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FLIGHT CREW TASK PERFORMANCE AND THE
REQUIREMENTS FOR A NEW TOOL SUPPORTING
THE PRE-FLIGHT, FLIGHT PLANNING AND
BRIEFING TASK

Volume II

THESIS
9479.2

FLIGHT CREW TASK PERFORMANCE AND THE REQUIREMENTS FOR A NEW TOOL SUPPORTING THE PRE-FLIGHT, FLIGHT PLANNING AND BRIEFING TASK

(Book of Appendices)

Thesis submitted for the Degree of Doctor of Philosophy (Ph.D.),

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Contents

Appendix 1: Breakdown of Appendices & Associated Thesis Chapters	3
Appendix 2: HILAS Timeline.....	4
Appendix 3: Summary of Self Reports Types	6
Appendix 4: Existing Flight Crew Tools.....	8
Appendix 5: Active Flight Operations Process, Task Dependencies, Blockers and Facilitators	21
Appendix 6: Active Flight Operation – Process Gates and Associated States	44
Appendix 7: Task Analysis Template: Pre Flight, Flight Planning & Briefing Task	68
Appendix 8: Prototypes - Pre Phase 1 Participatory Design.....	74
Appendix 9: Participatory Design: Phase 1, Updated Prototypes	78
Appendix 10: Participatory Design: Phase 2, Updated Prototypes	82
Appendix 11: Proposed Intelligent Flight Plan (Current Flight) - Prototypes.....	88
Appendix 12: Operational and Organisational Processes Underlying Intelligent Flight Plan.	96
Appendix 13: Assignment of Risk Rating for Specific Flight	99
Appendix 14: Summary of Thesis Data Available on CD.....	103
Appendix 15: Definition of Acronyms used in Thesis	106
Appendix 16: Glossary of Aviation/Cockpit Terms	109



9479.2

Appendix 1: Breakdown of Appendices & Associated Thesis Chapters

Appendix #	Thesis Chapter	Appendix Title
1	N/A	Summary of Appendices
2	Introduction	HILAS Timeline
3	Study 1	Summary of Self Reports
4	Study 4	Existing Flight Crew Tools
5	Study4	Active Flight Operations Process: Task Dependencies, Blockers and Facilitators
6	Study 4	Active Flight Operation Process: Process Gates and Associated States
7	Study 4	Task Analysis Template: Pre-Flight, Flight Planning & Briefing Task
8	Study 5	Prototypes: Pre Phase 1 Participatory Activities
9	Study 5	Participatory Design, Phase 1: Updated Prototypes
10	Study 5	Participatory Design, Phase 2: Updated Prototypes
11	Study 6	Intelligent Flight Plan (Current Flight): Proposed User Interface
12	Study 6	Operational and Organisational Processes Underpinning Intelligent Flight Plan Concept
13	Study 6	Assignment of risk rating for flight
14	N/A	Summary of Thesis Data Available on CD
15	N/A	List of acronyms used in thesis
16	N/A	Definition of Aviation/Cockpit terms

Appendix 2: HILAS Timeline

#	Study	Description	Timeline	Airline Involved				
				1	2	3	4	5
1	Active Flight Operation - Process Mapping & Evaluation	Flight Operations Active Process, Process Mapping	Workshops conducted from October 05 to April 06	Y	Y	Y	Y	Y
2	Flight Planning Process	Flight Planning, Process Mapping & Information Flow Analysis	October 06 – November 06		Y			Y
3	Safety/PM/Risk	3: 1 - Performance Management, Safety & Risk	June 05 to February 06 October – November 06		Y	Y		Y
		3: 2 - ALTA scenario and LOSA Evaluation	November 05 – January 06		Y			
		3:3 - Crew Resource Management	October – November 06					Y
4	Flight Crew Task Analysis	Flight Crew Level One Case Study	October 06 – November 06		Y			Y
		Flight Crew Level Two Case Study	October 06 – March 07					Y
5	Flight Crew: PD Modeling of High Level Tool Concepts	Overall Analysis	March – April 07	N/A				
		Initial prototype model	April 07	N/A				
		Collaborative modeling and evaluation of prototypes 1	April 07					Y
		Updates to prototype	May 07	N/A				
		Collaborative modeling and evaluation of prototypes 2	June 07					Y
		Updates to prototypes	June – August 07	N/A				
		Final prototypes	December 07	N/A				
		Evaluation of Flight Plan Concept & Supporting Operational and Organisational Functions	March 08					Y

Concept	Updates to prototypes and background scenario definition	March 08	N/A			
	Evaluation of Flight Plan Concept & Supporting Operational and Organisational Functions	April 08				Y
	Updates to prototypes and background scenario definition	April 08	N/A			
	Trial implementation of intelligent flight plan concept and specification of Operational and Organisational Functions	May 08				Y
	Final Prototypes	May 08	N/A			

Appendix 3: Summary of Self Reports Types

This appendix provides an outline of specific Flight Crew reports – both operational and safety/human factors.

Operational

Journey Log/Flight Log (Mandatory: Company)

The flight log is used to report summary operational information related to the flight. This includes landing pilot, defects recorded, remaining fuel, takeoff and landing times, delays and any services used. The design of the flight log depends on the requirements of the specific airline. Safety information is not captured in these reports. Flight reports are completed before the flight closes and completion of such reports is mandatory. Mostly reports take the form of a paper tool. However, certain airlines have implemented electronic reports accessible on an Electronic Flight Bag (EFB) or laptop computer

Delay reports (Mandatory: Company)

These capture delay information (e.g. delay information/reasons and associated delay codes).

Technical Log (Mandatory: Authorities/Company)

The technical log provides Flight Crew with information about the overall technical status of the aircraft. Further, the technical log allows crew to report any new defects identified during the aircraft walk-around (e.g. before the Captain accepts the aircraft), or during the actual flight. Flight Crew refer to the Technical log before they accept the aircraft (first flight using the aircraft), or in the aircraft turnaround (after close of the previous flight). The Technical Log provides information about all actions taken in relation to all previously deferred defects (e.g. defects deferred in the last or prior flights). If the Captain is unsatisfied with the technical status of the aircraft (status or deferred defects), or new defects are entered, he/she must request assistance from Maintenance. Items recorded in the technical log, form a basis for discussion between Flight Crew and Maintenance. If the problem is not rectified, the Captain can request an alternative aircraft.

Safety

Air Safety Reports (Mandatory: Authorities/Company)

Air Safety Reports (ASR's) allow flight crew to provide confidential feedback about safety critical events that occur during the flight operation. These reports are mandatory and are completed at the end of the flight. Typically, these are available in paper format. Feedback from these reports is sent both to the airline's safety department and to the authorities.

All safety critical events that occur during the flight operation are recorded by the Flight Operations Quality Assurance (FOQA) system. FOQA data is routinely analysed by Safety personnel, using Flight Data Monitoring (FDM) analysis software. If a safety critical event is recorded for a particular flight (e.g. following from FDM analysis), the Safety Manager can request that the crew complete an ASR, if one has not already been completed.

Occurrence Reports (Mandatory: Authorities/Company)

These are used to provide feedback about incidents or accidents that occur during the flight operation. This includes ATC problems, traffic alerts, passenger problems and so forth. Completion of these reports is mandatory. These reports are presented in paper format. Feedback from these reports is sent both to the airline's safety department and to the authorities.

Confidential Human Factors/Safety Reports (Voluntary)

Confidential Human Factors/Safety Reports allow Flight Crew to provide confidential feedback about general safety issues encountered by crew and/or safety issues encountered during a particular flight operation. These reports are completed on a voluntary basis. Typically, these are available in paper format, although electronic reporting is available in certain airlines. Feedback from these reports is sent to the airline's Safety Department.

Anonymous reports (Voluntary)

Anonymous Reports allow Flight Crew to provide anonymous feedback about general safety issues encountered by crew and/or safety issues encountered during a particular flight operation. These reports are completed on a voluntary basis. Typically, these are available in paper format, although electronic reporting is available in certain airlines. Feedback from these reports is sent to the airline's Safety Department.

Appendix 4: Existing Flight Crew Tools

Introduction

Each tool is described in terms of its purpose or function, when it is used and the key information imparted. Certain tools are used by Flight Crew across multiple flight phases, and are referred to as such. It should be noted that there is a degree of overlap between certain cockpit systems. That is, certain tools present similar types of information at different levels of detail or in different formats.

Tools used while crew on duty and actively involved in the flight task

Flight Management System (FMS)

The flight management system refers to a critical sub-set of Flight Deck information displays and controls that Flight Crew use to obtain information related to the flight/aircraft situation, and action aircraft control decisions. The FMS is a federated system of different control and display units. The function, design and configuration of specific FMC systems vary according to the aircraft type and model. Two high level sets of systems are distinguishable – the Flight Director System and the Electronic Flight Information System. Typically, older aircraft models use the Flight Director System, while newer aircraft use an Electronic Flight Information System. Overall, these systems and their associated displays present navigation, route monitoring and situation information, at different levels of detail and in different formats. This includes flight routing information, specific flight/aircraft parameters (i.e. heading, altitude and speed), weather information, traffic information and terrain information. Certain information displays are positioned in the Pilots forward field of view (heads up), while others are located in a 'heads down' position.

Flight Director System (FDS)

The flight director system (FDS) combines a number of flight instruments to present an overall display of the aircrafts flight path and the control commands required to obtain and hold the desired path. The major components of a flight director system are the flight director indicator (FDI), a horizontal situation indicator (HSI), a mode selector and the flight director computer.

The Flight Director Indicator provides critical navigational information and command cues to the Pilot. The aircraft's attitude relative to the natural horizon is shown by the aircraft symbol and the flight command bars. The command bars move up for a climb or down for descent,

and roll left or right to provide lateral guidance. To comply with the directions indicated by the command bars, the pilot manoeuvres the aircraft to align the fixed symbol (e.g. aircraft symbol) with the command bars. The Flight Directors also supports the landing task – providing visual clues to the Pilot concerning the location of the aircraft in relation to the runway. This information is derived from sensors and technology related to the aircrafts Instrument Landing System (ILS).

The HSI supports Pilots in understanding and using navigational aids. The HIS displays information obtained from combinations of the heading indicator, radio magnetic indicator (RMI), track indicator and range indicator. It may also display VOR, DME, ILS or ADF information. The aircraft heading is displayed on a rotating compass card under the heading lubber line. The card is calibrated in 5 degree increments. The heading pointer provides magnetic bearing information from the aircraft to the selected ground station (VOR or ADF). The fixed aircraft symbol and floating track bar display the aircraft's position relative to the selected track (VOR or ILS localizer). The Pilot uses the HIS to monitor the progress of the aircraft, and to select desired tracks, in accordance with the flight plan route.

Electronic Flight Information System

The Electronic Flight Information System (EFIS) refers to a system where conventional electro-mechanical flight instruments have been replaced by cathode ray tubes (CRT). These CRTs electronically display flight information in much the same presentation as electro-mechanical instruments. However, unlike the electro-mechanical instruments, information can be customised on these displays, according to specific system rules. The two most commonly used EFIS instruments are the electronic horizontal situation indicator (EHSI) and the electronic attitude director indicator (EADI). These can also be called an ND (Navigation Display) or a PFD (Primary Flight Display). The system may also include a multifunctional display (MFD) on a larger CRT which can provide expanded displays of HSI, radar, and navigation data from flight instruments. This can also include other data such as checklists, emergency procedures, etc. Data from various sources can be integrated into various combinations of displays depending on the equipment installed.

The Navigation Display presents a plan view of the aircraft horizontal navigation situation. Information displayed includes compass heading, selected heading, selected VOR, localizer, or RNAV course and deviation (including annunciation or deviation type), navigation source annunciation, digital selected course/desired track readout, excessive ILS deviation (when Category II configured), to/from information, back course localizer annunciation, distance to station/waypoint, glide slope MGP, or VNAV deviation ground speed, time-to-go, elapsed time or wind, course information and source annunciation from a second navigation source, weather radar target alert, waypoint alert when RNAV is the navigation source, and a bearing pointer that can be driven by VOR, RNAV or ADF sources as selected on the display

select panel. The ND can also be operated in an approach format or an en route format with or without weather radar information included in the display.

The PFD presents a display of aircraft attitude and flight control system steering commands including VOR, localizer, TACAN, or RNAV deviation; and glide slope or pre-selected altitude deviation, flight control system mode annunciation, auto-pilot engage annunciation, attitude source annunciation, marker beacon annunciation, radar altitude, decision height set and annunciation, fast-slow deviation or angle-altitude alert, and excessive ILS deviation (when Category II configured).

The weather panel displays weather information on the Navigation Display (i.e. overlaid on routing information). Pilots can choose to the display mode for this information (i.e. NORM, off, standby), and the range (i.e. weather for different nautical mile ranges such as 10, 25, 50, 100, 200 and 300 nm).

Control and Display Unit

Information is entered in the FMS using the control and display unit (CDU). This includes an alphanumeric keyboard, line select keys and seven function keys for direct access to specific display pages. The CDU also features a scratchpad which provides a working area for the pilot to enter data and/or verify the data before line selecting it to the desired position. The line select keys allow data to move from the Scratchpad to the line display. Information on the scratch pad does not affect the FMS until it is moved to a line on the display. The scratchpad also provides advisory or alerting messages.

Stick and Rudder

The Stick and Rudder are used by Pilots to adjust and control the aircraft's flight attitude. Specifically the Stick and Rudder allow the Pilot to manipulate the different aircraft control surfaces (i.e. ailerons, elevators and rudder) to control motion over the aircraft's three axes of rotation (i.e. vertical, longitudinal and lateral). In addition, Pilots use additional flight controls to manipulate lift (i.e. spoilers and flaps) and speed (slats and airbrakes).

Throttle

The throttle is used to select the power settings for the aircraft. Aircraft performance is a function of the specific power and attitude settings selected. Specific power settings are selected for taxi, takeoff, climb, cruise, approach and landing and runway roll out.

