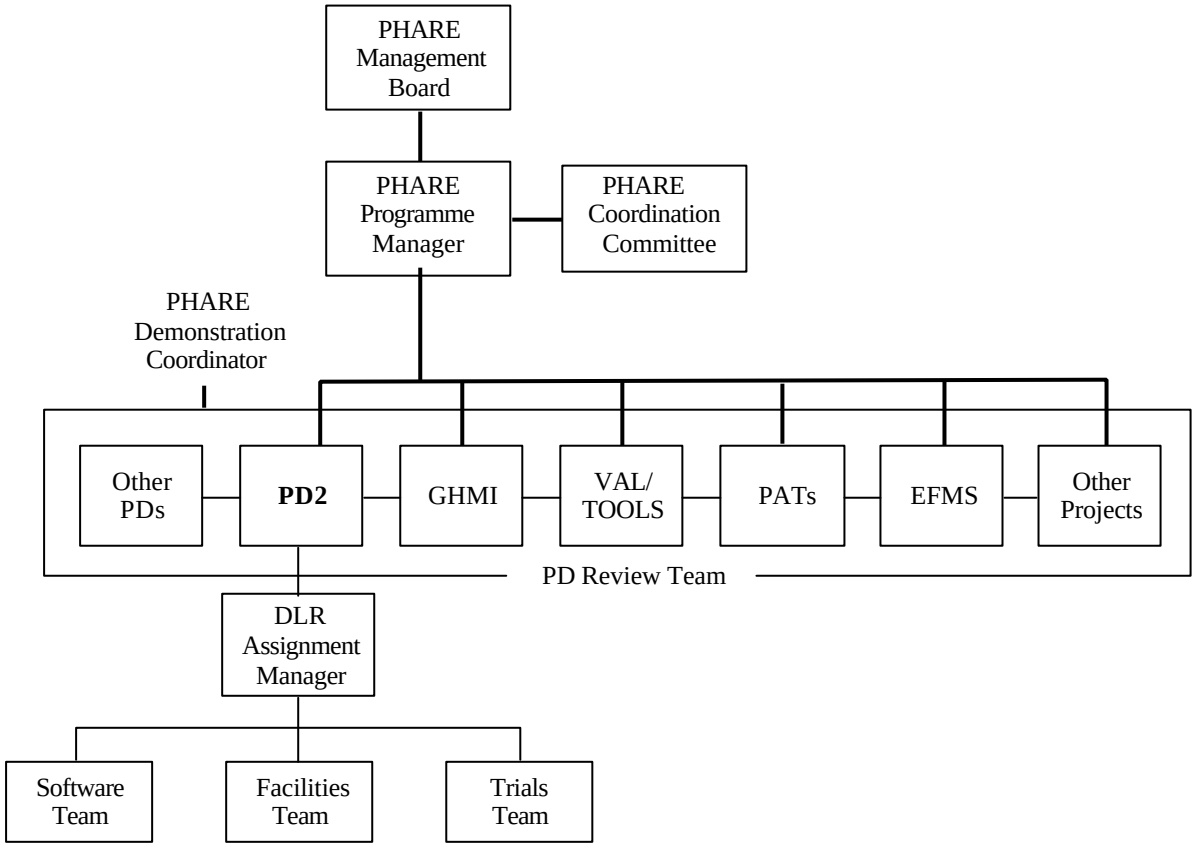


Figure 4.1: PD/2 Project Management Structure

## 4.1 PD/2 PROJECT MANAGER

Responsible for the organisation and coordination of different tasks within PD/2, including the relations with the outside tool development projects
The major contributing projects are:-

- the PHARE Advanced Tools project (PATs) which is responsible for the provision of the advanced computer assistance tools for PD/2
- the Ground Human Machine Interface project (GHMI) which is responsible for the specification of the HMI for both the reference system and the advanced system (the system including the PATs) necessary to support the PD/2 Organisations.
- Experimental Flight Management System project (EFMS). Responsible for aspects related to the provision of air/ground dialogue and the Airborne Human Machine Interface (AHMI).
- Validation Tools project (VAL) which is responsible for the definition of the requirements for the measurement and analysis techniques for PD/2.
- Common Modular Simulator project (CMS) responsible for the development of the Application Programming Interfaces (API) used by the PATs tool

The PD/2 Project Manager reports to the PCC.

