EPISODE 3

Single European Sky Implementation support through Validation

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EXECUTIVE SUMMARY

This annex contains the questionnaires sent to the Episode 3 Work Work Package 4 experts. These questionnaires include questions related to:

- 4D Trajectory Management /Initial 4d Trajectory Management;
- Change From 2D PTC To ASAS S&M Operation;
- Strategic Complexity Reduction Using 4D PTC;
- Extended AMAN Horizon;
- Flight In Managed Airspace;
- Structured & Non-Structured Airspace;
- Multisector planner Role.

The method used to build and distribute these questionnaires is a modified Delphi Method which includes meetings with the experts.

The annex includes together with the questions the answers provided by the experts and a statistical study of the level of agreement reached.

A collation of the answer of the experts where presented in a meeting for discussion. In the meeting some of the outputs of the questionnaires changed due to the internal discussions. These changes are not reflected in this annex but in the outputs of the main document.

1 INTRODUCTION

The Episode 3 WP4 Expert Group used a method based on questionnaires to gather information about different topics from the experts. This method aimed to extract and maximize the benefits that the Expert Group method presents and minimize its disadvantages.

The Delphi Method was identified as an appropriate technique for the conduction of this Expert Group when further detailing the SESAR ATM target concept. This method consists of the systematic solicitation and collation of judgments on a particular topic through a set of carefully designed sequential questionnaires interspersed with summarized information and feedback of opinions derived from earlier responses.

The Delphi Method does not suggest any kind of meetings where experts are able to discuss some key points, share information and consolidate the results. Since these kinds of meetings are considered important, the present Expert Group used a modified Delphi method, by including some meetings where the analysed information coming from the questionnaires are showed and studied by all participants.

The collation of the questionnaires from the different experts allowed that the point of view from experts who where not able to attend the meetings due to time constrains or location, where taken into account. This method also takes advantage of the synergy of the group discussion and removes undesirable social interactions that exist within any group so that the consensus reached is as reliable as possible.

The Expert Group questionnaire management was based on three main features:

- Anonymity: Various sets of questionnaires where distributed to all experts and the answers of each one gathered prior to the subsequent meeting. The proposals and opinions of each member of the group where anonymous, being disseminated to other experts in an integrated form, without specifying the author of each clarification. This has the following positive aspects:
    - Avoids one group member from influencing the others;
    - Allows a member to re-establish their former view without any loss of reputation;
    - Allows members to express their arguments without worrying about their correctness (this allows people to commit mistakes without losing reputation).
- Controlled feedback and iteration process. There where various rounds of questionnaires plus meetings, which allowed the members of the Expert Group to know other member opinions and thus modify their former opinions.
- The final results are given in a statistical form. The presented information of the group is not just the opinion from the point of view of the majority. Moreover, this gives the grade of consensus reached by the group. The number of experts is very low to make a complete statistical analysis. The average, the mode and the variance are given.

Five questionnaires were distributed and are compiled in this document.

1.1 PURPOSE OF THE DOCUMENT

The purpose of this document is to provide the answers given by the WP4 experts and a statistical analysis of the agreement achieved before the meetings.

1.2 Intended Audience

The intended audience of this annex is the same as the main document, the En-route expert group report [1]. It includes:

- EP3 WP4 En-Route and Traffic Management:
  - EP3 WP4.1 WP4 management and Co-ordination Leader;
  - EP3 WP4.2.2 Operational Concept Refinement Leader;
  - EP3 WP4.3 WP4 Validation Activities Leader;
  - EP3 WP4.3.2 FTS on Strategic de-confliction and 4D Precision Trajectory Clearance -PTC Leader;
  - EP3 WP4.3.3 Gaming on Queue, Trajectory and Separation Management Leader;
  - EP3 WP4.3.4 Prototyping on Queue, Trajectory and Separation Management Leader;
  - EP3 WP4.4 WP4 Final Report Leader.
- EP3 WP2 System Consistency;
- Expert Group Partners.

1.3 Document Structure

This document is structured in an introduction which explains the purpose of the document, the audience involved and the background of the project. Sections two to six contains the questionnaires together with the answers and the statistical analysis. The seventh section contains the references and applicable documents.

1.4 Background

This document is comprised in the Episode3 project. Episode 3 is responsible for the validation of the operational concept expressed by SESAR, whilst ensuring preparation for partners SESAR Joint Undertaking (SJU) activities.

This document is an annex to the En-route expert group report [1], which seeks for concept clarification in issues related to the En-route execution phase of a flight. For further information refer to the report.