Flight Plan

The Flight Plan provides the crew with all the necessary information required to perform the flight. Key information provided includes: flight number, routing information, aircraft location and registration, crew details, passenger information, fuel figures, weather, alternates and NOTAMS. This information is used to form an overall picture of the flight and anticipate any

problems that may occur. Depending on the airline process and technical resources, the Flight Plan is either provided in paper format (i.e. series of printed pages) or is accessible using a desktop computer system. This tool is used at all flight phases – but most especially during the two critical planning and briefing activities - pre-flight and at top of descent. As noted earlier, the actual flight does not necessarily follow the initial flight plan prepared by Dispatch. Specific flight parameters may change depending on the operational situation and environment.

Checklists

Checklists are used at different phases of flight, to confirm that all required tasks have been performed, in accordance with airline procedures. As such, checklists provide a task management function ensuring that all necessary crew tasks are completed at the appropriate time. Typically, the PF will call for a checklist, the PM will read out each line of the checklist, the PF will review that the item is complete and verbalize this, and then the PNF will cross check that this is the case – also verbalizing the status of the checklist item. Typically, checklists are available in printed format and are laminated. The checklist is positioned on the top of the flight deck. Both PF and PM have copies of the checklist. The number and content of checklists varies across airlines. Nonetheless, crews are required to perform specific checklists at specific flight times. Example checklists include, before push-back, taxi, before takeoff, takeoff, cruise, top of descent, final approach, post landing, taxi and shut-down.

VHF Radio

VHF Radio is used by Flight Crew to interact with ground personnel (e.g. Co-ordinator, Maintenance, Flight Control, Baggage Handlers etc). It is also used to interact with ATC (e.g. Ground Control, Tower and ATC on route). The Flight Plan details the specific frequency at which ATC can be contacted. The Pilot Flying and Pilot Monitoring listen to the VHF Radio during all flight phases. However, the Pilot Monitoring is responsible for interaction with ATC. Typically, airline procedures require that crew keep their head-sets on during critical flight phases. However during cruise, head-sets are often not used. In this instance, ATC communications are monitored using a loudspeaker function. Specific dials on the flight deck allow the crew to select different VHF frequencies, as they pass through different airspace areas.

HF Radio

High Frequency Radio is used by Pilots to communicate in oceanic airspace where there is no VHF coverage. HF voice messages from the aircraft are transcribed by a radio operator and sent to the ATC centre as a telex message. HF voice frequencies on the North Atlantic are often congested making it difficult for pilots to communicate efficiently with ATC.

Mobile Phone

Often, crews use their mobile phone to obtain the latest operational information. Also, crews use their mobile phone to contact relevant operations personnel, if they are having a problem. This is an informal tool.

ACARS

ACARS is a data link messaging system using VHF or SATCOMS. Flight Crew use ACARS to send and receive messages to Operations Control and Dispatch. During the aircraft turnaround, Flight Crew send and receive messages related to the latest load information and slot times. During flight, Flight Crew send and receive messages related to passenger transits and landing details (i.e. runway in use, gate number). Information/messages are automatically printed on narrow pieces of paper. Messages are not sent and received at safety critical times (i.e. taxi, takeoff and final approach and landing). ACARS is not used for urgent messages.

The ACARS system is comprised of an airborne subsystem and a ground system. The airborne subsystem consists of the CMU, radio systems, a display screen and printer. The ground system consists of all the ACARS remote transmitting/receiving stations and the data link service provider's computer and switching systems. The Air Carrier Command and Control and Management Subsystem are part of the ground infrastructure, and provide all the ground-based airline operations including: operations control, maintenance and crew scheduling.

ECAM

The ECAM is used throughout flight to monitor aircraft performance information. The ECAM provides information about the status of engines, fuel distribution etc. While on the ground, the ECAM displays information concerning the status of the doors.

VOLMET

Flight Crew use VOLMET to obtain current and future weather forecasts. VOLMET provides a continuous weather broadcast, from a range of transmitting stations, which broadcast at specific times. Typically this is used in cruise and before the top of descent.

Automated Terminal Information Service (ATIS)

ATIS is used to obtain information about the destination airport. This includes information about the status of the runway, airport services and local area weather forecasts.

Personal Announcement (PA) System

The Personal Announcement System is used to communicate with Cabin Crew and Passengers during flight. This is an electronic based system.

Out the Window View

If visibility is good (i.e. daytime and good weather conditions), the view out the window of the aircraft supports Flight Crew navigation and situation assessment (i.e. routing, terrain and traffic). In reduced visibility conditions (i.e. night flying, fog, rain storms), Flight Crew depend on the information provided by the electronic instruments. During ground operations, both PF and PM monitor the out the window view for traffic and obstacles. During cruise, both PF and PM cross reference geographical cues indicated from the window view, with relevant terrain information depicted on maps. During approach and final approach, Flight Crew monitors the runway location and status.

Aircraft Technical Log

The technical log provides Flight Crew with information about the overall technical status of the aircraft. Further, the technical log allows crew to report any new defects identified during the aircraft walk-around (i.e. before the Captain accepts the aircraft), or during the actual flight. Flight Crew refer to the Technical log before they accept the aircraft (first flight using the aircraft), or in the aircraft turnaround (after close of the previous flight). The Technical Log provides information about all actions taken in relation to all previously deferred defects (i.e. defects deferred in the last or prior flights). If the Captain is unsatisfied with the technical status of the aircraft (status or deferred defects), or new defects are entered, he/she must request assistance from Maintenance. Items recorded in the technical log, form a basis for discussion between Flight Crew and Maintenance. If the problem is not rectified, the Captain can request an alternative aircraft.

Standard Operating Procedures/Manuals

Airline Standard Operating Procedures detail the specific procedures that must be followed in all phases of flight. In addition, procedures are defined for non normal and emergency situations. These are typically presented in paper format, and carried in the Pilots flight bag.

Terminal Charts

Terminal charts are used during taxi out, takeoff, approach and landing. Terminal charts include airport approach plates, airport taxi diagrams, arrival procedures and departure procedures. Pilots use terminal charts for planning, and as a source of specific reference data. As planning tools, charts inform Pilots about approach and landing procedures; detailing navigation aids to be used, and/or altitudes and headings to follow. From a reference perspective, charts display minimum parameters for landing under different

weather and equipment conditions, terrain elevations, and radio frequencies. To date, terminal charts are generally used in paper format.

Airport Ground Charts

These charts provide information about the overall airport area, including runway configuration, taxiway access to holding spots/apron, terminal buildings and hangars. These charts also include information about any obstacles in the airport vicinity.

Standard Instrument Departure (SID)

The Standard Instrument Departure depicts the departure procedure to be followed at a particular airport. Pilots refer to this during all the flight phases up to and including climb. Typically, the SID is presented in paper format. Although Jeppesen departure charts are not drawn to scale, the layout of the fixes on the chart are drawn schematically. These charts provide the following information – first contact radar frequencies, NOTAMS information, runway access, runway configuration and minimum altitudes/flight levels. The lost communications departure procedure is available only on a few departure procedures.

Instrument Approach Procedure (IAP)

The Instrument Approach Procedure depicts the instrument approach procedure to be followed for the approach to a particular airport. Crews consult this chart at the briefing at the top of descent and for the duration of the approach. Typically this chart is presented in paper format and includes information related to landing procedures, runway configuration and NOTAMS.

Standard Terminal Arrival Route (STAR)

The Standard Terminal Arrival Route depicts the arrival route to be followed at a particular airport. Flight Crew use the STAR during the briefing at the top of descent and for the duration of the approach. Typically, the STAR is presented in paper format.

Taxi-way charts

Taxiway charts depict the taxi route to be followed at a specific airport. Typical information includes runway numbers and exits, procedures to be followed etc.

Enroute Charts/Maps

En route charts are used by Pilots throughout the flight for navigational purposes. Information includes geographical features, minimum altitudes and restricted areas.

Enroute maps: Visual Flight Rules (VFR)

Visual flight rules enroute maps depict the topography for a specific location. These are used during the cruise period. Typically these charts depict terrain, airports, airspace, and other useful landmarks. Charts are named according to the major city contained on the chart.

Enroute maps: Instrument Flight Rules (IFR)

Instrument flight rules enroute maps depict the topography for a specific location, along with specific instrument instruction. These are used during the cruise period. IFR enroute charts provide long range navigation information for IFR operations. Typically these charts place less emphasis on visual navigation than VFR sectional charts - providing less detailed terrain information

Quick Reference Handbook

This includes brief tips relating to problems encountered in flight – specifically in relation to aircraft technical issues. This is available in paper format. Both Pilots have a quick reference handbook – it is carried in the Pilots flight bag.

Weight and Balance Form

Flight Crew use the Weight and Balance form to determine whether the distribution of aircraft weight is within safe parameters. The weight and balance form presents a graphical representation of the safe/appropriate distribution of weight across the aircraft along with some supplementary text information. This is used in the pre-flight phase after the flight plan is loaded in the FMS and before the performance calculations are made. Typically this is presented in paper format.

Performance Calculations Tables

The performance calculations tables present the performance calculations for takeoff and landing. These are used in the pre-flight phase after the distribution of aircraft weights is determined. Typically this is presented in paper format.

NOTAMS

The Notices to Airman are used to identify any obstacles that need to be taken into account in the vicinity of the airport. NOTAMS are available in printed format, and often are listed with the Flight Plan.

Crew Notes

Throughout the Flight, Flight Crew record salient information related to the flight on paper, so that important flight information is easily accessible and not forgotten. This is an informal practice and these notes are 'informal tools'. Information recorded includes updates to the

flight plan, summary of performance calculations, ATC instructions, ATC frequencies, fuel figures, gate numbers and so forth.

Individual Expertise

Depending on the operational or environmental complexity, it may not be possible to follow procedures absolutely. In analyzing a situation and making decisions regarding the appropriate course of action, Flight Crew defer to their own prior experience and expert knowledge. Flight Crew share this information with each other both formally (i.e. briefings) and informally (i.e. conversation during flight).

Flight Crew Team briefings and communications (Formal & Informal)

Flight Crew interact with each other both formally (i.e. execution of checklists or performance of briefings at specific points in the flight as define in airline procedures) and informally (i.e. conversation during flight). The information exchanged in this interaction supports the development of a common situation model, crew situation assessment, flight planning and crew decision making.

Flight Crew briefings and communications with other roles

Flight Crew communicate with a number of other operational roles to obtain information relevant to their task. This includes: ATC, Cabin Crew, Maintenance, Dispatch, Ground Handling and Operations Control. Flight Crew interact ATC using the VHF frequency. Flight with Cabin Crew either directly or using the PA system. Flight Crew interact with Maintenance either directly, or using the VHF Frequency or mobile phone. Flight Crew interact with Operations Control via Mobile Phone, ACARS or VHF frequency. Flight Crew interact with Dispatch either directly, ACARS or VHF Frequency.

CRM Guidelines

Certain airlines provide summary guidelines for making a good flight briefing (i.e. before flight or at top of descent). Flight Crew can refer to these in flight, to ensure that their briefings are comprehensive and that both crew members have taken relevant CRM factors have into account during the briefing.

Airworthiness Certificate

The airworthiness certificate provides information related to the certification of the technical status of the aircraft, following its annual check. This information is presented in paper format.

Green Book / Aircraft Log

The Aircraft Log contains the flight hours of the aircraft. At the end of each flight, the Captain records the flight time in the aircraft log.

Reporting Tools

In addition to the tools defined above, Pilots interact with a range of paper tools, to report on the flight. These are described below.

Flight Reports / Flight Log

The flight log is used to report summary operational information related to the flight. This includes landing pilot, defects recorded, remaining fuel, takeoff and landing times, delays and any services used. The design of the flight log depends on the requirements of the specific airline. Safety information is not captured in these reports. Flight reports are completed before the flight closes and completion of such reports is mandatory. Mostly reports take the form of a paper tool. However, certain airlines have implemented electronic reports accessible on an Electronic Flight Bag (EFB) or Laptop Computer.

Air Safety Reports

Air Safety Reports allow Flight Crew to provide feedback about safety critical events that occurred during the flight operation. These reports are mandatory and are completed at the end of the flight. Typically, these are available in paper format. Feedback from these reports is sent both to the airline's safety department and to the authorities.

Occurrence Reports

Occurrence reports are used to provide feedback about incidents or accidents that occur during the flight operation. This includes ATC problems, traffic alerts, passenger problems and so forth. Completion of these reports is mandatory. These reports are presented in paper format. Feedback from these reports is sent both to the airline's safety department and to the authorities.

Accident Reports

Accident reports are completed by crew following an accident. These reports capture detailed information about the accident. These reports are presented in paper format. Feedback from these reports is sent both to the airline's safety department and to the authorities.

Confidential Voluntary Human Factors/Safety Reports

Confidential Human Factors/Safety Reports allow Flight Crew to provide confidential feedback about general safety issues encountered by crew and/or safety issues encountered during a particular flight operation. These reports are completed on a voluntary basis. Typically, these are available in paper format, although electronic reporting is available in certain airlines. Feedback from these reports is sent to the airline's Safety Department.

Anonymous Voluntary Human Factors/Safety Reports

Anonymous Reports allow Flight Crew to provide anonymous feedback about general safety issues encountered by crew and/or safety issues encountered during a particular flight operation. These reports are completed on a voluntary basis. Typically, these are available in paper format, although electronic reporting is available in certain airlines. Feedback from these reports is sent to the airline's Safety Department.

De-brief interviews/communications with Safety Personnel

As part of incident investigation, or following analysis of flight technical information, crew may be invited to provide feedback their about own performance (e.g. to explain what happened from their perspective). Typically, this takes the form of a one to one interview with Safety personnel. Depending on airline procedures, this might be supplemented by a written report.

Off Duty Tools

Safety Bulletins & Magazines

Safety Bulletins provide Flight Crew with information related to airline safety initiatives or critical safety events (e.g. incidents or accidents), that they can learn from. This information is usually available in magazine format. Copies of safety bulletins or Magazines are posted to crew, or available in the crew room.

Email

Crew email is used on the ground, to provide feedback to operations about safety issues, or to make training requests. The crew receive updates regarding changes to their schedule by email, or mobile phone.

Mobile Phone

The crew receive updates (e.g. text messages) regarding their flight schedule using their mobile phone.