## 4.2 ASSIGNMENT MANAGER

The DLR PD/2 Assignment Manager is responsible to the PD/2 Project Manager for the execution of PD/2.

## 4.3 TASK MANAGERS

Responsible for the organisation and coordination of work within a task.
There are three task leaders responsible to the PD/2 Assignment Manager:

- Software Team leader
- Facilities Team leader
- Trials Team leader

## 4.4 DEMONSTRATION COORDINATOR

Responsible for the organisation and coordination of work between different PHARE Demonstration programmes (PD/1, PD/2 and PD/3). He reports to PCC.

## 4.5 PD REVIEW TEAM

Responsible for reviewing and accepting the project deliverables. They report to the PCC. The PD Review Team comprises of the Project Leaders of the following projects: PATs, GHMI, EFMS, Validation Tools, PD/1, PD/2, PD/3, CMS, and is chaired by Demonstration coordinator.
The operation of this group is described in section 10.1.

# 5 DELIVERABLES

## 5.1 DELIVERABLES TO PD/2

The following table indicates the deliverables to PD/2, the appropriate project and the person responsible for ensuring the milestone is delivered. The deliverables are identified as milestones in the PD/2 program with delivery dates given in the Gantt chart at Annex C and the risk associated with these deliverables are discussed in section 6.

In addition this table provides an indication of the projects/establishments contributing effort to PD/2

| -Project(Responsible) | Milestone (Delivery to PD/2) |
|---|---|
| -PATs<br>(PATs Coordinator) | PAT-4.2.2m (PD/2 PATs requirements available)<br>PAT-6.1.2m (PD/1-PD/2 NM available)<br>PAT-6.2.2m (PD/1-PD/2 TP available)<br>PAT-6.3.2m (PD/1-PD/2 FPM available)<br>PAT-6.4.2m (PD/1-PD/2 CP available)<br>PAT-6.5.4m (PS tool for PD/2 available)<br>PAT-6.7.2m (PD/1-PD/2 AM available)<br>PAT-6.7.3m (PD/1-PD/2 AM evaluated)<br>PAT-6.8.1m (DM tool for PD/2 available)<br>PAT-7.3.7m (PD/2 PATs set validated) |
| -GHMI<br>(GHMI Chairman) | GHMI-3.1m (PD/2 Ground System HMI requirements delivered to PD/2)<br>GHMI-3.2m (PD/2 Reference System Spec available)<br>GHMI-3.3m (PD/2 GHMI ready for evaluation)<br>GHMI-3.4m (PD/2 GHMI evaluated)<br>GHMI-3.5m (PD/2 GHMI ready for PD/2 host integration) |
| -EFMS<br>-AHMI<br>(EFMS Project Leader) | EFMS-2.2.2.1.2m (EFMS TMA performance established)<br>EFMS-2.2.3.4m (TMA ATM trials completed)<br>EFMS-5.1m (EFMS equipped A/C - fl.sim. ready for PD/2 integration test)<br>AHMI-2m (AHMI requirements for PD/1 and PD/2 available)<br>AHMI-5.2m (AHMI ready for use in PD/1 and PD/2) |
| -Validation Tools<br>(Validation Tools Proj. leader) | VAL-3.1m (PD/2 Experimental methodology requirements delivered)<br>VAL-6.1m (Methods and measurements provided)<br>VAL-6.2m (Validation Tools tested) |
| -CMS<br>(CMS Project leader) | CMS-2.3.1.10m (PAT/CMS API final version available) |