1.5 Glossary of Terms

Term	Definition
A/C	Aircraft
ACC	Air Traffic Control Centre / Area Control Centre
ADD	Airborne Derived Data
ADS	Automatic Dependent Surveillance
AMAN	Arrival Manager
ANSP	Air Navigation Service Provider

Term	Definition
AOC	Airline Operational Control / Airlines Operations Centre
APOC	Airport Operations Centre
ARR	Arrival
ASAS	Airborne Separation Assistance Systems
ASAS C&P	ASAS Crossing and Passing
ASAS ITP	ASAS In Trail Procedure
ASAS S&M	ASAS Sequencing&Merging
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer / Air Traffic Controller
ATFMS	Air Traffic Flow Management system
ATM	Air Traffic Management
ATS Supervisor	Air Traffic Service Supervisor
ATSU	Air Traffic Service Unit
AU	Airspace Users
CDA	Continuous Descent Approach
CDM	Collaborative Decision Making
CDTI	Cockpit Displays of Traffic Information
CFMU	Central Flow Management Unit
CL	Capability Level
ConOps	SESAR Concept of Operations
CPDLC	Controller Pilot Data-Link Communication
CTA	Controlled Time of Arrival
CTO	Controlled Time of Over-fly
DCB	Demand and Capacity Balance
DEP	Departure
DFS	Deutsche Flugsicherung GmbH
DOD	Detailed Operational Description document
DSNA	Direction des Services de la Navigation A'rienne
E-AMAN	Extended Arrival Manager
EC	Executive Controller
ECAC	European Civil Aviation Conference
EEC	EUROCONTROL Experimental Centre
EG	Expert Group
E-OCVM	European Operational Concept Validation Methodology
EP3	Episode 3
ETA	Estimated Time of Arrival
FAB	Functional Airspace Block
FC	Flight Crew
FDPS	Flight Data Processing System
FL	Flight Level
FMS	Flight Management System

Issued by the Episode 3 consortium for the Episode 3 project co-funded by the European Commission and Episode 3 consortium.

Term	Definition
FTS	Fast Time Simulation
GAT	General Air Traffic
GE	Gaming Exercise
IAF	Initial Approach Fix
ICAO	International Civil Aviation Organisation
IFR	Instrumental Flight Rules
IP	Implementation Package
ISDEFE	Ingeneria de Sistemas para la Defensa de Espana S.A
KPA	Key Performance Area
KPI	Key Performance Indicator
MET	Meteorological Information Service
MIL	Military
MSAW	Minimum Safe Altitude Warning
MSP	Multi-Sector Planner
MTCD	Medium Term Conflict Detection
MTCD & R	Medium Term Conflict Detection and Resolution
NATS	National Air Traffic Services (UK)
NOP	Network Operational Plan
OAT	Operational Air Traffic
OI	Operational Improvement
OS	Operational Scenario
PROMAS	Process Simulator
PT	Predicted Trajectory
PTC	Precision Trajectory Clearances
QTSM	Queue, Trajectory and Separation Management
RBT	Reference Business Trajectory
RNP	Required Navigation Performance
RTA	Required Time of Arrival
RTS	Real Time Simulation
SAR	Search and Rescue
SBT	Shared Business/Mission Trajectory
SDD	Safety Design document
SESAR	Single European Sky ATM Research programme
SJU	SESAR Joint Undertaking
SL	Service Level
SWIM	System Wide Information Management
TCT	Tactical Controller Tool
TED	Trajectory Editor
TMA	Terminal Manoeuvre Area
TMR	Trajectory Management Requirement
TOC	Top of Climb

Term	Definition
TOD	Top of Descent
TP	Trajectory Predictor
TTA	Target Time of Arrival
TTO	Target Time of Over-fly
UAV	Unmanned Aerial Vehicle
VFR	Visual Flight Rules
VLJ	Very Light Jet
WP	Work Package

2 QUESTIONNAIRE 1

This section reflects the outcomes of the 1st questionnaire before the meeting. Some of the final answers changed in the meeting. These final answers can be found in the minutes [2] and presentation [3] of the first expert group meeting. The final expert group report, [1], reflects the final agreed answers.

4D trajectory management

3D routes (with lateral and vertical containment) may be defined for a given airspace volume. Depending on the airspace, the traffic complexity and the ATM level capability of the service provider and the aircraft concerned, 3D routes may be fixed or temporary in nature or user preferred trajectories.

The separation mode using 3D is applicable to ATM-3/4 aircraft. They are applied dynamically to best match the aircraft's performance capability and "contain" the vertical evolution of the trajectory. This has the potential to provide significant gains in airspace capacity and will be supported by automation tools to assess trajectories and propose 3D separation provision solutions under time critical conditions.