Crew Information Systems

Certain airlines provide web access to crew information. This includes roster information, high level flight plan information (e.g. route flying), crew information and training information. Further, these systems provide electronic access to aircraft operating manuals, SOPs and reports. In addition, certain airlines provide feedback about safety initiatives and examples of incidents, for training purposes.

Training Tools

Communications with Fleet Captain

Flight Crew engage in a number of informal communications with Fleet Training Captains, to discuss problems that they are having and best practice recommendations to resolve these problems. Typically this takes the form of informal conversations either in person or via email.

Simulator Training

During simulator training sessions, crew execute specific problem scenarios. Crews execute their own strategies and learn from this experience. The de-brief session functions as a tool to evaluate crew task performance and identify best practice strategies. During such sessions, crew have the opportunity to pose questions to the training Captain, in relation to operational or technical problems encountered.

CRM Training

During CRM training, crew encounter foundational CRM concepts such as team briefing, situation awareness and assessment and joint decision making. TEM frameworks and behaviors are also explored. Specifically, crew review safety case studies arising from real world operational feedback (i.e. safety critical events or accidents). This affords an understanding of the potential problems that crew may encounter in the operation and best practice CRM and TEM behaviors, to mitigate these problems and avoid unacceptable aircraft states.

Appendix 5: Active Flight Operations Process, Task Dependencies, Blockers and Facilitators

Process Phase	Process Sub Phase	#	Process Gate / Critical Point in Process	Process State	Process Relationships & High Level Process Dependencies	Task Dependencies		Task Blockers (Threats, Problems or Issues)	Facilitators
						Flight Crew	Other Role		
					Flight Operations: Flight Planning/Aircraft Rostering and Pairing & Active Flight Operation Flight Operations: Flight Plan created and signed off by Eurocontrol				

					<p>review of flight plan by both CPT and FO, agreement on fuel and agreement on alternates.</p> <p>Quality of briefing impinges on work later</p>		<p>enough time to discuss technical status together e.g. might need de-icing or extra fuel and want to agree on this/review this</p> <p>Not full technical information about aircraft - MEL items not known in brief</p> <p>During day – if waiting for aircraft to come in and not aware of tech status – impact on work before flight – earlier get tech status – easier to plan day</p> <p>Operations dept. doesn't always call to let you know status of aircraft</p> <p>If Cabin Crew not answer safety/emergency questions – might require new crew –</p>	<p>weather/NOTAMS etc</p> <p>Sometimes FC pre-fill flight report – save on time later</p>
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			airplane	Maintenance		around by FC, review of technical log and agreement on technical status of aircraft	release of aircraft by Maintenance	finish maintenance and go Outsourced maintenance Technical log not available for short time – with Maintenance Engineer who at another aircraft – cannot investigate issues Engineer working on a number of aircraft at same time – limited access delays Engineer not licensed to review MEL issue (e.g. avionics/airframe) Flight plan not in database – take extra 5 minutes to enter into FMGS Co-ordinator dispatching a number of aircraft at same	plan updates
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								time – limited access	Task management – get on with tasks as well as can Use of ACARS – flight plan updates
7	Full Crew Briefing	Crew joint briefing complete (if not done earlier)						Crew briefing dependent on availability of senior and cabin crew If not full time for briefing, CC may not get fully informed about flight	Task management – get on with tasks as well as can Use of ACARS – flight plan updates
8	Cabin ready to board	Fuel loaded Cleaning complete Passengers ready to board Cargo ready to load Catering ready to load Draft weight and balance/mass calculations completed	Flight Operations: Active Flight Operation & Ground Operations: Aircraft loading Flight Operations: Active Flight Operation & ATC: Flight Management			Draft performance calculations dependent on initial aircraft weight and balance calculations Technical problem on flight deck – might not want to board passengers – delays	Progress with passenger boarding dependent on fuel receipt handover by fuelling agent Updates regarding passenger boarding status from Co-ordinator or Boarding Agent	If two captains in crew – they might have difficulties doing performance calculations – not used to doing it – slower than FO If new crew (new FO) – less experience – work takes longer If end of shift – maintenance engineer might not be as available – finish maintenance	

				<p>Draft performance calculations completed</p>		<p>Draft weight and balance calculations dependent on availability of load sheet from Load Control</p>	<p>and go Outsourced maintenance Technical problem on flight deck – might not want to board passengers Engineer not licensed to review MEL issue – delay waiting for other Engineer Fuelling – cannot board passengers and fuel at same time in certain stations Cleaners on board doing specialist cleaning – delay boarding Airbus design – never see 2 cabin crew at back of aircraft – coordination/communication difficulty Engineer working on a number of aircraft</p>	
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							at same time – delays and limited access Dispatcher dispatching a number of aircraft at same time	
9	All doors closed	Passengers boarded Catering loaded Cargo loaded Baggage loaded Final weight and balance/mass calculations completed Final performance calculations completed Load sheet and loading certificate complete Passenger count	Flight Operations: Active Flight Operation & Ground Operations: Aircraft loading Flight Operations Active Operation and ATC: Flight Management	Final performance calculations dependent on final aircraft weight and balance calculations If briefing process interrupted (high risk) – might cause distraction – not discuss airport/taxi layout or takeoff fully etc	Communications from boarding agent that all passengers who have checked in have boarded aircraft Final weight and balance calculations – dependent on final passenger numbers count from Cabin Crew Final weight and balance calculations	Passenger baggage loaded and no show – have to unload baggage Discrepancy between passenger count and passenger figures on load sheet – reconciling this causes delay Delays getting final passenger information or runway intersection – late to completing final performance calculations Cannot go until technical log signed off e.g. airworthiness	Task management – get on with tasks as well as can Use of ACARS – flight plan updates If substantial delay might run checklist again to ensure not missed anything Try to keep Co-ordinator out of cockpit when doing briefings Default procedure – anyone appear on deck, wait to be spoken to – cc put hand on shoulder – interruption at crucial moment at part of briefing	

			<p>confirmed</p> <p>Cabin secure</p> <p>Cockpit flight preparations complete</p> <p>Aircraft ready for start up and push-back</p> <p>Clearances requested</p>		<p>dependent on availability of final load sheet from Load Control</p> <p>Ready to pushback – dependent on passenger seated confirmation information from Cabin Crew</p>	<p>certificate</p> <p>Not all technical information to hand - usually query worksheets</p> <p>information – worked overnight – in hangar – work done but basic entry in tech log – work sheet reference/signoffs for inspections etc</p> <p>FC may not know certain things with aircraft type – might not be experienced – need to query items</p> <p>If end of shift – maintenance engineer might not be as available – finish maintenance and go</p> <p>Outsourced maintenance</p> <p>Can run wrong performance module for wrong aircraft –</p>	<p>If interphone problems use hand signals</p> <p>Pre-flight briefing – first flight of day include full briefing – emergency briefing and departure briefing. For subsequent flights – not do emergency brief (emergency scenarios e.g. aborted takeoff, engine failure) – done it once</p> <p>Do calculation for shortest distance – runway intersection.</p> <p>So then if do full runway – have time to edit/update calculation (time strategy).</p> <p>Assuming going to be safer – use intersection figure – and then if has to do full runway, its ok.</p> <p>Technically should do performance calculation for every point.</p>
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Execution	back and start	Blocks	<p>Pushback clearance obtained</p> <p>Ramp clear of traffic</p> <p>Pushback complete</p> <p>Tug and toe bar disconnected</p> <p>Ready for Taxi</p> <p>ATC instructions/flight plan changes communicated</p>	<p>Operation & ATC:</p> <p>Flight Management</p> <p>Flight Operations: Active Flight</p> <p>Operation & Ground Operations:</p> <p>Aircraft Push-back</p>		completion of pre-taxi checklist	<p>Ground ATC clearance</p> <p>Push-back dependent on communication with Ground Personnel / toe truck driver and walker</p> <p>Push-back dependent on completion of push-back tasks by ground personnel / toe truck driver and walker</p>	<p>aircraft and then FC can't go – lose window for push-back</p> <p>Not having a tug and toe bar – being used to push other aircraft and have to wait</p> <p>Could have icing conditions – running close to another de-icing time – pressure</p> <p>Having to wait for de-icing rig – delays – Munich & northern airports cater better for this</p> <p>Delays and de-icing - lose minutes if have to de-ice again</p> <p>Communication difficulties with Ground Personnel – language/contact</p> <p>Technical difficulty during pushback</p>	<p>back – continue in hope that resolve it and then if can't taxi back to stand – commander management thing – inviting more trouble if try and deal with it during push back etc – if didn't resolve following ECAP procedure on screen – then taxi back – restart computer</p>
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	Taxi	11	Taxi	Taxi clearance obtained	Flight Operations: Active Flight Operation & ATC: Flight Management		Taxi – dependent on completion of pre-taxi checklist Taxi – dependent on flight plan briefing	Taxi dependent on all clear to taxi signal from Ground Control Taxi dependent on Ground ATC clearance to taxi	Technical problem after push-back – first flight of day with airbus – computer re-set Taxi – unfamiliar/familiar airport Confusing taxi instructions Poor taxiway markings Poor visibility – weather (e.g. fog, wind, rain) or night-time Poor runway conditions e.g. water, ice or snow Incoming traffic Late departing traffic – last takeoff ATC instructions/language Technical issue in takeoff e.g. engine	At taxi out do review of V speeds – and at that point might flag an error On airbus, get visual signals/alerts for inappropriate configuration settings
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									failure	
Takeoff	12	Ready for Takeoff	Ready for Takeoff	Flight Operations: Active Flight Operation & ATC: Flight Management			Takeoff – dependent on completion of pre-taxi checklist Takeoff – dependent on flight plan briefing	Takeoff dependent on all clear to taxi signal from Tower ATC	ATC instructions/language Technical issue in takeoff e.g. engine failure Incoming/landing traffic Poor visibility – weather (e.g. fog, wind, rain) or night-time Poor runway conditions e.g. water, ice or snow	Briefing between crew
Climb	13	Initial Climb	Initial Climb	Flight Operations: Active Flight Operation & ATC: Flight Management			Climb – dependent on flight plan briefing	Tower ATC – flight plan routing updates	ATC changes (altitude, heading, speed) given weather or traffic Poor weather conditions Traffic issues	
	14	Level Off	Successful climb	Flight Operations:				ATC flight		

					Active Flight Operation & ATC: Flight Management				plan routing updates		
Cruise	15	Cruise	Successful Cruise	Flight Operations: Active Flight Operation & ATC: Flight Management	Flight Operations: Active Flight Operation & ATC: Flight Management			ATC flight plan routing updates	ATC changes (altitude, heading, speed) given weather or traffic Poor weather conditions Traffic issues	Use of automation Ongoing error checks/navigation accuracy checks Briefing for next flight if have time	
Descent, Approac h & Landing	1	Before Top of Descent	Successful Cruise	Flight Operations: Active Flight Operation & ATC: Flight Management	Flight Operations: Active Flight Operation & ATC: Flight Management			ATC flight plan routing updates	Availability of weather information Availability of traffic information Poor weather conditions Traffic issues ATC changes (altitude, heading, speed) given weather or traffic		
	2	Top of	Descent briefing	Flight Operations:	Flight Operations:		Top of	ATC flight			

							ordination and communication			
	5	At transition level	Cleared to altitude (off Flight level)	Flight Operations: Active Flight Operation & ATC: Flight Management			Management of descent – dependent on flight plan briefing at dispatch phase Management of descent – dependent on descent/approach/landing planning and briefing Management of descent – dependent on FC co-ordination and communication	ATC flight plan routing updates ATC clearance		
	6	Initial	Approach phase	Flight Operations:			Management	ATC flight		

Appendix 6: Active Flight Operation – Process Gates and Associated States

Process Phase	Process Sub Phase	#	Process Gate / Critical Point in Process	Process State	Other Related States				
					Flight Plan State	Aircraft State	Flight Crew State	Other Role State	Tools & Information State
		1	Crew Arrives	<p>Aircraft rostering and pairing complete</p> <p>Flight Plan created and signed off by Eurocontrol</p> <p>Updates to crew list/manifest</p> <p>Load sheet prepared</p> <p>Briefing can commence</p>	<p>Flight plan complete</p> <p>Updates to crew list/manifest</p> <p>Flight plan available to crew (printed out or copied to crew flight planning IT system)</p>	<p>Aircraft available</p> <p>Aircraft on time</p> <p>Aircraft technical status ok</p>	<p>FC have valid license</p> <p>FC arrive at office on time</p> <p>FC fit for flight / ready for work</p> <p>On duty – rostered for flight</p> <p>FC checked in/signed in and ready to brief</p> <p>Knowledge of procedures (trained and competent)</p> <p>Crew alert</p>		<p>Mobile phone available</p> <p>Check in computers available</p> <p>Flight Planning computers available</p> <p>Flight plan information available</p> <p>Updated weather information available</p> <p>Airport/Runway information available</p> <p>Crew details information available (cockpit and cabin crew)</p> <p>NOTAMS information available</p>

	2	<p>Dispatch</p>	<p>Fuel agreed Flight plan sign off Fuelling can proceed</p>	<p>Flight Plan reviewed Flight plan sign off Fuel, alternates and route agreed</p>	<p>Aircraft available Aircraft on time Aircraft technical status ok Fuelling can commence</p>	<p>FC team established Flight plan reviewed and agreed PF/PM Agreed Crew briefed Common situation assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed</p>		<p>Mobile phone available Flight Planning computers available Mobile phone available ACARS available Gate number available MX status available Full MX technical information available Fuel informational available – including trends information Weather information available Alternates information available NOTAMS information available</p>
	3	<p>Crew meeting</p>	<p>Crew ready to transfer to aircraft</p>	<p>Flight Plan reviewed with CC and passenger updates communicate</p>	<p>Aircraft available Aircraft on time Aircraft technical status ok Fuelling can commence</p>	<p>CC available and briefed by Purser Whole crew team established – FC and CC Crew briefed Common situation</p>		<p>Mobile phone available Passenger information available Service information available Gate number available Bus/transport information available</p>