## 5.2 KEY DELIVERABLES DOCUMENTS

The following table lists the key deliverable documents from PD/2, the schedule for their delivery is given in the PD/2 Gantt chart at Annex C.

| WBS | Task name | Deliverable |
|---|---|---|
| PD2-1.2 | Baseline PD/2 Operational specification | "Operational specification of PD/2" document |
| PD2-2.1 | PD/2 Outline project plan | "PD/2 Outline project plan" document |
| PD2-2.2 | PD/2 Facilities specification | Document containing a specification of the ground-, air- and air-ground systems to be used at the hosting site. |
| PD2-2.3 | Update PD/2 Operational specification | "Final Operational specification of PD/2" document |
| PD2-2.4 | PD/2 Demonstration project plan | "PD/2 Demonstration Project Plan" document |
| PD2-3.1 | Reference system development | User manual to brief controllers on the system organisation and capabilities |
| PD2-4.1 | Datalink development | Software package + user's guide for host system dedicated data link facilities |
| PD2-4.3 | HMI integration and testing | User manual updated with advanced system options on host to brief controllers of system organisation and capabilities |
| PD2-7.1 | Develop operational scenarios | Operational scenarios and scripts document |
| PD2-7.2 | Airspace scenario scripts | Airspace scenarios/scripts document containing a description of:<br>Set of pre-checked flight plans, Database with airspace description, Database with infrastructure description |
| PD2-7.3 | Integration test | Tested and approved full script of exercise execution<br>Training manuals for controllers and (pseudo) pilots |
| PD2-9.1 | Facility test for PD/2 | Facility test report |
| PD2-9.3 | PD/2 Demonstration (pilot phase) | Exercise log<br>Results of recording facilities:<br>-quick-look<br>-for subsequent analysis<br>Pilot and controller comment and responses to questionnaires |
| PD2-9.4 | Analyse PD/2 pilot phase and Ground system modification spec, | Ground system modification spec,<br>Air system modification spec,<br>Operational procedure |

| WBS | Task name | Deliverable |
|---|---|---|
| | | modification spec,<br>Evaluation procedure modification spec |
| PD2-9.6 | PD/2 Demonstration (main phase) | Exercise log<br>Results of recording facilities<br>-quick-look<br>-for subsequent analysis<br>Pilot and controller comment and responses to questionnaires |
| PD2-10.1 | PD/2 Analysis | Grouping of data that show interesting correlations,<br>Indicators of statistically important differences,<br>Conclusions from analysis concerning influence of variables on issues addressed in the investigation |
| PD2-10.2 | PD/2 Report | Final report |

# 6 SIMULATION ELEMENTS

The simulation environment comprises all hardware and software components which are necessary to run the realtime simulation trials for PD/2. The basis for these components are that of ATMOS developed and built up at DLR Institute for Flight Guidance since about 1980. The present state of the simulation complex will be extended by additional modules and by enhancements of existing modules to fulfil the requirements of PD/2.
A detailed description is provided in the PD/2 Facility Specification document with a summary provided below:

## 6.1 GROUND SYSTEM

The major components of the simulated ground system are:

- the PATs set (AM, DM, PS, NM, TP, CP, FPM)
- system plan processing,
- weather modelling, also used by the air system,
- communication handling, also used by the air system,
- the controller HMI including surveillance, flight plan managing and electronic coordination between working positions

and
the supporting data bases including aircraft modelling parameters, airspace- as well as route description and traffic- and weather scenario.

## 6.2 AIR SIMULATION SYSTEM

The air simulation will be provided by an advanced version of the ATMOS multi aircraft simulation module. The simulation will employ a performance behaviour which is derived from BADA performance data and from practically experienced (observed by measurements of Frankfurt arrival flights) operation parameters.

The possibility to use MASS is also considered. For this an updated version of MASS is needed, which takes into account the specific requirements identified for PD/2.

Standard navigation functions permit each aircraft to fly along prescribed routes which are part of the traffic/weather scenario file. Without any pseudo pilot interaction or data link interference the aircraft would automatically follow a trajectory along the prescribed route.
The 4D - FMS functionality of the Arrival Manager is used by the air system to simulate 4D-FMS equipped aircraft.