The allocation of 3D routes is a powerful deconfliction method with longitudinal separation (if required) provided by ATC to complement the 3D route. This may be achieved through surveillance based separation and/or the dynamic application of constraints or delegated to flights that can utilise appropriate ASAS capabilities

The 3D (see note above) and 4D Precision Trajectory clearance concepts rely on the deconfliction of flights to achieve substantially increased capacity with reduced ANSP costs. Self-separation relies on distributed tactical intervention to achieve the same goals. The benefits of these concepts are similar and it is expected that the two concepts can co-exist. Both concepts should become candidates for further research.

Question	Description	Answer
Q1.1	What do you understand as the “Initial 4D trajectory management”? Provide a brief description.	*The initial 4D trajectory management is essentially a planning function. The System will provide the ATCO with a more precise means of predicting the future position of an aircraft and particularly its relationship to the trajectories of other concerned flights: enabling earlier less obtrusive interventions to maintain separation. The greater predictability will also enable the better planning of arrival sequences.*
		First trajectory for an aircraft, i.e. a set of points (lat/long or name) with altitude and time. This trajectory is delivered either by the FMS-System of the aircraft or from a trajectory prediction tool, if the aircraft is not capable to deliver it.
		1) The first step of the 4D PT concept implementation. *OR* *2) “initial 4D” function: the first description of the RBT(or SBT) of a flight, taking in account all the constraints available at this time for the trajectory definition (as the period of activity of military areas, or the RTA, if the departure airport is in the horizon of the destination airport AMAN, or level or trajectories restrictions).*
		I think “initial 4D trajectory management” that it is based on 3D routes, and is fit ATM3/4 aircraft. It can solve conflicts through using longitudinal separation. Based on some surveillance facilities, it can increase airspace capacity.
		4D trajectory management will provided higher 4D precision trajectories in all 4dimensinons, and share 4D precision data for stakeholder. Through use 4D contract to achieve the goal which in order to keep high performance and safety to response more and more complexity situation (For En-route, Airspace, Sector, Fix).

Question	Description	*Answer*
		A time constraint (CTA/RTA) at the merging point of the destination airport is a method to improve arrival management (provide more runway capacity). Initially, the aircraft will be capable to satisfy one (or more) time constraints. This will be achieved by adapting the speed profile accordingly. The optimal method is to adapt the cruise speed slightly (depends on the requested time shift compared to ETA). *The aircraft updates the RBT according to the assigned RTA (after takeoff or when assigned during flight). It is now capable to satisfy the time constraint, if* • *it is cleared along its trajectory or appropriate TMRs (trajectory is conflict free)* • *other aircraft are separated from it (4D aircraft has priority)* • *no other constraints are assigned, especially speed modifications* • *the wind forecast is accurate enough (current FMS are capable to arrive better than +-10 seconds)* *Aircraft having not the 4D capability are merged by tactical instructions. An enhanced AMAN horizon improves controllability and efficiency of this method.* *The enroute sectors support the 4D requirements of the AMAN by introducing* • *priorisation of 4D aircraft* • *separation and deconfliction methods which ensure a high predictability of the arrival time of aircrafts, less “open loop” advisories and less speed restrictions/modifications, because speed is the control variable for time and/or fuel efficiency* • *a minimum set of modified RBTs*

Question	Description	Answer
		The initial 4D trajectory management is one of the elements of the operational concept developed in SESAR and there is a specific definition for it: "A set of consecutive segments linking waypoints and/or points computed by FMS (airborne) or by TP (ground) to build the vertical profile and the lateral transitions; each point defined by a longitude, a latitude, a level and a time. *The Business/Mission Trajectories will be described as well as executed with the required precision in all 4 dimensions. The trajectories will be shared and updated from the source(s) best suited to the prevailing operational circumstances and capabilities and the sources include the aircraft systems, flight operational control systems and ANSP trajectory predictors. The ability to generate trajectories in the ATM system from flight plan data will be retained for those flights that are unable to comply with SESAR trajectory management requirements."*
		During the evolution of trajectory management, as Aircrafts embark more advanced avionics thus raising their ATM Capability level, while Ground Based tools, procedures and Communications raise their ATM Capability too, the ATM System is more capable of execute advanced operations. *This evolution begins with the stepped deployment, 2D, 3D, Fixed and User preferred routes, sometimes combined with lower advanced mode of operations. This operations period will provide very rich conclusions about lower PTC performance in real mixed environment, and which is the best way to introduce initial 4D trajectory operations. Hereof, initial 4D "function" or Trajectory is the situation where aircraft is flying its RBT following one single time constraint at each route clearance (TTAs, CTAs, CTOs and/or Speed Adjustments) with the required avionics performance (FMS with RTA function) but still not responsible for separation in managed airspace, which is conducted by the Controller, applying the best suitable mode.* *The last step will be to execute 4D contract operations by the most capable aircrafts and ground systems, while maintaining the aforementioned scenario. In accordance with clear operation rules and procedures, separation will be performed by aircraft ASAS (if separator) or Controller, whatever the case. For the achievement of this final scenario, it is a key to have the required level of automation for performing Complexity Reduction (Planning) and assuring separation, either in ground systems or avionics capable of managing multiple constraints.*