Aircraft Release & Turnaround	5	Arrive at aircraft	Crew boarded aircraft	Flight Plan updates (ATC windows, runway in use, routing instruction)	Aircraft available Aircraft on time Prior crew and passengers disembarked aircraft Fuelling can commence FMGS/FMC loaded with flight plan	Aircraft available Aircraft on time Prior crew and passengers disembarked aircraft Fuelling can commence FMGS/FMC loaded with flight plan	Crew updated by Boarding Agent/Coordinator Crew ready to start cockpit checks and loading of flight plan Crew briefed Common situation assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed	FMGS/FMC available ACARS available Mobile phone available VHF/Radio working Access to ground ATC Safety equipment available VHF Radio/frequency available ECAM available/working Full MX technical information available Aircraft technical log available Cabin crew technical log available Certificate of release available Maintenance Manuals available Checklists available QRH available Weather information available Alternates information available NOTAMS information available

						assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed	QRH available Weather information available Alternates information available NOTAMS information available Performance calculations tables (paper) available or Performance Calculations Computer/Laptop available
7	Full Crew Briefing	Crew joint briefing complete (if not done earlier)	Flight Plan updates (ATC windows, runway in use, routing instruction)	Aircraft technical status/air worthiness signed off, or under review Fuel loaded or being loaded	Whole crew team established – FC and CC Crew briefed Common situation assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed SID reviewed	FMGS/FMC available ACARS available Mobile phone available Intercom available VHF/Radio working Access to ground ATC SID Available ECAM available/working Load Sheet Available SID Available Taxi chart available Checklists available QRH available	

								Performance calculations tables (paper) available or Performance Calculations Computer/Laptop available
8	Cabin ready to board	Fuel loaded Cleaning complete Passengers ready to board Cargo ready to load Catering ready to load Draft weight and balance/mass calculations completed Draft performance calculations completed	Flight Plan updates (ATC windows, runway in use, routing instruction)	Aircraft technical status/air worthiness signed off, or under review Fuel loaded Cleaning complete 'Safe' state of aircraft for passengers	Draft weight and balance/mass calculations completed Draft performance calculations completed Crew briefed Common situation assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed SID reviewed			FMGS/FMC available ACARS available Mobile phone available Intercom available VHF/Radio working Access to ground ATC Latest ATC window information available ACARS working ECAM available/working Final load sheet available SID Available Taxi chart available Checklists available QRH available Performance calculations tables (paper) available or Performance Calculations Computer/Laptop available

								Slot time information available Runway information available
9	All doors closed	<p>Passengers boarded</p> <p>Catering loaded</p> <p>Cargo loaded</p> <p>Baggage loaded</p> <p>Final weight and balance/mass calculations completed</p> <p>Final performance calculations completed</p> <p>Load sheet and loading certificate complete</p> <p>Passenger count confirmed</p>	<p>Flight Plan updates (ATC windows, runway in use, routing instruction)</p>	<p>Aircraft technical status/air worthiness signed off</p> <p>Doors closed/armed</p> <p>Chocks off</p> <p>Aircraft ready for push-back</p>	<p>Final passengers numbers</p> <p>Final weight and balance/mass calculations completed</p> <p>Final performance calculations completed</p> <p>Cockpit preparations complete</p> <p>Load sheet and loading certificate complete</p> <p>Pre flight briefing conducted</p> <p>SID reviewed</p> <p>Crew briefed</p> <p>Common situation assessment</p> <p>Common TEM</p> <p>Knowledge of</p>	<p>Aircraft cleaned</p> <p>Aircraft fuelled</p> <p>Cabin row security checks complete</p> <p>Passenger count confirmed to dispatch/ca ptain</p> <p>Load sheet and loading certificate complete</p> <p>QRH available</p> <p>FMGS programmed with appropriate route and takeoff calculations</p> <p>Slot time information available</p> <p>Runway information available</p>	<p>Headsets available</p> <p>FMGS/FMC available</p> <p>ACARS available</p> <p>Mobile phone available</p> <p>VHF/Radio working</p> <p>Access to ground ATC</p> <p>Passenger numbers available</p> <p>Cargo/baggage numbers available</p> <p>ECAM available/working</p> <p>SID Available</p> <p>Taxi chart available</p> <p>Checklists available</p> <p>QRH available</p>	

Flight Execution	Engine push back and start	10	Out of Gate/Off Blocks	<p>Cabin secure</p> <p>Cockpit flight preparations complete</p> <p>Aircraft ready for start up and push-back</p> <p>Clearances requested</p>	<p>Flight Plan updates (ATC windows, runway in use, routing instruction)</p>	<p>Parking breaks off</p> <p>Engine started</p> <p>Ready for taxi</p> <p>Aircraft ready to move under own power</p> <p>Tug and toe bar disconnected</p> <p>Aircraft operating on own power</p>	<p>Pre start briefing complete</p> <p>Crew briefed</p> <p>Common situation assessment</p> <p>Common TEM</p> <p>Knowledge of procedures (trained and competent)</p> <p>Crew alert</p> <p>Threats identified and managed</p>	<p>Maintenance/Personnel clear</p>	<p>Slot time information available</p> <p>Runway information available</p> <p>Pushback clearance obtained</p> <p>Ground Marshall/MX/Ground</p> <p>Crew hand signals – thumbs up and clear</p> <p>Headsets available</p> <p>FMGS/FMC available</p> <p>ACARS available</p> <p>Mobile phone available</p> <p>VHF/Radio working</p> <p>Access to ground ATC</p> <p>ECAM available/working</p> <p>SID Available</p>
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	Takeoff	12	Ready for Takeoff	Ready for Takeoff	<p>Flight Plan updates (routing instruction and clearances)</p> <p>ATC instructions/flight plan changes communicated</p> <p>Incoming/landing traffic cleared runway</p> <p>Takeoff clearance obtained</p>	Aircraft configured for takeoff	<p>Crew knowledge of V speeds</p> <p>Pre takeoff checklist complete</p> <p>Crew briefed on takeoff plan</p> <p>Crew briefed</p> <p>Common situation assessment</p> <p>Common TEM</p> <p>Knowledge of procedures (trained and competent)</p> <p>Crew alert</p> <p>Threats identified and managed</p>		<p>FMGS/FMC available</p> <p>Primary Flight Display/Flight Director available/working</p> <p>TCAS available/working</p> <p>GPWS available/working</p> <p>Headsets available</p> <p>ACARS available</p> <p>Mobile phone available</p> <p>VHF/Radio working</p> <p>ECAM available/working</p> <p>SID Available</p> <p>Taxi chart available</p> <p>Takeoff clearance obtained</p> <p>Checklists available</p> <p>QRH available</p> <p>VHF/Radio working</p> <p>Access to ATC</p> <p>Updates to Flight Plan communicated by ATC</p> <p>Latest ATC clearance information</p>	
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			communicated		Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed		TCAS available/working GPWS available/working Checklists available QRH available ATIS working VHF/Radio working Access to ATC Updates to Flight Plan communicated by ATC Latest ATC clearance information provided
Cruise	15	Cruise	Successful Cruise	Updates to Flight Plan (routing, heading/speeds, holding patterns, alternates, runway in use) Ongoing monitoring and navigation checks ATC instructions/flight plan changes communicated	Aircraft configured for cruise Aircraft travel from one waypoint/fix to next Autopilot engaged	Checks complete Crew briefed Common situation assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed	FMGS/FMC available Primary Flight Display/Flight Director available/working TCAS available/working GPWS available/working Checklists available QRH available ATIS working VHF/Radio working Access to ATC Updates to Flight Plan

									<p>communicated by ATC</p> <p>En route charts (IFR, VFR) available</p> <p>Latest ATC clearance information provided</p>
Descent, Approach & Landing	1	Before Top of Descent	Successful Cruise	Updates to Flight Plan (routing, heading/speeds, holding patterns, alternates, runway in use)	Aircraft configured for cruise	<p>Crew briefed</p> <p>Common situation assessment</p> <p>Common TEM</p> <p>Knowledge of procedures (trained and competent)</p> <p>Crew alert</p> <p>Threats identified and managed</p> <p>Errors identified and managed</p> <p>FC common situation assessment</p>	<p>ATC instructions/flight plan changes communicated</p>	<p>FMGS/FMC available</p> <p>Primary Flight Display/Flight Director available/working</p> <p>TCAS available/working</p> <p>GPWS available/working</p> <p>Weather information available and accurate</p> <p>Traffic information available and accurate</p> <p>Terrain information available and accurate</p> <p>STAR available</p> <p>IAP available</p> <p>Volmet working</p> <p>ATIS working</p> <p>VHF/Radio working</p> <p>Access to ATC</p>	

							<p>ECAM available/working</p> <p>En route charts (IFR, VFR) available</p> <p>Updates to Flight Plan communicated by ATC</p> <p>Latest ATC clearance information provided</p> <p>Checklists available</p> <p>QRH available</p>
2	Top of Descent	Descent briefing complete	Cruise ended Updates to Flight Plan (routing, heading/speeds, holding patterns, alternates, runway in use)	Aircraft configured for descent	Initial planning/briefing completed FC agreed plan for descent/approach and landing FC altered mindset – prepared for landing – cruise ended FC happy with fuel Crew complete top of descent	ATC instructions/flight plan changes communicated	<p>FMGS/FMC available</p> <p>Primary Flight Display/Flight Director available/working</p> <p>ECAM available/working</p> <p>Approach and landing time and speeds known</p> <p>Updated weather information available</p> <p>Airport/Runway information available</p> <p>Checklists available</p> <p>QRH available</p> <p>IAP available</p> <p>STAR available</p>

					checklist Crew briefed Common situation assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed	TCAS available/working GPWS available/working Weather information available and accurate Traffic information available and accurate Terrain information available and accurate ATC clearance obtained FMGS set for descent
3	15 minutes before landing	Updates to Flight Plan (routing, heading/speeds, holding patterns, alternates, runway in use)	Aircraft configured for approach		Crew briefed Common situation assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed FC agreed plan	FMGS/FMC available Primary Flight Display/Flight Director available/working TCAS available/working GPWS available/working Weather information available and accurate Traffic information available and accurate Terrain information available and accurate

								available Airport/Runway information available Checklists available QRH available IAP available STAR available ATC clearance obtained
5	At transition level	Cleared to altitude (off Flight level)	Updates to Flight Plan (routing, heading/speeds, holding patterns, alternates, runway in use)	Aircraft configured for approach QNH Set	Crew briefed Common situation assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed	ATC instructions/flight plan changes communicated	FMGS/FMC available Primary Flight Display/Flight Director available/working TCAS available/working GPWS available/working Weather information available and accurate Traffic information available and accurate Terrain information available and accurate Headsets available Checklists available QRH available	

							Checklists available QRH available IAP available STAR available ATC clearance obtained
10	Touchdown and roll out	Aircraft touchdown and roll out	Crew briefed Common situation assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed				FMGS/FMC available Primary Flight Display/Flight Director available/working TCAS available/working GPWS available/working Weather information available and accurate Traffic information available and accurate Terrain information available and accurate Headsets available Checklists available QRH available ATC clearance obtained
11	80 knots / Handover of	Aircraft landed Aircraft exit	After landing checklist complete				FMGS/FMC available Primary Flight Display/Flight

		controls to captain			runway Aircraft configured for taxi	Crew briefed Common situation assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed		Director available/working TCAS available Headsets available Checklists available QRH available Ground clearance obtained
12	Taxi to gate				Aircraft configured for taxi	Crew briefed Common situation assessment Common TEM Knowledge of procedures (trained and competent) Crew alert Threats identified and managed		Headsets available Parking gate number agreed Checklists available QRH available Ground clearance obtained
13	Park and Shut-down				Aircraft parked Engine shut-	CPT confirm doors disarmed	CC disarmed	Headsets available

					down Chocks on			doors CC opened doors	Checklists available QRH available Ground Marshall/MX/Ground Crew Hand Signals – Thumbs up obtained
Post Flight	Flight Report			Engine shutdown Parking breaks on Chocks on				Checklists available QRH available	
	Change Aircraft/Prepar e For Next Flight			Engine shutdown Parking breaks on Chocks on				Checklists available QRH available	

Appendix 7: Task Analysis Template: Pre Flight, Flight Planning & Briefing Task

Task Background, Objective & Criticality	
Task Name & Number	
Task Background/Context (Overall, what going on at time, why performing task)	
Task Objective	
User Familiarity With Task	
Task Criticality / Importance Why Focus on Task	
Role/Task Performance & Co-ordination with Other Roles	
Active FC Role	
Co-ordination with other FC Role	
Co-ordination with other Roles	
Task Contexts/Scenarios (Variability)	
Different Contexts/Scenarios	
Task Environment	
Task Environment	
Process/Timeline Background	
Sub Process	
Process Phase	
Process Sub Phase	

Critical Point		
Prior Dependencies /Task Pre-requisites (Flight Planning)		
Prior Dependencies/Task Pre-requisites (Active Flight Operation)	Primary & Supporting Role	
	Other Roles	
Parallel Dependencies (Same Process: Inputs/Work of Other Roles Going on at Same Time)		
Parallel Dependencies (Other Process)		
Use of Procedures		
Use of Procedures		
HF Dimensions		
HF Dimensions		
Task Duration		
Typical Duration	Start	
	End	
Context/Duration		
Task Relationships & Workload Management		
Relationship to Other Tasks / Flight Crew	Earlier (Active Flight Operation)	
	Same time (Active Flight Operation)	
	Later (Active Flight Operation)	

Task Management & Workload			
Task Strategy, Narrative & Workflow			
Task Strategy (Standard scenario)			
Task Narrative (Standard scenario)			
Task Structure (Active FC Role)	Task (If high level)	Subtask	Actions
Alternative Task Strategies, Paths & Workarounds			
Deviations According to Different Contingencies/Contexts			
Task Completion & Feedback			
Criterion for Task Completion			
Feedback/Task Completion	People	Self	
		Other Flight Crew	
		Other Flight Teams	
	Tools (Electronic)		
	Tools (Paper)		
	Window/View		

Task Output, After State & Future Dependencies

Task Output/Result		
After State	Process	
	Flight Plan	
	Aircraft	
	People	
	Tools	
	Environment	
Future Dependencies		

Task Information Requirements, Information Understanding & Action

Task Information Required	
Information Priority	
Mental Model of Information	
Why Require Information? What do with Information? Relationship Information & Action?	