At any time a pseudo pilot can take over the control of an aircraft via a simplified "pilot" interface (tabular data of 6 aircraft on one screen) on controller request.

## 6.3 LIVE AIRCRAFT

All software means will be obtained to integrate the real aircraft ATTAS equipped with EFMS and an Experimental Cockpit into this environment via a telemetry data link. The Experimental Cockpit can also be connected to this environment via Ethernet network in a ground simulation mode.

## 6.4 COMMUNICATION FACILITIES

The facility will include simulated communications for air/ground, ground/ground and intercoms.
The communication equipment falls into the following categories:

AIR/GROUND VOICE COMMUNICATION

consisting of:

- simulation of a radio telephony link between pseudo pilots and controllers
- a real wireless connection between the real aircraft and the controller.

GROUND/GROUND VOICE COMMUNICATION

Each controller working position is equipped with an electronic switchboard by which telephone line connections can be established to any other ground position.

AIR/GROUND DATA COMMUNICATION

Data between (simulated) aircraft and ground system will be passed through a Datalink module simulating the main characteristics of a Mode S or Satellite Datalink in terms of transmission capacity and delay.
The real aircraft will be connected to this module via the telemetry equipment which is an integral part of the flight test environment.

GROUND/GROUND DATA COMMUNICATION

Enhanced ground / ground data communication will partly replace the ground / ground voice communication. The details of data distribution on the different controller positions and of controller / system interaction has to be solved in a coherent approach with the PATs and the GHMI project.

COMMUNICATIONS DATA LOGGING

Communications data logging will be performed by recording the following parameters of exchanged messages:

- origin
- release time
- destination
- reception time
- contents

A detailed description of the full communication requirement is given in the PD/2 Facility Specification.

# 7 ANALYSIS REQUIREMENTS

Within the PHARE programme, the aim of the PHARE demonstrations is to show quantitative productivity increase as well as controller approval which can be expected from introduction of advanced computer assistance tools and data link facilities.
The PHARE Validation Tools group is identifying a number of measurement techniques for the evaluation of questions related to performance, workload and acceptance for PHARE demonstrations. The aim is to ensure, as far as possible, a harmonisation of the experimental methods and procedures applied to the individual PDs. PD/2 will adopt the proposals of this group.

Two categories of measurements have been identified, mandatory and optional measurements. Mandatory measurements shall be applied for quantitative evaluation in all simulation runs of PHARE Demonstration Main Phases. Optional measurements are those for analysing and documenting individual simulation runs and are to be applied predominantly in the Pilot Phase experiments.

The measurements to be used for the evaluation of PD/2 will refer to the following criteria:

- performance (quantitative traffic handling), this will be manned system performance as well as operator performance;

- workload, in a highly automated system will largely be a matter of mental load on the controller. In addition to peak workload, the question of underload and situation awareness should also be addressed;

- acceptance (controller approval), this refers to the man/machine interface as well as the operational procedures.

The methods used to measure these criteria must be non-intrusive. Any techniques which require a controller to perform a secondary task are considered to be too intrusive for use in the Main Phase. Physiological measurements and eye movement recordings which might be perceived intrusive and also require considerable effort in subject preparation and calibration will be considered only as optional methods.

Mandatory measurements will concentrate on the following groups:

- system output data, this will include „objective“ metrics describing performance aspects, such as accuracy of flight path observance, traffic flow, and delay/economy figures in a given ATC scenario;

- operational data, this will include the registration of events depending on subject behaviour (such as communication behaviour) or operator inputs (frequency, errors, etc.). The operational aspect may also include visual perception and decision making;

- controller judgements and opinions, these measurements will be collected by means of questionnaires, post-session interviews and debriefings.

More details of the measurements and analysis to be performed are provided in the PD/2 Facility Specification.