Question	Description	*Answer*
		We are in line with 4DTRAD concept of operation
Q1.2	Do you have any suggestion to improve its SESAR definition or any comment on it?	*"It implies a target time of arrival over a waypoint of the trajectory, e.g. the initial approach fix (IAF), within a time window tolerance." Replaced by: It provides an electronic 'position report' indicating to the ground system the programmed track, speed, altitude and eta. for the remaining waypoints on the agreed flight route to a degree of accuracy adequate for traffic planning and queue management.. The definition sent refers to trajectory management that is, one manner in which the 4D can be employed. References to tolerances are misleading as these are values that can be used but are not part of the definition itself.*
		None
		I didn't find any SESAR definition of the "initial 4D function" in D3 and D4 deliverables, or in DODs;
		No
		no
		Some research effort have to be put in determining "the required precision in all 4 dimension" to achieve the expected benefits of this function and, on the other hand, there is some uncertainty about the availability of the necessary technology.
		SESAR ConOps description is high level. There are not other documents with the same general degree of approval, that describes operations in a thoroughly manner, within SESAR definition phase. Although there are many other documents that describe operations in a deeply manner, these documents are not fully approved in SESAR environment. It is very recommended that a fully agreed documentation should be clearly identified.
		The term is a bit unclear to me, and does not seem to be well defined in DODs. My own understanding is that a refers to some kind of Traffic Flow management concept in which aircraft are given 4D trajectories (or better 3D plus a CTA, both with windows) that are in principle flyable, preferred and conflict-free.

Question	Description	*Answer*
		I am not aware of a SESAR definition. In general, the definitions of those concepts are rather high-level, and not very explanatory. What I would like to know is how the Separation Management works, in much greater detail than yet provided by the SESAR architecture or the EP 3 DoDs.
Q1.3	Define the "Initial 4D trajectory management" major business / system processes.	*Complexity management, separation management, queue management, capacity/demand balancing, sector traffic planning, performance based clearances*
		FMS-Ground Connection to deliver and exchange trajectory information, Ground based trajectory prediction tool, which should process also FMS data if available, Controller tools to display trajectory information and change trajectories
		Definition of common (board and ground) initial 4D trajectory by computing SBT / aircraft capabilities / ATC constraints . This "initial" 4D trajectory will be updated until the taking off; after take off, it will be the reference 4D trajectory (it will be updated during the flight as often as necessary). This trajectory has to be compliant with the RBT; it is difficult to find differences between these 2 trajectories.
		Airspace--3D routes—aircraft performance--time conditions—automation tools--Initial 4D trajectory management
		1. Established a contract for one flight ,will be considered as "non-deviating" and will thus have priority over other flights. *2. Will be identifiable to ATC and other aircraft.* *3. Airborne systems will automatically initiate a re-negotiation of the trajectory and the corresponding 4D contract.*
		• *Data link close loop between the airborne and ground systems, enabling to share the same RBT.* • *Air-ground negotiation of 3D trajectory and time constraint.* • *Uplink of successive clearances for each ATSU Area of Responsibility.*

Question	Description	Answer
		MAJOR BUSINESS: *Its major business is to free Controller resources by reducing the tactical intervention on trajectories and Complexity Reduction workload. Therefore, Capacity is foreseen to be increased, enabling Controller resources to be distributed on performing tactical separation over less capable aircrafts that follow more resource demanding modes of operation (Conventional, 2D, 3D), thus demanding more reactive Controller actions. 4D trajectories precision relies on intent and conformance monitoring tools that supervise the RBT actually flown and the datalink transmission of time constraints.* ***SYSTEM PROCESSES:*** *FMS 4D route intent and conformance monitoring process.* *Automated Ground Based Tools 4D Route intent and conformance monitoring process.* *Combined Air / Ground trajectory data correlation process. SWIM environment. Information sharing.* *4D Nominal Route revision request process triggered by: Separation Provision / Sequencing / /Short to Medium De-confliction action / Weather / Changing arrival constraints / User / Pilot Request / Controller Request / Disruptive events, etc…*
		In the FMS, it consists in downlink of 4D data: current position, predicted positions ·(Altitude, Latitude, Longitude, Time Over significant Point, Point Type), and FMS status (managed, selected, etc.) *Air-ground negotiation of 3D trajectory (route and level clearances) and time constraint (downlink of ETAmin, ETAmax, uplink of CTA constraint)* *Being able to reach a given point at a requested time (single RTA management)*