Tools & Information Resources

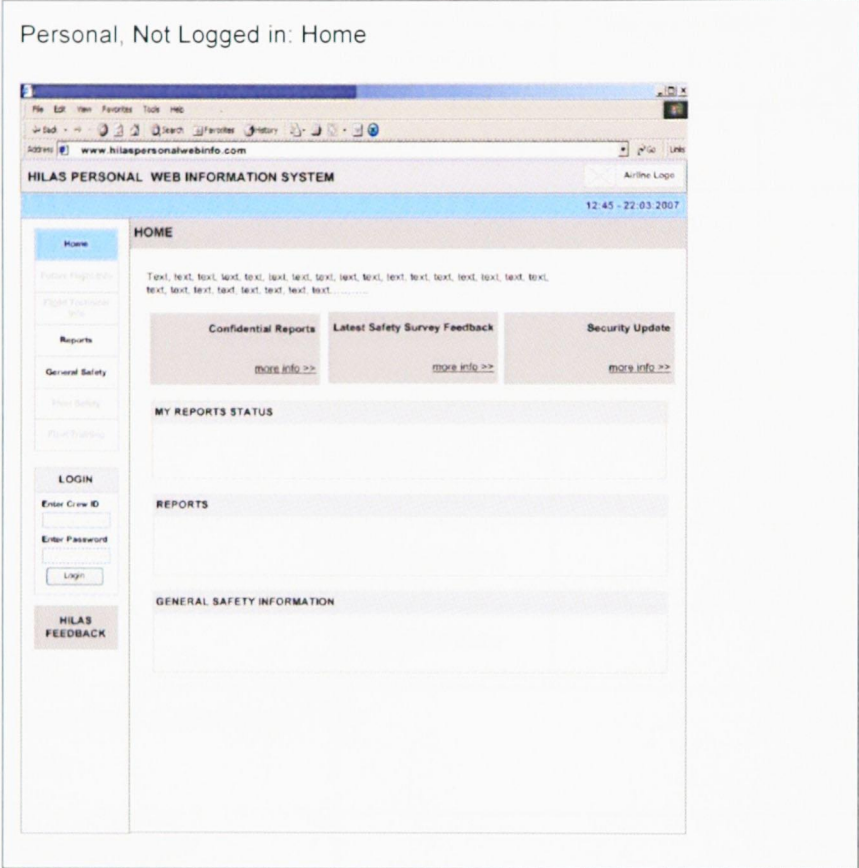
Actual Information Provided & Characteristics		
Information Gaps		
Overall, Who is responsible for different information sets required? Information Producers/Owners?		
List of Tools & Information Resources		
What information from	People	Self

whom/what?		Pilot Team/FC	
		Broader Flight Team	
	Tools (Electronic)		
	Tools (Paper)		
	Window/View		
Nature of Interaction? (When interact, How Interact, Process)	People	Self	
		Pilot Team/FC	
		Broader Flight Team	
	Tools (Electronic)		
	Tools (Paper)		
	Window/View		
Risk, Tools & Information Flow			
Overall View on Tool/Information Support for Task			
TEM Dimensions			
TEM Dimensions			
Good Points & Facilitators			
Good points (What supports task performance)			
Task Problems/Hazards/Risks			
Typical Task Problems/Hazards/Risks			

Source/Reason	
Specific Tool Problems	
Tool Problems	
Requirements	
HILAS: Process Improvement Requirements	
Tool Requirements	

Appendix 8: Prototypes - Pre Phase 1 Participatory Design

Personal – Not Logged In



EFB

EFB – Login

HILAS EFB
Airline Logo

12:45, 13-03-2007

LOGIN

Please LOGIN to access the EFB application.
Either member of crew may login.

1. Enter Flight Number
2. Enter Username
3. Enter Password/ID
4. Select Login

EFB – Home Page

HILAS EFB
Airline Logo

12:45, 13-03-2007

- Home
- Flight Plan
- Future Flights/Plans
- Reports
- Messaging
- LOGOUT
- GO TO DEMO MENU
- HILAS FEEDBACK
- BATTERY

02:31

HOME

FLIGHT PLAN (THIS FLIGHT)

Risk Status: Low, Auto Dispatch

ETD: XXXXXXXXXXXX ETA: XXXXXXXXXXXX Slot Status: 13:45

Aircraft Status: At Gate Gate Number: 27 Co-ordinator: XXXXXXX

[View Flight Plan Details](#)

MESSAGES SUMMARY

FUTURE FLIGHTS SUMMARY

Flights Today Flights This Pairing

Info	Flight No	Date	ESD	From	To	Changes/Notices	Risk Status	Briefing
/	IB XXXX	13-06-07	XXXXX	XXXXX	XXXXX	Yes	Low	<input type="checkbox"/>
/	IB XXXX	13-06-07	XXXXX	XXXXX	XXXXX	Yes	Low	<input type="checkbox"/>
/	IB XXXX	13-06-07	XXXXX	XXXXX	XXXXX	TBC	TBC	<input type="checkbox"/>

[View Flight Plan Information For Selected Flight](#)

COMMUNICATIONS

CONNECTIONS STATUS

EFB – Flight Plan Summary

HILAS EFB
Airline Logo

12:45, 13-03-2007

- Home
- Flight Plan
- Future Flights/Plans
- Reports
- Messaging
- LOGOUT
- GO TO DEMO MENU
- HILAS FEEDBACK
- BATTERY

02:31

FLIGHT PLAN SUMMARY

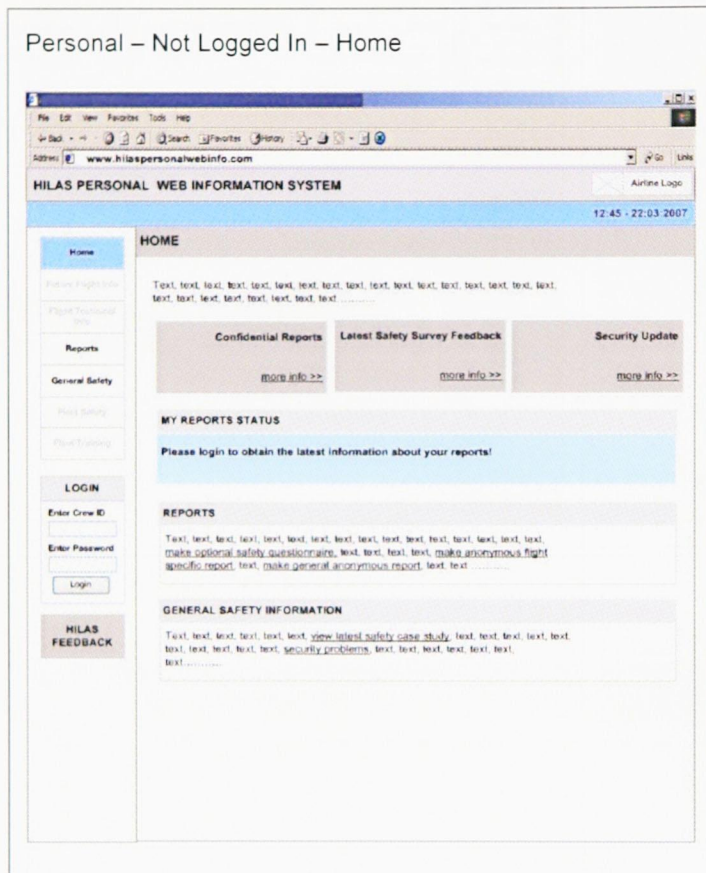
Flight Plan Summary TEM & Briefing Routing & Flight Levels Alternates Fuel & Trends Info

Weather Aircraft Passenger & Load NOTAMS Crew Airports

77

Appendix 9: Participatory Design: Phase 1, Updated Prototypes

Personal – Not Logged In



Dispatch

Dispatch – Home Page

HILAS DISPATCH SYSTEM Airline Logo

Name: XXXXX XXXXXXX ID: XXXXXX 12:45 - 13-06-2007

HOME

FLIGHT PLAN (THIS FLIGHT)

Risk Status: **Low, Auto Dispatch**

ETD: XXXXXXXXXXXX ETA: XXXXXXXXXXXX Slot Status: 13:45

Aircraft Status: At Gate Gate Number: 27 Co-ordinator: XXXXXX

[View Flight Plan Details](#)

MESSAGES SUMMARY (THIS FLIGHT)

(3) New Messages
(1) Sent Message
(0) Draft Message

[View Messages](#)

DOCUMENTS SUMMARY (THIS FLIGHT)

(3) Charts
(1) Aircraft Bulletin

[View Documents](#)

FUTURE FLIGHTS SUMMARY

Flights Today All Flights This Pairing

Date	Flight No	Date	ESD	From	To	Changes/Notices	Risk Status	Briefing
/	IB XXXX	13-06-07	XXXXX	XXXXX	XXXXX	Yes	Low	<input type="checkbox"/>
/	IB XXXX	13-06-07	XXXXX	XXXXX	XXXXX	Yes	Low	<input type="checkbox"/>
/	IB XXXX	13-06-07	XXXXX	XXXXX	XXXXX	TBC	TBC	<input type="checkbox"/>

[View Flight Plan Information For Selected Flight](#)

FLIGHT REPORTS

(0) Mandatory Reports Completed
(0) Optional Reports Completed
(0) Draft Reports

[View Reports](#)

Home
Flight Plan
Future Flights
Messaging
Documents
LOGOUT
Logout
HILAS FEEDBACK

Dispatch – Flight Plan Summary

HILAS DISPATCH SYSTEM

Name: XXXXX XXXXXXX ID: XXXXXX Flight Number: IB 3169 Aircraft Reg: XXXX From: MAD To: DUB

FLIGHT PLAN: FLIGHT SUMMARY

Home
Flight Plan
Future Flights
Messaging
Documents
LOGOUT
Logout
HILAS FEEDBACK

Flight Plan Summary | TEM & Briefing | Routing & Flight Levels | Alternates | Fuel & Trends Info
Weather | Aircraft | Passenger & Load | NOTAMS | Crew | Airports

FLIGHT DETAILS (DEPARTURE)

ETD: XXXXXXXXXXXX
Slot Status: 13:45
Aircraft Status: At Gate
Gate Number: 27
Weather Status: CAVOK
Current Runway In Use: 15
Co-ordinator: XXXXXX

FLIGHT DETAILS (ARRIVAL)

ETA: XXXXXXXXXXXX
Weather Status: CAVOK
Current Runway In Use: 04
Airport: CAT 11/111

LATEST OPERATIONAL CHANGES & MESSAGES

Aircraft change: A320 (B)
Cabin Attendant change: XXXXXXXX
Passenger update: 7 passengers in transit (delay = 1 hour approx)

RISK **Low, Auto Dispatch**

Aircraft: **Low** Crew: **Low** Environment: **Medium**

AIRCRAFT

Aircraft Type/Model: A320 (B4) Technical Status: TBC Operational bulletin: Yes

CREW

Captain: Checked in First Officer: Checked in
Senior Cabin Crew: Checked in Cabin Attendants: 2 of 4 checked in

PASSENGERS

Total: 48/50 98/100 146/150 Transits: (7), delayed by 1 hour ID/Free Tickets, Iberia: (2)

FLIGHT PLAN

Flight Plan Signoff: No
Fuel: Standard XXXX kilos Flight Level: Standard Alternates: Standard

EFB – Home Page

HILAS EFB
Airlines Logo

Name: XXXXX XXXXXXX ID: XXXXXX Flight Number: IB 3169 Aircraft Reg: XXXX From: MAD To: DUB
12:45, 13:06:2007

Home

Flight Plan

Future Flights

Reports

Messaging

LOGOUT

Logout

GO TO DEMO MENU

HILAS FEEDBACK

BATTERY

02:31

HOME

FLIGHT PLAN (THIS FLIGHT)

Risk Status: Low, Auto Dispatch

ETD: XXXXXXXXXXXX ETA: XXXXXXXXXXXX Slot Status: 13:45

Aircraft Status: At Gate Gate Number: 27 Co-ordinator: XXXXXX

[View Flight Plan Details](#)

MESSAGES SUMMARY

(3) New Messages
(1) Sent Message
(0) Draft Message

[View Messages](#)

FUTURE FLIGHTS SUMMARY

Flights Today Flights This Pairing

Info	Flight No	Date	ESD	From	To	Changes/Notices	Risk Status	Briefing
<input checked="" type="checkbox"/>	IB XXXX	13:06:07	XXXXX	XXXXX	XXXXX	Yes	Low	<input type="checkbox"/>
<input checked="" type="checkbox"/>	IB XXXX	13:06:07	XXXXX	XXXXX	XXXXX	Yes	Low	<input type="checkbox"/>
<input checked="" type="checkbox"/>	IB XXXX	13:06:07	XXXXX	XXXXX	XXXXX	TBC	TBC	<input type="checkbox"/>

[View Flight Plan Information For Selected Flight](#)

COMMUNICATIONS

Last Update: 10:45 - 22:03:2007

Next Update: 12:45 - 22:03:2007

[Communicate / Synchronise](#)

CONNECTIONS STATUS

Status of Connection: On Ground, Connected

Connection: GPRS Signal: Strong

Typical Update Time: 1.5 minutes

EFB – Flight Plan Summary

HILAS EFB
Airlines Logo

Name: XXXXX XXXXXXX ID: XXXXXX Flight Number: IB 3169 Aircraft Reg: XXXX From: MAD To: DUB
12:45, 13:06:2007

Home

Flight Plan

Future Flights

Reports

Messaging

LOGOUT

Logout

GO TO DEMO MENU

HILAS FEEDBACK

BATTERY

02:31

FLIGHT PLAN: FLIGHT SUMMARY

[Flight Plan Summary](#)
[TEM & Briefing](#)
[Routing & Flight Levels](#)
[Alternates](#)
[Fuel & Trends Info](#)
[Weather](#)
[Aircraft](#)
[Passenger & Load](#)
[NOTAMS](#)
[Crew](#)
[Airports](#)

FLIGHT DETAILS (DEPARTURE)