# 8 RESOURCES

Resources for the project are given in the detailed baseline plan at Annex A.

Where projects are delivering to PD/2 their individual project plans will detail the resources and exact nature of the deliverables.

Where tasks are led by the DLR with contributions from other PHARE partners the PD/2 Project Manager will contact the designated representative for each contributor and agree the nature and schedule for the work to be undertaken.

# 9 PROJECT SCHEDULE

The project schedule is provided in a Gantt chart at Annex B.

# 10 PROJECT ACCEPTANCE

## 10.1 REVIEW PROCESS

### Introduction

The PHARE Demonstration are collaborative projects which are managed by the respective hosting sites and require deliverables from other PHARE projects for their successful outcome. The following PHARE projects are providing deliverables to the PD's:-

- Ground HMI (GHMI)
- Validation Tools
- PHARE Advanced Tools (PATs)
- Experimental Flight Management System (EFMS)
- Common Modular Simulator (CMS)
- PHARE Aeronautical Telecommunications Network (PATN)

Each of these groups will provide information relating to their respective deliverables to the individual PD's which will be incorporated into the PD deliverable documents. These documents require an agreed review process and it is for this purpose that the PD Review Team (PRT) has been established.

### PD Review Team

The PRT will comprise the respective PD project manager, the project manager (or his designated representative) from each of the projects supporting the PD and the PHARE Demonstration Coordinator. The PHARE Demonstration Coordinator will be chairman of the group.

The PRT will be responsible for technical review of deliverable documents from the PD's.

### Categories of PD Deliverables

PD's have 3 categories of deliverables as follows:-

1. Internal deliverables (deliverables that are important for the internal project progress)
2. External deliverables (deliverables important both for the project itself but also for other projects)
3. Major deliverables (external deliverables identified by PMB as needing their approval)

### Approval/Signing-off Procedures for PD Deliverables

The following approval procedure is to be applied:

Internal deliverables are to be approved (signed off) by the project leader, and reported as completed in a progress report to PCC.

External deliverables are to be approved in three stages:

1. Approval by the project leader. The document will be signed by the author(s) and submitted to the PRT for technical acceptance.
2. Approval of technical contents by the PRT. On acceptance the document will be signed by the PRT leader and then be submitted to the PCC for final acceptance.
3. Approval of organisational and inter-project co-ordination aspects by the PCC and signing by the PHARE Programme Manager.

Major deliverables should also follow the 3-step approval mentioned for external deliverables and should involve work (preferably in the form of an executive summary, approved by PCC) to lead to a 4th step:

4. Approval of political and external to PHARE aspects by the PMB.

## 10.2 SOFTWARE CONTROL

The design, production, testing and control of software developed to support PD/2 will be subject to the local procedures of the hosting site. Procedures will be developed to handle software delivered from other PHARE partners for inclusion with the hosting site facility.

## 10.3 DOCUMENTATION CONTROL

The design, production and control of internal documents developed to support PD/2 will be subject to the local procedures of the hosting site.
Configuration Control of external documents will be maintained through a PHARE document data base.

# 11 TRAINING AND SIMULATION NEEDS

The Training and Simulation needs vary according to the phase of the Demonstration which is in progress. It is simplest to consider them separately under each phase, the phases being Reference System Development and Calibration Phase, Facility Test Phase. Training and Pilot Phase, and Main Phase. A detailed training and simulation plan is provided in the PD/2 Facility Specification. It is intended to build two different systems to support the controller, the Reference System (for ORG 0) and the Advanced System (for ORG 1 and ORG 2).
The GHMI Project will support the development of a PD/2 training device for familiarisation of subjects with new features of the PD/2 GHMI tools and working positions.

## 11.1 REFERENCE SYSTEM DEVELOPMENT AND TEST PHASE

The aim of this period of tests is to allow controllers who know the simulated environment to exercise the system and calibrate it from their real system experience in terms of workload and performance.