Question	Description	*Answer*
Q1.4	Identify 10 disruptive (degraded / non-nominal) events that could impact the “initial 4D trajectory management” from being applied.	*There is no 3D routes* *There are a great deal of traffic in one airspace* *There are no enough automation tools* *The aircraft performance are not enough* *ATCo abilities are not fit* *Time conditions are not permitted* *The longitudinal separation is not permitted* *There are not enough surveillance facilities* *Airspace conditions are not permitted* *Some emergency situations*
		Airborne systems data not available *Ground systems TP data not available* *Air-Ground data link not available* *Unexpected scenario constraints making it impossible to find out a solution (a clearance for a trajectory segment)* *Unexpected aircraft performance.*

Question	Description	Answer
		1. ATC system can not provided enough performance to response 4D requirement. *2. 4D function experiment show "this function is not enough safe".* *3. To achieve 4D trajectory management is too expensive.* *4. Passenger do not believe 4D trajectory management.* *5. Controller consider 4D trajectory management tools are not easy to use.* *6. Pilot need more time to execute 4D trajectory management, so they have no time to do it.* *7. 4D trajectory management can not response complexity situation.* *8. 4D trajectory management is more inefficient.* *9. Aircraft have not enough performance to response "4D function".* *10. We have other efficient "Function" to replace "4D function".*
		Delayed Take-off (for several reasons) *Change of runway configuration which also suddenly influences the departure routes of a/c which remain cleared for the same runway as before* *Weather* *Conflict resolution in the TMA* *High priority traffic in the TMA, as police or emergency helicopters* *Closure of destination airport* *Emergency situation onboard the a/c; e.g. technical failures, medical situations, security reasons,…* *Intruding traffic; e.g. lost VFR, military disobedience,* *Complexity issues, with snowball effect* *Multiple simultaneous conflicts without closed loop solution*

Question	Description	Answer
		Flight Crew or Controller Indisposition. Inability to proceed normal operation. *FMS or needed avionics malfunction. Inability to comply with 4D operation through TMRs.* *Communications Link lost or degraded (Airborne or Ground based).* *Degraded Aircraft Fight Performances. Inability to comply with CTAs, CTOs and TMRs generally.* *Traffic Complexity Increase to unmanageable nominal or accorded level. TMRs changing.* *Open Loop deviation due to unpredicted events that causes major changes in TMRs.* *Controller work overloading.*
		Aircraft failures *SBT or RBT change* *Aircraft type change* *Military constraints changes* *Weather conditions (in airports or in route)* *Traffic flow restrictions (implemented , cancelled or changes)* *Deconfliction constraints (if this function is available)* *ATC system failure*

Question	Description	*Answer*
		DL failure *Failure of controller tools to construct 4D trajectory proposal and communicate it to the aircraft* *Aircraft non-compliance with cleared route* *Confusion over priorities for the aircraft (how mandatory is the CTA)* *Convective weather activities* *Incorrect data input* *Electro-magnetic interference (natural or vindictive)* *Conflicting priorities for the ATCO* *Failure of coordination across multiple ACC boundaries* *Traffic complexity resulting in ATCO selecting non-4D solution as being simpler/faster to apply*

Question	Description	*Answer*
		Weatherconditions: *unpredictable Windsituation in different altitude layers, rapidly changed ground wind* *unpredictable Temperature in different altitude layers, ground temperature* *Icing conditions* *Military procedures:* *TRA entry and exit conditions and their observation* *Formation flights* *Military procedure at emergencies (RadioCom Failures etc.)* *Aircraft performance changes due to last minute changes* *Additional load at the airport (passenger, freight)* *Aircraft change* *Aircraft equipment does not comply with requirement for trajectory delivery (low ATM-Capability Level)* *ATC-Reasons:* *Runway change* *Runway blocked (inspection, emergency, arrival flow with a lot of heavies, …)* *Departure time was not kept due to any reason*
		The precision of the data sent to ATC *Equipped x non-equipped aircrafts in the same airspace defined to perform 4DF.*
Q1.5	What roles are involved in the process?	*Planning Controller, Executive Controller, Trajectory planning, descent profile planning, traffic management*