ETD: XXXXXXXXXXXX

Slot Status: 13:45

Aircraft Status: At Gate

Gate Number: 27

Weather Status: CAVOK

Current Runway In Use: 15

Co-ordinator: XXXXXX

FLIGHT DETAILS (ARRIVAL)

ETA: XXXXXXXXXXXX

Weather Status: CAVOK

Current Runway In Use: 04

Airport: CAT 11/111

LATEST OPERATIONAL CHANGES & MESSAGES

Aircraft change: A320 (B)

Cabin Attendant change: xxxxxxxx

Passenger update: 7 passengers in transit (delay = 1 hour approx)

COMMS

Last Update: 10:45 - 22:03:2007

Next Update: 12:45 - 22:03:2007

[Communicate](#)

RISK Low, Auto Dispatch

Aircraft: Low Crew: Low Environment: Medium

AIRCRAFT

Aircraft Type/Model: A320 (B4) Technical Status: TBC Operational bulletin: Yes

CREW

Captain: Checked in First Officer: Checked in

Senior Cabin Crew: Checked in Cabin Attendants: 2 of 4 checked in

PASSENGERS

Total: 48/50, 98/100, 146/150 Transits: (7), delayed by 1 hour ID/Free Tickets, Iberis: (2)

FLIGHT PLAN

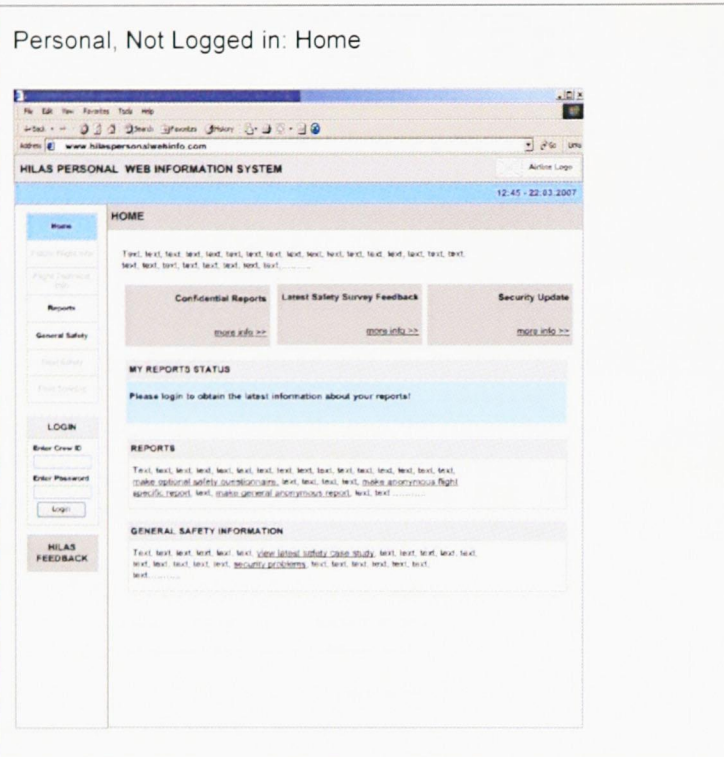
Flight Plan Signoff: No

Fuel: Standard: xxxx kilos Flight Level: Standard Alternates: Standard

81

Appendix 10: Participatory Design: Phase 2, Updated Prototypes

Personal Not Logged In



Personal Logged In

Personal, Logged in: Home

The screenshot shows a web browser window displaying the 'HILAS PERSONAL WEB INFORMATION SYSTEM'. The user is logged in as 'NAME: XXXXX XXXXX' with ID 'XXXXXXXX' and Role 'XXXXXXXX'. The date is '12-45 - 22-03-2007'. The main content area is titled 'HOME' and contains several sections:

- Future Flight Info:** Placeholder text.
- Flight Technical Info:** Placeholder text.
- Reports:** A yellow box containing:
 - (1) New complete Flight Deck reports required [more info](#)
 - (1) Draft mandatory performance report to finish [more info](#)
 - (1) Draft optional report to finish [more info](#)
- General Safety:** Placeholder text.
- Fuel Safety:** Placeholder text.
- Flight Training:** Placeholder text.
- LOGOUT:** A 'Logout' button and placeholder text:
 - (1) Special flight this week [more info](#)
 - (2) Routine flight this week [more info](#)
- HILAS FEEDBACK:** Three buttons for 'Latest A320 Case Study', 'A320 Operating Guidelines', and 'Latest Safety Bulletin', each with a 'more info >>' link.

Personal, Logged in: Future Flight Summary

The screenshot shows the 'HILAS DISPATCH SYSTEM' interface. The user is logged in as 'NAME: XXXXX XXXXX' with ID 'XXXXXXXX' and the date is '12-45 - 13-04-2007'. The main content area is titled 'FUTURE FLIGHTS' and contains:

- Home** (selected)
- Flight Plan**
- Future Flights:** A section titled 'FUTURE FLIGHTS SUMMARY' with placeholder text and radio buttons for 'Flights Today' and 'All Flights This Pairing'.
- Messaging**
- Documents**
- LOGOUT:** A 'Logout' button.
- HILAS FEEDBACK:** A 'View Flight Plan Information For Selected Flight' button.

A table is displayed with the following data:

Date	Flight No	Date	ESD	From	To	Changes/Notes	Risk Status	Briefing	Unfamiliar
13-04-07	JB XXX	13-04-07	XXXX	XXXX	XXXX	Yes	Low	Yes	Yes
13-04-07	JB XXX	13-04-07	XXXX	XXXX	XXXX	TBC	TBC		

EFB

EFB: Login

HILAS EFB Airline Logo

12:45, 13:06:2007

LOGIN

Please LOGIN to access the EFB application. Either member of crew may login.

1. Enter Flight Number
2. Enter Username
3. Enter Password/ID
4. Select Login

EFB: Home

HILAS EFB Airline Logo

12:45, 13:06:2007

Name: XXXXX XXXXXX ID: XXXXXX Flight Number: IB 3169 Aircraft Reg: XXXX From: MAD To: DUB

HOME

Home
Flight Plan
Future Flights
Reports
Messaging

FLIGHT PLAN (THIS FLIGHT)


Risk Status: Low - Auto Dispatch

ETD: XXXXXXXXXXXX ETA: XXXXXXXXXXXX Slot Status: 13:45
Aircraft Status: At Gate Gate Number: 27 Co-ordinator: XXXXXX
[View Flight Plan Details](#)

LOGOUT

GO TO DEMO MENU

HILAS FEEDBACK

BATTERY
 02:31

MESSAGES SUMMARY

(2) New Messages
(1) Sent Message
(8) Draft Message
[View Messages](#)

FUTURE FLIGHTS SUMMARY

Flights Today Flights This Pairing

Info	Flight No	Date	ESD	From	To	Changes/Notice	Risk Status	Briefing
	IB 3169	13:06:07	XXXXX	XXXXX	XXXXX	Yes	Low	<input type="checkbox"/>
	IB 3169	13:06:07	XXXXX	XXXXX	XXXXX	Yes	Low	<input type="checkbox"/>
	IB 3169	13:06:07	XXXXX	XXXXX	XXXXX	TBC	TBC	<input type="checkbox"/>

[View Flight Plan Information For Selected Flight](#)

COMMUNICATIONS
Last Update: 10:45 - 22:03:2007
Next Update: 12:45 - 22:03:2007

CONNECTIONS STATUS
Status of Connection: On Ground Connected
Connection: GPRS Signal: Strong
Typical Update Time: 1.5 minutes

EFB: Current Flight (Flight Summary)

HILAS EFB Airline Logo

12:45, 13:06:2007

Name: XXXXX XXXXXX ID: XXXXXX Flight Number: IB 3169 Aircraft Reg: XXXX From: MAD To: DUB

FLIGHT PLAN: FLIGHT SUMMARY

Flight Plan Summary | TEM & Briefing | Routing & Flight Levels | Alternates | Fuel & Trends Info
Weather | Aircraft | Passenger & Load | NOTAMS | Crew | Airports

FLIGHT DETAILS (DEPARTURE)

ETD: XXXXXXXXXXXX
Slot Status: 13:45
Aircraft Status: At Gate
Gate Number: 27
Weather Status: CAVOK
Current Runway In Use: 15
Co-ordinator: XXXXXX

FLIGHT DETAILS (ARRIVAL)

ETA: XXXXXXXXXXXX
Weather Status: CAVOK
Current Runway In Use: 04
Airport: CAT 11/111

LATEST OPERATIONAL CHANGES & MESSAGES

Aircraft change: A320 (B)
Cabin Attendant change: XXXXXXXX
Passenger update: 7 passengers in transit (delay = 1 hour approx)

RISK Low - Auto Dispatch

Aircraft: Low Crew: Low Environment: Medium

AIRCRAFT

Aircraft Type/Model: A320 (B4) Technical Status: TBC Operational bulletin: Yes

CREW

Captain: Checked in First Officer: Checked in
Senior Cabin Crew: Checked in Cabin Attendants: 2 of 4 checked in

PASSENGERS

Total: 48/50, 98/100: 146/150 Transits: (7), delayed by 1 hour ID/Free Tickets, Iberia: (2)

FLIGHT PLAN

Flight Plan Signoff: No
Fuel: Standard: XXXX kilos Flight Level: Standard Alternates: Standard


Home
Flight Plan
Future Flights
Reports
Messaging

LOGOUT

GO TO DEMO MENU

HILAS FEEDBACK

COMMS
Last Update: 10:45 - 22:03:2007
Next Update: 12:45 - 22:03:2007

BATTERY
 02:31

EFB: Future Flights

HILAS EFB Airline Logo

12:45, 13:06:2007

Name: XXXXX XXXXXX ID: XXXXXX

FUTURE FLIGHTS

FUTURE FLIGHTS SUMMARY

Please note that you ACCESS future flight plan information (e.g. routing, weather, airport information etc) only. This information is not updated in real-time (e.g. current to last ground update).
Flight plan actions (e.g. request additional fuel), cannot be performed until the previous flight is finished if you wish to request additional fuel for your next flight, while in the air, please use the ACARS system.

Flights Today Flights This Pairing

Info	Flight No	Date	ESD	From	To	Changes/Notice	Risk Status	Briefing	Unfamiliar
	IB 3169	13:06:07	XXXXX	XXXXX	XXXXX	Yes	Low	<input type="checkbox"/>	No
	IB 3169	13:06:07	XXXXX	XXXXX	XXXXX	Yes	Low	<input type="checkbox"/>	Yes
	IB 3169	13:06:07	XXXXX	XXXXX	XXXXX	TBC	TBC	<input type="checkbox"/>	


[View Flight Plan Information For Selected Flight](#)

LOGOUT

GO TO DEMO MENU

HILAS FEEDBACK


COMMS
Last Update: 10:45 - 22:03:2007
Next Update: 12:45 - 22:03:2007

BATTERY
 02:31

EFB: Message in Queue

Communicate Update Message


COMMUNICATE UPDATE


 Please note that your message is being queued, and will be sent once you communicate/synchronise with ground systems.

EFB: Communications In Progress

Communications In Progress Update

COMMUNICATIONS IN PROGRESS

 Communications/synchronisation with ground systems is currently in progress.



EFB: Communications Complete

Communicate Complete Message

COMMUNICATIONS COMPLETE

 You have successfully communicated/synchronised with ground system.

Appendix 11: Proposed Intelligent Flight Plan (Current Flight) - Prototypes

Flight Plan / Summary

HILAS DISPATCH SYSTEM
✕ Airline Logo

Name: XXXXX XXXXXX ID: XXXXXX Flight Number: IB 3163 Aircraft Reg: XXXX From: MAD To: DUB 12:45 - 13:06:2008

Home

Flight Plan

Future Flights

Messaging

Documents

LOGOUT

Logout

HILAS FEEDBACK

Last Update of Flight Plan Information

12:40 -13:06:08

FLIGHT PLAN: FLIGHT SUMMARY

Flight Plan Summary
TEM & Briefing
Routing & Flight Levels
Alternates
Fuel & Trends Info

Weather
Aircraft
Passenger & Load
NOTAMS
Crew
Airports
Signoff Flight Plan

FLIGHT PLAN STATUS

Last Update: 12:40 - 13:06:2008
Dispatch Status: Auto Dispatch
Flight Plan Signoff: No

Fuel: Standard: xxxx kilos
Flight Level: Standard
Alternates: Standard

FLIGHT DETAILS (DEPARTURE)

ETD: xxxxxxxxxxxx

Slot Status: 13:45

Aircraft Status: At Gate

Gate Number: 27

Weather Status: CAVOK

Current Runway In Use: 15

Co-ordinator: XXXXXX

FLIGHT DETAILS (ARRIVAL)

ETA: xxxxxxxxxxxx

Weather Status: CAVOK

Current Runway In Use: 04

Airport: CAT 11/111

LATEST MESSAGES (OPERATIONAL UPDATES, CHANGES, RELEVANT REAL TIME REPORTS)

No Messages: (5) Time & Date Last Message: 13:10 - 13:06:2008

Status	From	Date & Time	Message
<input type="checkbox"/>	Co-Ordinator	13:10 - 13:06:2008	Passenger update: 7 passengers in transit (delay + 1 hour approx)
<input type="checkbox"/>	Duty Manager	XXXXXXXXXXXX	Bird strike reported at DUB airport
<input type="checkbox"/>	Duty Manager	XXXXXXXXXXXX	Potential for aircraft change - aircraft technical status TBC

RISK/TEM SUMMARY

Overall Risk Rating: Low

Aircraft: Low Crew: Medium Environment: Medium

CUSTOM RISK/TEM BRIEFING

Briefing available: Yes Status of Briefing: System (No extra information added by Crew e.g. high involvement options)

[View Briefing](#)

OTHER BRIEFINGS & BULLETINS

Type	Availability	Last Update	View Info
Special Flight Briefing/Approach Briefing	Yes	XXXXXXXXXX	View
Airport Bulletin	Yes	XXXXXXXXXX	View
Operational Bulletin	Yes	XXXXXXXXXX	View

AIRCRAFT

Aircraft Type/Model: A320 (B4) Technical Status: TBC

CREW

Captain: XXXXX, Checked in First Officer: XXXXX, Checked in

Senior Cabin Crew: XXXXX, Checked in Cabin Attendants: 2 of 4 checked in

PASSENGERS

Total: 48/50, 98/100: 146/150 Transits: (7), delayed by 1 hour ID/Free Tickets, Iberia: (2)

Flight Plan /TEM/Briefing

HILAS DISPATCH SYSTEM
Airline Logo

Name: XXXXX XXXXXX ID: XXXXXX Flight Number: IB 3169 Aircraft Reg: XXXX From: MAD To: DUB 12:45 - 13:06:2008

Home

Flight Plan

Future Flights

Messaging

Documents

LOGOUT

Logout

HILAS FEEDBACK

Last Update of Flight Plan Information

12.40 - 13:06:08

FLIGHT PLAN: TEM & BRIEFING

Flight Plan Summary
TEM & Briefing
Routing & Flight Levels
Alternates
Fuel & Trends Info

Weather
Aircraft
Passenger & Load
NOTAMS
Crew
Airports
Signoff Flight Plan

RISK/TEM SUMMARY

Risk Status: Low **Dispatch Type:** Auto Dispatch

Aircraft: Low **Crew:** Medium **Environment:** Medium

RISK/THREAT INFORMATION

Please note that the TEM information provided here reflects the latest information recorded in the safety system, related to flight threats identified for this flight - up until the publication of the flight plan by Dispatch (e.g. 1 to 2 hours before flight). Information pertaining to threats identified after the publication of the flight plan and/or operational updates - is recorded in the operational updates section below.