During the early stages of the development and testing of the Reference System, use will be made of non-operational controllers, meaning controllers who, although fully qualified, are currently in desk jobs or shortly retired. Test runs will be arranged to fit in with the development needs and with the availability of staff.

Towards the completion of the Reference System Development there will be a need for two, more formal, simulation test periods during which it will be necessary to use operational controllers, that is controllers currently practising and validated on Approach and Area Control Sectors.

These test periods will each need to be approximately 1 week long. During these weeks the subjects will take part in a series of trial runs which will build up to full two sector runs. This period will allow testing of traffic samples to establish reasonable loadings and adjustment of system and experimental parameters and of operational procedures before the formal measured test runs of the Pilot and Main phase are carried out.

The two weeks will be separated by a period during which modifications to the simulation and its parameters can be made and new traffic scenarios can be built to take account of controllers reactions and comments. The same controllers should if possible be made available for each of these 1 week periods.

If due to problems in the availability of controllers a second week for measurements on the improved reference system is not possible, then those trials has to be take place for those occasions when controller are on site to discuss and elaborate the GHMI and PATs for the advanced system.

## 11.2 PATS SYSTEM DEVELOPMENT AND INTEGRATION

Following the calibration exercise the system will undergo further development to incorporate the PATs and data link aspects of the system.

The dedicated Controller HMI for the advanced organisations ORG 1 and ORG 2 will be integrated.

A connection with the experimental aircraft ATTAS equipped with EFMS via a dedicated data link (realised by telemetry) will be established.

An adaptation of the present assessment and validation tools will also be performed in order to meet the requirements of the experimental methodology to be used.

The whole development and integration process has to be accompanied by operational experts.
For the integration a number of three day periods are foreseen in which the PD/2, PATs and GHMI developers jointly review the status of the PATs System together with controllers and operational experts.

## 11.3 FACILITY TEST PHASE

This task is the last test of the complete air-ground integrated system, including aircraft and full complement of controllers. It is the last general rehearsal before the system is declared ready for the PD/2 pilot phase.
It includes evaluation and selection of measurement techniques to be applied in cooperation with the Validation Tools project.

The training and simulation needs and provisions will be similar to those indicated for the Reference System calibration. Non-operational controller staff can be used for trials arranged to fit in with system testing needs and controller availability.

## 11.4 TRAINING AND PILOT PHASE

A training program for all controllers involved in the main phase has to be organised consisting of a more general part about the ideas and operational procedures implied by the advanced ORGs (a video tape may be sufficient) and a part to make the controller familiar with the basic GHMI (Mouse/Window) techniques. For this a special training facility has to be installed at the real control centres (a workstation or a PC) with a training program able to measure the degree of experience with the GHMI techniques

Logistics of all aspects of the simulation including those relating to the interface of the ATTAS aircraft will be tested out. Non-operational staff can be used for this part of the Phase.

The pilot phase will be used to explore the number of options and combinations of variables to be used in the main phase and to test the proposed timetable.

This will require a full set of 6 controllers (some of them may be replaced by operational experts familiar with the system) during two weeks.

## 11.5 MAIN PHASE

The main phase will involve the performance of a structured evaluation exercise according to a predefined experimental programme.

Eight weeks of trials are scheduled, each with a different set of controllers

Each week will include re-training, briefing and subsequent debriefing of controllers, (pseudo) pilots and system operators, the conduct of the sessions and collecting and consolidation of results from the various recording facilities. An exercise log will be kept during the period of the trials.

Every team of controller has to perform 2 training sessions and 6 measured trials during the 5 days.

The ATTAS aircraft, the DLR Braunschweig Telemetry datalink facility and is support staff will be needed for parts of each of the eight weeks.

# 12 RISK MANAGEMENT

PD/2 as currently planned requires deliverables from other PHARE activities during the build up to the demonstration. The deliverables which have been identified as potential risks to the successful completion of the project are detailed below together with the steps taken to minimize the effects of the risks.