Question	Description	*Answer*
		Aircraft equipment, accuracy of the aircraft equipment, a/c performance, FMS-Capability *Pilots (needs to keep the trajectory requirements),* *Company (Aims of Company influence the initial 4D trajectory management),* *airport processes,* *ATC techniques,* *ATC-Controllers and rules* *ATFMS* *SWIM*
		AOs / pilots / information feeders (ATCO, CFMU, MET services, Military , technical services…)
		Some preparations for 4D precision trajectory
		Pilot ; controller; 4D contract coordinator
		Sorry, what process?
		Flight Crew: *Monitoring flight, comply with CTAs/CTOs/Waypoints and TMRs.* ***Executive Controller:*** *Trajectory Clearance Process. Separation. Tactical intervention.* ***Planning Controller:*** *Monitoring Flights in sector/s under his responsibility. Short to medium term de-confliction actions. Negotiating trajectory changes.* ***Airborne Systems:*** *PT Calculation, RBT Correlation, RTA Function.* ***Ground Systems:*** *Display Scenarios and De-confliction / Separation Options. RBT calculation and correlation.*
Q1.6	The SESAR Operational Concept will be implemented through Operational Improvements (OIs). Identify which are directly applicable.	*AUO-0301, AUO-0302, AUO- 0303, AUO-0304, CM-0301, CM-0302,AOM-0504,AOM-0701,AOM-0801*
		Don't know

Question	Description	Answer
		All the OIs which enables: *board to ground or ground to ground data exchange* *a common view of aircraft trajectories (between ground and board)* *CDM*
		1. Complexity management *2. Airspace capacity management* *3. New separation modes* *4. Collaborative decision making* *5. Minimising segregation*
		IS-0301 Interoperability between AOC and ATM Systems (FDPS) *IS-0302 Use of Aircraft Derived Data (ADD) to Enhance ATM Ground System Performance* *IS-0303 Use of Predicted Trajectory (PT) to Enhance ATM Ground System Performance* *AUO-0301 Voice Controller-Pilot Communications (En Route) Complemented by Data Link* *AUO-0302 Successive Authorisation of Reference Business / Mission Trajectory (RBT) Segments using Datalink* *AUO-0303 Revision of Reference Business / Mission Trajectory (RBT) using Datalink* *CM-0401 Use of Shared 4D Trajectory as a Mean to Detect and Reduce Potential Conflicts Number*
		These OIs are directly applicable to 4D trajectories during IP2. See table on page 6, 7 and 8.
Q1.7	Identify which KPAs will be affected by the application of these procedures and identify the impact severity (high-medium-low).	*SAFETY-MEDIUM; PREDICTABILITY-HIGH; CAPACITY-UNKNOWN; EFFICIENCY-should be HIGH;*
		At least: Predictability (High), Capacity (Medium), Safety (Medium)

Question	Description	Answer
		1.Safety medium *2.Capacity high* *3.Cost effectiveness low* *4.Environment medium* *5.Flexibility high* *6.Predictability low* *7.Flight efficiency high*
		Predictability (High), Efficiency (High), Capacity (medium), Safety (medium)
		Assessment extracted from OIs/KPA Impact Analysis from D5 OIs Baseline. OIs are pondered with a factor indicating the number of enablers affected by each OI.
Q1.8	Identify possible technical and operational constraints regarding the implementation and use of the “Initial 4D trajectory management”.	**Technical / Operational** — **Description**
		OPS Increasing ATCo workload. It need a extra attention to focus on the 4D flights *OPS Mixed situation. There maybe different separation models in one airpace,4D/3D/2D/ASAS…* *TECH High level automation system and facilities. Automation system and facilities should be effectively, accurately..*
		OPS Ratio of 4D equipped aircraft *OPS Time/Speed constrains due to other functions*
		Aircraft performance Ability of keep Speed and height *Software We need found more well algorithm model.* *Controller workload The 4D trajectory management tool easy to use not increase controller workload*

Question	Description	Answer
		TECH Overall integrity of the RBTdata. *TECH Stability of solutions in case a simultaneously required adaptations.* *T/ O Procedural redundancy in case of local or global failures of SWIM and its related communication means.* *T/ O Procedural redundancy in case of individual a/c failures. I* *OPS Limited degrees of freedom for pilots to choose alternative conflict resolutions.* *OPS Stability of scaling long term, medium term and short terms adaptations.* *OPS The difficulty to narrow the size of possible deviations (tubes, time windows, TMR) in order to increase capacity while maintaining sufficient robustness and resilience.* *OPS The management of rude behaviour of aircrew* *OPS The management & hierarchy of priorities in case of global changes, due to e.g. weather, airport closure, airspace closure,…*
		Technical Airborne Systems and Ground Systems are developed unparallel or at different speeds not achieving the same required level for implementing the Operational Improvement in a substantial way. *Operational Developing of Operational rules in En Route airspace requires high level of coordination and harmonisation between involved stakeholders to achieve seamless operation in ECAC airspace.*
		Data link Whatever the means used for data exchanges, it has to be reliable and fast *SWIM Define and update 4D trajectory needs a lot of information from different sources*
		D Link Failure to provide a system to system communications capability for the exchange of trajectories. *Legal Need to define the legal limits of the uses for the down loaded information: what parameters are needed to implement profiled climbs and descent: what is safe?* *Availability Where is the threshold of availability at which efficiencies will be realised?*