View (Risk/Threat Info) Crew Aircraft Environment

View (Timeline) All / Full Flight Specific Process Phase or Sub Phase

Phase Pre Flight Flight Execution Post Flight

Sub Phase Pre Flight Planning & Briefing Release & Turnaround

Risk/Threat Details

Crew Arrive
Dispatch
Flight Briefing
Transfer to Aircraft

Type	Risk Rating	Threat	Briefing	How Manage (Opt)	Mnd. Report
Crew	Low	FO less than 100 hrs on A320	View	Add Info	<input type="checkbox"/> Make Report
Crew	Low	Last flight of 3 day pairing	View	Add Info	
Aircraft	Low	APU US	View	Add Info	
Environ.	Low	ATC Restrictions	View		
Environ.	Medium	Weather at DUB - CAT II/III	View		

LATEST MESSAGES (OPERATIONAL UPDATES/CHANGES, REAL TIME THREATS)

Please review the latest operational messages related to your flight. Note that this includes any real time information about flight threats, or operational changes that may become flight threats.

No Messages: (5) **Time & Date Last Message:** 13:10 - 13:06:2008

Status	From	Date & Time	Message
<input type="checkbox"/>	Co-Ordinator	13:10 - 13:06:2007	Passenger update: 7 passengers in transit (delay = 1 hour approx)
<input type="checkbox"/>	Duty Manager	XXXXXXXXXXXXXX	Bird strike reported at DUB airport
<input type="checkbox"/>	Duty Manager	XXXXXXXXXXXXXX	Potential for aircraft change - aircraft technical status TBC

HIGH INVOLVEMENT (OPTIONAL)

Enter Additional Information About Flight Threats (Not Recorded Above) & How Manage

Send Flight TEM/Briefing Information To Senior Cabin Crew

Add more general tips/briefing information relating to this (1) flight/route, (2) aircraft type, (3) departure or arrival airport and/or (4) points of observation that you think might be relevant to other crews.

RISK/TEM BRIEFING INSTRUCTION

Please review the briefing summary for your flight. This includes a summary of (1) all briefing information (e.g. best practice) related to flight threats recorded by the system and (2) any additional information entered by you relating to how manage these threats, or how manage threats not identified by the system (e.g. high involvement options).

X

Y

Z

OTHER BRIEFINGS & BULLETINS

Type	Availability	Last Update	View Info
Special Flight Briefing/Approach Briefing	Yes	XXXXXXXXXX	View
Airport Bulletin	Yes	XXXXXXXXXX	View
Operational Bulletin	Yes	XXXXXXXXXX	View

Crew Information

HILAS DISPATCH SYSTEM
Airline Logo

Name: xxxxx xxxxxxx ID: xxxxxx Flight Number: IB 3169 Aircraft Reg: xxxx From: MAD To: DUB
12:45 - 13:06:2008

Home

Flight Plan

Future Flights

Messaging

Documents

LOGOUT

Logout

HILAS
FEEDBACK

Last Update of
Flight Plan
Information

12.40 -13:06:08

FLIGHT PLAN: CREW INFORMATION

Flight Plan Summary
TEM & Briefing
Routing & Flight Levels
Alternates
Fuel & Trends Info

Weather
Aircraft
Passenger & Load
NOTAMS
Crew
Airports
Signoff Flight Plan

COCKPIT CREW

<p style="margin: 0;">CAPTAIN</p> <p style="margin: 5px 0;">Name: XXXXXX </p> <p style="margin: 5px 0;">Date Joined Fleet: 22:01:2004</p> <p style="margin: 5px 0;">Prior Experience of Route: Yes</p> <p style="margin: 5px 0;">Last Time Flown Route: 15:03:2008</p>	<p style="margin: 0;">FIRST OFFICER</p> <p style="margin: 5px 0;">Name: XXXXXX </p> <p style="margin: 5px 0;">Date Joined Fleet: 01:04:2008</p> <p style="margin: 5px 0;">Prior Experience of Route: Yes</p> <p style="margin: 5px 0;">Last Time Flown Route: 11:05:2008</p>
---	---

CABIN CREW

<p style="margin: 0;">SENIOR CABIN CREW</p> <p style="margin: 5px 0;">Name: XXXXXX </p> <p style="margin: 5px 0;">Date Joined Fleet: 22:01:1994</p>	<p style="margin: 0;">CABIN CREW</p> <p style="margin: 5px 0;">Name: XXXXXX </p> <p style="margin: 5px 0;">Date Joined Fleet: 13:09:2000</p>
<p style="margin: 0;">CABIN CREW</p> <p style="margin: 5px 0;">Name: XXXXXX </p> <p style="margin: 5px 0;">Date Joined Fleet: 29:03:2005</p>	<p style="margin: 0;">CABIN CREW</p> <p style="margin: 5px 0;">Name: XXXXXX </p> <p style="margin: 5px 0;">Date Joined Fleet: 05:01:2007</p>

91

Aircraft Information

HILAS DISPATCH SYSTEM Airline Logo

Name: xxxxxx xxxxxxxx ID: xxxxxx Flight Number: IB 3169 Aircraft Reg: xxxx From: MAD To: DUB 12:45 - 13:06:2008

FLIGHT PLAN: AIRCRAFT INFORMATION

Flight Plan Summary | TEM & Briefing | Routing & Flight Levels | Alternates | Fuel & Trends Info
Weather | **Aircraft** | Passenger & Load | NOTAMS | Crew | Airports | Signoff Flight Plan

AIRCRAFT SUMMARY INFORMATION

Aircraft Type/Model: A320 (B4)	Current Technical Status: TBC
Last Turnaround Check: xxxxxxxx	Engineer Name/ID: xxxxxxxxxxxx
Last Turnaround Check Details:	New Deferred Defects: (2)
	Old Deferred Defects: (5)
	View Deferred Defects List (Technical Log)

AIRCRAFT CHECKS SUMMARY

Last Daily Check: xxxxxxxx	Next Daily Due: xxxxxxxx
Last Weekly Check: xxxxxxxx	Next Weekly Check Due: xxxxxxxx

Home

Flight Plan

Future Flights

Messaging

Documents

LOGOUT

Logout

HILAS FEEDBACK

Last Update of Flight Plan Information

12:40 - 13:06:08

NOTAMS

HILAS DISPATCH SYSTEM
Airline Logo

Name: xxxxx xxxxxxxx ID: xxxxxx Flight Number: IB 3169 Aircraft Reg: xxxx From: MAD To: DUB 12:45 - 13:06:2008

Home

Flight Plan

Future Flights

Messaging

Documents

LOGOUT

Logout

HILAS
FEEDBACK

FLIGHT PLAN: FUEL INFORMATION

Flight Plan Summary TEM & Briefing Routing & Flight Levels Alternates Fuel & Trends Info

Weather Aircraft Passenger & Load NOTAMS Crew Airports Signoff Flight Plan

NOTAMS SUMMARY

Total NOTAMS: (30) (20) (10) (0) NOTAMS Status: Medium

NOTAMS LIST

Rating All High Medium Low

Timeline All /Full Flight Departure Cruise Arrival

NOTAMS List

No	Rating	Timeline	Details
1	Low	XXX	xxxxxxxxxxx
2	Low	XXXX	xxxxxxxxxxxxxxx
3	Low	XXXX	xxxxxxxxxxxxxxx
4	Low	XXXX	xxxxxxxxxxxxxxx
5	Medium	XXXXX	xxxxxxxxxxxxxxxxxxx

93

High Involvement Options

DATA FORM

Add Information About How Manage Recorded Threats

Add Information About How Manage Specific Flight Threats Listed

ADD INFORMATION ABOUT SPECIFIC FLIGHT THREATS

Threat type: Crew Aircraft Environment

Timeline: All / Full Flight Specific Process Phase or Sub Phase

Rating: Low Medium High

Threat Description:

How Manage:

Keywords:

Add Information

Add Information About New Threats and How Manage

Add Information About Additional Threats

INFORMATION ABOUT ADDITIONAL THREATS

Threat type: Crew Aircraft Environment

Timeline: All / Full Flight Specific Process Phase or Sub Phase

Select Specific Timeline: Phase Pre Flight Flight Execution Post Flight

Sub Phase: All Pre Flight Planning & Briefing Aircraft Release & Turnaround

Gate: All Crew Arrive Dispatch Briefing Transfer to Aircraft

Rating: Low Medium High

Threat Description:

Keywords:

How Manage:

Keywords:

Add Information

Add Information & Enter Information About Additional Threats

Send Information To Senior Cabin Crew

Send Briefing Information To Senior Cabin Crew

SEND BRIEFING INFORMATION TO SENIOR CABIN CREW

Information: All Information Specific Information

Threat Type: Crew Aircraft Environment

Timeline: All Specific Timeline

Select Which Threats to Communicate to Crew, and if Feedback to CPT required

Type	Risk Rating	Threat	Inform CC	CPT Feedback
Crew	Low	FO less than 100 hrs on A320	<input type="checkbox"/>	<input type="checkbox"/>
Crew	Low	Last flight of 3 day roster	<input type="checkbox"/>	<input type="checkbox"/>
Aircraft	Low	APU / IS	<input type="checkbox"/>	<input type="checkbox"/>
Environ	Low	ATC Restrictions	<input type="checkbox"/>	<input type="checkbox"/>
Environ	Medium	Weather at DUB - CAT II/III	<input type="checkbox"/>	<input type="checkbox"/>

Send Information To Senior Cabin Crew

Flight Plan Signoff

HILAS DISPATCH SYSTEM Airline Logo

Name: xxxxx xxxxxxx ID: xxxxxx Flight Number: IB 3169 Aircraft Reg: xxxx From: MAD To: DUB 12:45 - 13:06:2008

FLIGHT PLAN: SIGNOFF FLIGHT PLAN

Flight Plan Summary | TEM & Briefing | Routing & Flight Levels | Alternates | Fuel & Trends Info
Weather | Aircraft | Passenger & Load | NOTAMS | Crew | Airports | **Signoff Flight Plan**

FLIGHT PLAN SUMMARY INFORMATION

Fuel Figure: xxxxxxx Flight Level: xxxxxxxxxxxx
Alernate: xxxxxxxxxxxx Other: xxxxxxxxxxxx

Other Information to be Detailed

FLIGHT PLAN SIGNOFF

Captain Details: xxxxxxxxxxxxxxxx

Signoff: Popup signature – once entered – appears in greyed out format

Appendix 12: Operational and Organisational Processes Underlying Intelligent Flight Plan

#	Process	Function	Sub Process	New Aspects
1	Flight Planning Process	Flight Planning	Aircraft pairing and rostering by Flight Planning	Taking into account latest feedback from Safety Department following crew reports
		Dispatch	Production of flight plan by Dispatch	Taking into account risk analysis feedback by relevant Safety/Risk personnel – this includes both ongoing proactive risk management and reactive risk management activities – specifically reactive(tactical) activities
		Flight Crew/Dispatch	Finalisation and handover of Flight Plan to Flight Crew by Dispatch	Taking into account the latest information about the operation (e.g. status and risk assessment)
		Flight Crew	Flight Crew – briefing and planning activities – following underlying CRM and TEM training approaches	Use of TEM and CRM information in flight plan
			Ongoing management of operation/flight plan by Flight Crew	Adding information about threats not recorded in system and how propose to manage them Sending briefing instruction to Senior Cabin Crew
		Flight Crew & Other Ops Roles (e.g. Maintenance, Co-ordinator, Fueller, Load Control)	Information sharing between Flight Crew and other operational roles at different points in flight timeline	Operational updates

		Flight Crew and Duty Manager	Co-ordination between Flight Crew and Flight Operations Duty Manager regarding specific flight (e.g. operational/environmental problems)	Operational updates Joint problem solving FC/Duty Manager – sharing flight plan information
			Real time management of global flight operations by Flight Operations Duty Manager	Operational updates Joint problem solving FC/Duty Manager – sharing flight plan information
		Flight Crew	Flight Crew reporting at the end of the flight	Extended Journey Log on EFB Flight Crew review of reports archive
3	Safety/Quality/Improvement Process	Safety Department	Analysis of reports data for risk management/organisational learning purposes by Risk and Safety Personnel	Customisation of TEM information for flight plan
				Generation of requests for mandatory reports about specific flight threats (noted in flight plan)
				Feedback to Flight crew about safety actions
				Feedback to flight planning about risks to be mitigated
				Feedback to dispatch – risks for specific flight
		Analysis of FDM data for risk management/organisational learning purposes by Risk and Safety Personnel and feedback to relevant personnel	Flight feedback to crew	
Sharing of safety information with other airlines and relevant agencies	Sharing of safety/risk analysis			
Production of general and fleet specific safety case studies based on operational data by	Use of data to generate case studies			