These deliverables are identified as milestones in the PD/2 program and comprise the following:

| TOPIC | RISK | RISK ASSESSMENT | MITIGATION |
|---|---|---|---|
| CMS-2.3.1.10m (PAT/CMS API final version available) | The identified risk is that the agreed standards will be changed during the development of the PATs system after the reference system has been built. | LOW risk of API changes for modules used for the reference system.<br>LOW programme impact if changes are small. | The group involved in the definition of the CMS standards involves participants from DLR the PD/2 hosting site, with experience of the DLR API architecture. Therefore if the CMS standards changes are small then the API specifications developed so far could be adapted. |
| PAT-7.3.7m: PD/2 PATs set validated | The identified risk is that the PATs will not be delivered on schedule | LOW risk of not meeting deliverable.<br>HIGH programme impact if delivery milestone not met. | The risk to the PD/2 programme of failure to meet this deliverable is mitigated by the fact that DLR is developing some of the tools for PD/2 and other tools for the DLR national programme which could be used in PD/2 if other PHARE tools were not available, however with much less functionality. |
| GHMI 3.5m: CWP HMI for PD/2 ready for PD/2 host integration | The identified risk is that the Ground HMI for PD/2 will not be delivered within the PD/2 timescales. | LOW risk if not meeting deliverable.<br>LOW programme impact if delivery milestone is not met. | There are two potential fallback options if the Ground HMI specification is not delivered on schedule.<br><br>1. The DLR has to develop a new HMI facility with the help of local software companies which will be able to handle reconfigurations in a timely manner.<br>The HMI developed to support the national tools |

| TOPIC | RISK | RISK ASSESSMENT | MITIGATION |
|---|---|---|---|
| | | | programme could be configured for the PD/2.<br><br>2. HMI work performed in the frame of the PD/1 programme could be adopted as a basis for PD/2. |
| VAL-6.1m (Methods and measure-ments provided) | The risk is that there will not be sufficient resources to meet the PD/2 deliverable. | LOW risk of not meeting deliverable. LOW programme impact if delivery milestone not met. | The risk to the PD/2 programme of failure to meet this deliverable is mitigated by the fact that DLR is leading the VAL project. The standard measurements and analysis methods of DLR would be applied |
| EFMS-5.1m: EFMS-equipped A/C - Flight Simulator ready for PD/2 integration test | The identified risk is that the EFMS project does not deliver the validated phase 1b equipped aircraft. | LOW risk of not meeting deliverable. LOW programme impact if milestone not met. | There is considerable organisation involved in the use of live aircraft in a demonstration. The risk is mitigated by the fact that there will have been live aircraft involved in DLR trials prior to PD/2. Also the requirement for live aircraft is not mandatory for PD/2 as the air server can simulate EFMS equipped aircraft.<br>The Experimental Cockpit of DLR could also be used as fixed based cockpit for PD/2. Live aircraft will provide credibility to the results. |

## 13 PROJECT REPORTING

The major steps in the management of the project plan and reporting of progress are as follows:-

### A PROJECT REVIEW

Three weeks prior to the PCC meeting the PD/2 Project Manager will update his project plan and deliver it to the PHARE Demonstration coordinator.

### B FIRST CONSOLIDATION

The PHARE Demonstration coordinator will integrate the updated project plan together with updates of the plans from all other PHARE projects into one consolidated plan. A clear indication of changes as compared to the last version of the plan will be included in the last version of the plan which will be distributed to the PCC for approval two weeks before the next PCC meeting.

### C APPROVAL

The PCC will assess the results of the consolidated plans and determine where changes need to be made in order to improve coordination between projects.

Where necessary, the PCC will pass major problems to the PMB for decision.

### D SECOND CONSOLIDATION

The demonstration coordinator will update the plans according to the PCC decisions and produce the next version of the consolidated plan. He will then distribute the resulting project plans and top-level milestones to all PHARE project leaders one week after the PCC meeting. Project managers should confirm within one week that changes are acceptable and will be implemented.