Question	Description	Answer
		Technical *Not enough accuracy and predictability* *Operational* *Unlawful interference (datasystem are not safe, any emergencies, …)*
		TECH *Synchronization process for CTA.* *OPS* *"Dialog" in high-density areas (proposal, conter-proposal - negotiation).* *OPS* *Manage profiles based on 4DF and the other in the same airspace.*
Q1.9	What new tools could be required to use operationally the "initial 4D trajectory management".	*Ability to construct a what-if trajectory on the controller ASW and communicate that trajectory directly to the a/c CDTI for direct loading into the FMS. No text menus. Ability to display a/c trajectory (from a/c) and compare with ground based calculations.*
		Controller tools: comparison of trajectory, conflict detection and resolution, Trajectory Management tools to display 4D-information and to Modify 4d-Trajectories, what if probing,
		A tool able to facilitate a CDM process: collect all the necessary information and propose 4D trajectories to the diverse stakeholders, enabling an eventual negotiation.
		Assessing tools
		A automatic tool ,can automatic manage 4D contract; can provided precise track data;
		Enhanced MTCD

Question	Description	*Answer*
		Ground Based: *De-confliction Console: MTCD & R for Complexity Manager and Planning Controller. De-conflicting options, negotiation and solutions within a given anticipated period of time.* *Medium Term Separation Assurance Tool: For Executive Controller. Aid for separation and Sequencing in real time aircrafts.* *Swim linked Data Correlation Tool: for monitoring and correlate Trajectory Data from shared Airborne and Ground Systems.* *Intent and Conformance Monitoring Tool. Automatic Prediction and detection of deviations from RBTs.* ***Airborne Based:*** *Intent and Conformance Monitoring Tool. . Automatic Prediction and detection of deviations from RBTs. Propose changes.* *FMS capable of down/Uplink of trajectory data (TMR changes, Time and speed constraints). FMS Capability of RTA function to comply with CTOs/CTAs/Waypoints and speed adjustments.*
		No new airborne tool is foreseen (only modification of FMS and ATSU)
Q1.10	What are the specific high-level requirements for the new tools?	*See 1.9*
		Able to integrate and analyse a great number of requests and constrains, and find quickly an appropriate trajectory.
		Effectively, fast, accurately
		1. Smart *2. Efficient* *3. Easy to use*
		Improved trajectory prediction

Question	Description	*Answer*
Q1.11	How will the transition between the "Initial 4D trajectory management" and ASAS take place?	*I don't understand the question. Why do we connect ASAS with 4D-Trajectory. We need an ATM-System to process 4D-Trajectory before we discuss any ASAS functionality.*
		What do you mean by "ASAS"? I suppose it is a part of the trajectory de-conflicted by using an ASAS application. *In my opinion, the two way of trajectory management will co exist, and eventually during the same flight; when an ASAS separation will be performed by a pilot , the manoeuvre will be integrated in the 4D trajectory (I suppose "ASAS" means that it is the pilot who is in charge of detecting the conflict situation, and provide separation with surrounding aircraft, using ASAS tools. If not, the responsibility remains with the ATCO who will decide a temporary responsibility transfer if an ASAS separation is requested to be provided by the pilot)*
		When the aircraft inter a unmanaged airspace from a controlled airspace by ANSP *ATCo and pilot make a dicision*
		We will improve 4D trajectory management more and more *One day we have excellent aircraft which can achieve ASAS*
		Sorry, what transition is your question about?
		When an aircraft is flying a 4D trajectory, once entered a non conflicted sector, the Controller or Flight crew may request to delegate the separation function to the Pilot. This could take place easily in less congested airspace, (i.e. during cruise phase in managed airspace) for many convenient reasons: airspace capacity, controller workload, flight efficiency, direct routing, etc. This delegation of the separation function has to have determined and agreed time duration and Flight Crew is responsible of performing the separation action: LC&P, VC&S, ITP, S&M, etc. As trajectory remains to be non-conflict free and is candidate to be subjected more often to tactical and strategic modification, separation responsibility has to return to Controller when clearance expires, providing that 4D Contracts (Which on the contrary, are conflict-free) are the best way to maintain a time lengthy ASAS operation.