			Safety/CRM personnel	
		Training	Production of general and fleet specific training information, by Training Dept., following co-ordination with Safety/CRM personnel	Use of data to generate case studies
4	Anytime (relates to all processes)	Management Personnel across different functions	Reporting by any operational or management personnel at any point in time	New self reports – confidential and anonymous
		Flight Crew	Flight Crew reporting at any point in time – confidential and anonymous	Updated reports Flight Crew review of reports archive
			Flight Crew – Competence/Feedback	New case studies New training information
				Flight Crew review of flight feedback information
Flight Planning/Briefing	Flight Crew advance review of flight plan information for future flights			

Appendix 13: Assignment of Risk Rating for Specific Flight

Table 1: Analysis of Current Situation (Example of Potential Data)

#	Category	Type	Description
1	Crew	Crew authority grade	Captain/First Officer
		Overall crew flying experience	Flying hours
		Crew Fleet experience	Flying hours
		Crew Ratings	Flight Checks, Simulator Checks, Ground School Checks, Other
		Competences	Technical, social/CRM
		English proficiency	Native language, level of fluency
		Recent flying	If back from holidays or sick leave, or mid roster
		Crew Familiarity	Familiarity with route, departure airport, arrival airport
		Duty/Fatigue	Location in duty roster and fatigue
		Flight Crew familiarity	Crew flown before together
		Flight Crew familiarity with CC	Crew flown before with senior cabin crew
		Safety events	Crew experienced problems/near misses/incidents – related to route
2	Aircraft	Technical log/MEL	Deferred defects (number and complexity)
		Daily check due	Data and time, location, status/updates
		Weekly check due	Data and time, location, status/updates
		Monthly check due	Data and time, location, status/updates
		Other issues	-
		Flight Plan/navigation	Standard, changes
		Flight Plan/fuel	Standard, changes

	Visibility	Night/day, Fog, Rain
	Weather (Fog)	Standard, Fog and level of
	Weather (Rain)	Standard, Rain and level of
	Weather (Snow/Ice)	None, level of
	Weather (Turbulence)	None, level of
	Weather (Wind)	Standard, light winds, gale, storms
	NOTAMS	NOTAMS apply to departure and arrival airport
	Routing	Complexity Mountains/high terrain
	Departure procedure	Complexity
	Approach procedure	Complexity, type of approach – straight in/circular
	Departure Airport	NOTAMS, status of runways navigational support, complexity of departure SOP
	Arrival Airport	NOTAMS, status of runways navigational support, complexity of departure SOP
	ATC	Delays/holding – recent report
	Bird Strike	Recent/new report
	Security	Relevant security procedures for route/airport Standard/special
	Passengers	Special passengers
	Cargo	Special cargo /NOTOCS, operating at maximum weight

Table 2: Historical/retrospective Data safety analysis (Example of Potential Data)

#	Category	Type	Description
1	Crew	Status of CRM across Fleet Crew	General trends, reports
		Status of fatigue across Fleet Crew	General trends, reports
		Flight Crew pairing/CRM issues	-
		Flight Crew/Cabin Crew – pairing issues	-
		Other Team/CRM issues	Dispatch, Duty Manager, Co-ordinator
2	Aircraft	Aircraft/fleet	General trends – anything to be aware of
		Specific Aircraft Registration	History, anything to be aware of
3	Environment	Bird strikes	Time of year/season, specific reports, relevant recent reports
		ATC Issues	Standard to have holding, difficulties contacting etc)
		Route and complexity / General	-
		FDM Analysis /Route	Note: not personal data
		FDM Analysis /Departure airport	Note: not personal data
		FDM Analysis /Arrival airport	Note: not personal data
		Departure airport	Runway information (length, surface quality, runway depth) runway issues, navigational support
		Arrival airport	Runway information (length, surface quality, runway depth) runway issues, navigational support
		Departure procedure	Complexity, suitability of
		Arrival procedure	Complexity, suitability of
		Weather trends	Time of year/season, recent reports

Appendix 14: Summary of Thesis Data Available on CD

Study	Location	#	Title
	Study 1/Workshop Feedback	1	Workshop Observations: Airline 1
		2	Workshop Observations: Airline 2
		3	Workshop Observations: Airline 3
		4	Workshop Observations: Airline 4
		5	Workshop Observations: Airline 5
		6	Workshop – Summary Themes
	Study 1/ Analysis / Team Performance Requirements	7	1a, flight planning and briefing
		8	1 b, dispatch and turnaround
		9	2a, off blocks, taxi and takeoff
		10	2 b, approach and landing
		11	1a, flight planning and briefing: 1a_1_crew arrive
		12	1a, flight planning and briefing: 1a_2_dispatch
		13	1a, flight planning and briefing: 1a_3_crew meeting
		14	1a, flight planning and briefing: 1a_4_transport_aircraft
		15	1 b, dispatch and turnaround: 1b_1_arrive_aircraft
		16	1 b, dispatch and turnaround: 1b_2_aircraft_technicalregister
		17	1 b, dispatch and turnaround: 1b_3_fullcrewbriefing
		18	1 b, dispatch and turnaround: 1b_4_cabin_ready_board
		19	1 b, dispatch and turnaround: 1b_5_alldoorsclosed

		20	2a, off blocks, taxi and takeoff: 2a_1_offblocks
		21	2a, off blocks, taxi and takeoff: 2a_2_taxi
		22	2a, off blocks, taxi and takeoff: 2a_3_readytakeoff
		23	2a, off blocks, taxi and takeoff: 2a_4_takeoff
		24	2 b, approach and landing: 2b_1_preparedescent
		25	2 b, approach and landing: 2b_2_topofdescent
		26	2 b, approach and landing: 2b_3_15minsbefore
		27	2 b, approach and landing: 2b4_sterilecockpit
		28	2 b, approach and landing: 2b5:at_transitionlevel
		29	2 b, approach and landing: 2b_6_initialapproachfix
		30	2 b, approach and landing: 2b7_finalapproachfix
		31	2 b, approach and landing: 2b8_1000ft
		32	2 b, approach and landing: 2b9_decisionheight
		33	2 b, approach and landing: 2b10_touchdown_rollout
		34	2 b, approach and landing: 2b11_captainhandover
		35	2 b, approach and landing: 2b12_taxi
		36	2 b, approach and landing: 2b13_park_shutdown
		37	3a, post flight review: 3a1_report
		38	3a, post flight review: 3a2_preparenextflight
Study4	Study 4	39	Process Gates and Tasks (High Level Summary)
		40	Level 1_FC_TA2 (Detailed Analysis)
Study 5	Study 5 / Prototypes: Pre Phase 1 PD	41	Dispatch
		42	Personal (not logged in)
		43	Personal (logged in)
		44	EFB

	Study 5 / Prototypes: Post Phase 1 PD	45	Dispatch
		46	Personal (not logged in)
		47	Personal (logged in)
		48	EFB
	Study 5 / Prototypes: Post Phase 2 PD	49	Dispatch
		50	Personal (not logged in)
		51	Personal (logged in)
		52	EFB
Study 6	Study 6 / PD /Phase 1	53	Dispatch
	Study 6 / PD /Phase 2	54	Dispatch
	Study 6 / Implementation Workshop	55	Workbook
		56	Tool A Presentation
		57	FO Strand Presentation
		58	Processes and Scenarios
		59	HCI_Dispatch_Demo
60	Final_Dispatch_HCI		

Appendix 15: Definition of Acronyms used in Thesis

No	Acronym	Description
1	ACARS	Aircraft Communications and Reporting System
2	AMT	Aircraft Management Technologies
3	APU	Aircraft Power Unit
4	ASR	Air Safety Report
5	ASRS	Air Safety Reporting System
6	ATA	Air Transport Association
7	ATC	Air Traffic Control
8	ATIS	Air Traffic Information Service
9	ATM	Air Traffic Management
10	CTM	Cockpit Task Management
11	CAT	Category
12	CFIT	Controlled Flight into Terrain
13	COA	Choosing a Course of Action
14	CSCW	Computer Supported Collaborative Work
15	CRM	Crew Resource Management
16	CTA	Cognitive Task Analysis
17	CWA	Cognitive Work Analysis
18	DME	Distance Measuring Equipment
19	DVI	Direct Voice Input
20	EASA	European Aviation Safety Agency
21	ECAM	Electronic Centralized Aircraft Monitor
22	EFB	Electronic Flight Bag

23	FAA	Federal Aviation Authority
24	FOM	Flight Operations Manuals
25	FC	Flight Crew
26	FANS	Future Air Navigation System
27	FDM	Flight Data Monitoring
28	FMC	Flight Management Computer
29	FMGS	Flight Management Guidance System
30	FOQA	Flight Operations Quality Assurance
31	GPWS	Ground Proximity Warning System
32	HCI	Human Computer Interaction
33	HILAS	Human Integration into the Lifecycle of Aircraft Systems
34	HMD	Helmet Mounted Display
35	HUD	Heads Up Display
36	ICAO	International Civil Aviation Authority
37	IAP	Instrument Approach Procedure
38	IFR	Instrument Flight Rules
39	ILS	Instrument Landing System
40	JAA	Joint Aviation Authority
41	LOFT	Line Operations Flight Training
42	LOSA	Line Operations Safety Audit
43	MEL	Minimum Equipment Lists
44	MOR	Mandatory Occurrence Report
45	MX	Maintenance
46	NOTAM	Notices to Airmen
47	PF	Pilot Flying

48	PAPI	Precision Approach Patch Indicator
49	PD	Participatory Design
50	PDA	Portal Digital Assistant
51	PED	Portable Electronic Device
52	PFD	Primary Flight Display
53	PNF	Pilot Not Flying
54	SOP	Standard Operating Procedures
55	SMS	Safety Management System
56	SA	Situation Assessment
57	SID	Standard Instrument Departure
58	STAR	Standard Terminal Arrival Routes
59	TEM	Threat and Error Management
60	TA	Traffic Advisory
61	TCAS	Traffic Collision Avoidance System
62	VFR	Visual Flight Rules
63	VOR	VHF Omni Directional Radio Range
64	RA	Resolution Advisory
65	RIPS	Runway Incursion Prevention System

Appendix 16: Glossary of Aviation/Cockpit Terms

No	Term	Description
1	Airway	An air corridor established for the control of traffic and marked with radio navigation aids.
2	Airspeed (AS)	The speed of an aircraft relative to its surrounding air mass.
3	Altitude (ALT)	The picture of the aircraft route in terms of a sequence of heights in different directions.
4	Active Fix	The fix or waypoint that is the current navigation reference for the aircraft.
5	Beacon	A ground navigational light, radio, or radar transmitter used to provide aircraft in flight with a signal to serve as a reference for the determination of accurate bearings or positions.
6	Bearing	The direction of one point relative to another as measured from a specific reference datum.
7	Clearance	ATC permission to perform an action (e.g. change flight level, altitude, to land, to takeoff etc).
8	Checkpoint	A geographical reference point used for checking the position of an aircraft in flight.
9	Control Point	The position an aircraft must reach at a predetermined time.
10	Course (CRS)	The direction of the intended path of an aircraft over the earth, or the direction of a line on a chart representing the intended aircraft path.
11	DME	Distance Measuring Equipment.
12	Distance (DIS)	Distance is the spatial separation between two points.
13	Drift	The rate of lateral displacement of the aircraft by the wind, generally expressed in degrees.
14	Drift Angle	The difference between the direction the aircraft is pointed at and the direction the aircraft travels.
15	Electronic Flight Information System (EFIS)	This system displays all flight, navigation, and weather radar information on two or three screens.
16	Flight Level (FL)	A surface of constant atmospheric pressure related to the standard datum plane.

17	Fix or Fix/Radial/Distance (FRD)	FRD is an acronym for Fix/Radial/Distance. A fix is the geographic position of an aircraft for a specified time established by navigational aids. Two intersecting LOPs are required to define a position or establish a fix (e.g. Fifth and Main Street).
18	Flight Plan	The Flight Plan features predetermined information for the conduct of the flight.
19	Groundspeed (GS)	The actual speed of an aircraft relative to the earth's surface.
20	Line of Position (LOP)	A line of position (LOP) is a line containing all possible geographic positions of the observer at a given instance in time e.g. Main Street. One LOP only partially defines a position.
21	Own-ship	The aircraft the Pilot is flying.
22	NAVAID	Navigational Aid.
23	Next Fix	The waypoint or fix immediately following the active fix in a flight plan or published flight procedure
24	Position	The current aircraft altitude, heading and nearest VOR.
25	Plan View	Conventional horizontal, top down, birds eye view map display.
26	Radial	A radial is an imaginary line drawn from a VOR.
27	Radio Beacons	Radio beacons are established at range stations along airways and at intermediate points between range stations to assist pilots in fixing position.
28	Routing	Flight plan, direction/speed, passage through different VOR's etc
29	Runway	A defined rectangular area on a land aerodrome prepared for the landing and take-off of an aircraft.
30	Running Fix/Position	To determine the aircraft location, the crew carry forward the last known line of position (based on estimation of distance), so that it intersects with the next line of position.
31	Separation	Distance between two aircraft – taking into account the 3D nature of flight.
32	Pilotage	The process of determination of position by identification of landmarks with their representations on a map or chart.
33	Taxiway	A defined path on a land aerodrome established for the taxing of aircraft and intended to provide a link between one part of the aerodrome and another.
35	Track (TK)	The direction the aircraft travels – specifically the actual path of an aircraft over the surface of the earth or its graphic representation.

35	VOR	VHF Omni Directional Radio Range. This is a signal sent to a receiver on an aircraft to determine the location of the aircraft.
36	VNAV	Vertical Navigation
37	Visual Approach Slope Indicator (VASI)	A pair of lights (ideally red lights over white – if appropriate position), to the side of the runway that instructs the pilot that the plane is on a safe and reasonable descent to the runway. This provides vertical guidance only (e.g. up/down guidance).
38	Waypoints (WPT)	A waypoint is a set of co-ordinates that identifies a specific point or location along a track or route, used by Flight Crew for navigational purposes.