In this way it is assured that all project review meetings are held on the basis of the latest information.

### SCHEDULE FOR MEETINGS

Two types of meetings have been identified to support the above project reviewing cycle:

| | Type | Frequency | Timing |
|---|---|---|---|
| 1 | PD/2 Review Team meeting | 2 monthly | 3 weeks before PCC |
| 2 | Tasks status meeting | at least monthly | as required by the work |

# 14 RELATED DOCUMENTS

A list of all PD/2 related documents will be maintained in a PHARE data base. The rules for document identification are given in Annex C.

The following is a list of the key documents for PD/2.

1. PD/2 Operational Specification, PHARE/DLR/PD2-1.2/OPS;

This document defines the broad operational objectives of PD/2.

2. PD/2 Outline Project Plan, PHARE/DLR/PD2-2.1/OPP;

This document provided the PD/2 outline project information on which the PD/2 Agreements has been based. The information is now superseded by the present document:

3. PD/2 Demonstration Project Plan, PHARE/DLR/PD2-2.4/DPP;

This document provided the PD/2 project information

4. PD/2 Facility Specification, PHARE/DLR/PD2-2.2/FAC;

The Facility Specification is a detailed description of the technical, operational and analysis requirements to be met by the simulation environment in support of PD/2.

5. PD/2 Operational Scenario, PHARE/DLR/PD2-7.1/OSD;

This document will describe the modus operandi for the
Planning Controller (PC) and Tactical Controllers (TC) necessary to support the organisations in PD/2. It concentrates on the task and operations to be performed rather than the mechanism available to implement the tasks.

6. PD/2 Airspace Scenarios and Scripts

This document will describe the detailed scenarios and air server scripts used for each of the traffic samples.

7. PHARE Document Database

This document will contain the status in terms of version of all the PHARE related documents and will be re-issued whenever a document is updated. The latest version will be held by the PHARE Cell

**ANNEX A RESOURCE PLAN**

RESOURCE PLAN

**ANNEX B GANTT CHART**

GANTT CHART

**ANNEX C DOCUMENT CONFIGURATION**

DOCUMENT CONFIGURATION

C. Document Identification

Document configuration will be controlled by revision number which will be maintained by the PHARE Cell. Documents will be uniquely identified as follows:

Programme>/<Establishment>/<WBS no.>/<document type>;<revision no.>

<Programme> is always PHARE.

<Establishment> is the identification of the establishment holding and maintaining the document (e.g. EHQ, DLR, EEC etc.). In the case of a document containing contributions from a number of establishments this will be the Task Manager establishment.

<WBS no.> is to be taken from the task description.

<document type> is to be taken from the following list.

| | |
|---|---|
| ADD | Architectural Design Document |
| AGN | Agenda |
| AGR | Agreement |
| ATP | Acceptance Test Plan |
| DDD | Detailed Design Document |
| DPP | Demonstration Project Plan |
| IDn | Information Document number n of a meeting |
| ITR | Integration Test Report |
| FAC | Facility Specification |
| MIN | Minutes of Meeting |
| OPM | Operator's Manual |
| OPP | Outline Project Plan |
| OPS | Operational Specification |
| OSD | Operational Scenarios Document |
| PNn | Project Note number n of a task |
| QAP | Quality Assurance Plan |
| QAR | Quality Assessment Report |
| REQ | Requirements |
| SAP | Safety Assurance Plan |
| SMM | System Managers Manual |
| SRD | Software Requirement Document |
| SSD | Scenarios Scripts Document |
| SSR | Study Report |
| STP | Software/System Test Plan |
| STR | System Test Report |
| TDn | Technical Document number n of a meeting |
| TPR | Task Progress Report |
| TRM | Training Manual |
| URD | User Requirement Document |
| UTR | Unit Test Report |
| WDn | Working Document number n of a meeting |
| WPn | Working Paper n of a task |

The status of each document will be maintained in a Configuration Control Document which will be re-issued each time one of the configured documents is updated.