Question	Description	*Answer*
		This question makes me wonder whether I understood the 4D trajectory management, or what "the transition" means. Sesar and the Dods are still immature in the description of how traffic flow management (e.g strategic deconfliction and separation management (PT, TC-SA, ASAS) work together.
		From a technology point of view, it will be analysed in exercise 6.4.4 (results available in July 2009). *How vision is first CTA on the merge point, then ASAS S&M when approaching the merge point*
Q1.12	Which actions will take place during the transition?	*N/A*
		Message exchange between ground and board in order to define the end of the 4D clearance, leading to a new responsibility sharing, and distribution of this information. *If the ATCO recovers the responsibility of separations after the "ASAS" period , the time, or point of the trajectory where responsibility sharing changes has to be pre define before the transition.*
		the responsibilities will be transferred between the ATCo ando the pilot
		3D; 4D, ASAS co-exist
		The transition could begin by a Flight Crew request to perform ASAS separation from a specific blocking aircraft with the Controller complying or not, depending on agreed procedure rules, the results from de-confliction tools, or other conflicting nearby trajectories. On the contrary, Controller may request a/c to perform ASAS separation for reducing workload. The Pilot and /or Controller has to specify how long the ASAS separation period would long and the point of ASAS termination. Once it is agreed, Pilot has the Separator role and performs the operation.
Q1.13	Who will be responsible for the a/c during the transition?	*During the transition to what? The flight crew is always responsible for the a/c*
		N/A

Question	Description	Answer
		The ATM services (i.e. an ATCO),until the beginning of the ASAS period of the flight. The transition period can be expressed in Nm or minutes, but the responsibility has to belong to only one actor at a time. The responsibility transfer my occurs at a specified point of the trajectory, at a specified (and commonly agreed) time , or when the actor who is going to keep the responsibility declares he is ready for that.
		The pilot
		All of stakeholder
		The responsible for separation will be the Controller, until transfer is acknowledged by Pilot. Some kind of phraseology should be accorded and also for datalink message instruction issuing and committing.
Q1.14	What phases do you think that the transition will have?	*Initial introduction: no changes to modus operandi but ATCO will utilize the available trajectories to confirm validity of his plans. As more a/c become equipped, he will display possible conflicts and probe the trajectory for what-if solutions on an informal basis.* *Midpoint: as aircraft are equipped, planning controller will assume trajectory planning role using what-if tools to probe trajectories and evaluate solutions. ICAO will commence evaluations to determine separation standards to be established for aircraft performance related clearances. AMAN will start functioning using times received from RBT with unequipped aircraft receiving the in-between times: since the ones for the RBT a/c are known. This is a de facto benefit although it is not a conscious demonstration of favouritism: it is just more logical.* *Endpoint: established separation standards will permit the development of procedures to apply aircraft performance to trajectory management.*
		N/A
		1) A preparation phase, to define the transition point on the trajectory(and perhaps the part of flight where ASAS spacing will have to be provided by the pilot) , the actions to carry on (frequency change, new trajectory, new data-link connexion…), and 2)execution phase: the transition at the expected time or position.
		Request –assessment—fast simulation-get the conclusion-coordination--implementation-

Question	Description	*Answer*
		3D; 4D, ASAS co-exist
		Request Phase. *Pilot / AUO request ASAS separation or Controller proposal.* ***Analysis Phase.*** *Factors to be analysed: Sector adverse or positive effects, Controller Workload, Complexity Level, duration of ASAS separation mode, point where separation delegation returns to Controller.* ***Transfer Phase or Denial of Transfer.*** *Pilot can begins action or has to wait for another situation.*
Q1.15	In which operational (e.g. required actors, roles, procedures…) and technical (e.g. systems / subsystems, equipment …) environments could the “Initial 4D trajectory management” be used?	*I don't understand the question*
		All
		Operational environment: actors/roles/procedures… *Technical environment: system/equipment/automation tools…*
		Aircraft performance *software* *Controller workload*
		As mentioned in answer to Q1.2 the operational and technical requirements are not completed yet.
		Regarding Technical scenario, aircraft has to be equipped with advanced FMS capabilities, (like RTA function) and RNPs capable of assuring tight flight parameters needed to comply with 4D TMRs. *Regarding Operational Scenario, one interesting trial will be application of 4D Trajectories from airports inside same AMAN Horizon (Extended AMAN Horizon) to validate the effects of issuing early CTAs/CTOs.* *Another initial application will be in managed en route airspace sectors, where traffic levels are low and aircrafts are not equipped with self separation function.*

Question	Description	Answer
Q1.16	During the transition between 4D and the use of ASAS, what could happen in a mixed environment?	*N/A*
		Don't believe there is an either/or scenario here. With accurate trajectory management, the benefits of ASAS are limited. ASAS cancels trajectory management and the root principle of SESAR is management by trajectory
		Nothing more than during the rest of the flight, as long as it will be possible to have divers type of flight management in the same airspace (4D contracts + 2D, 3D, 4D PT + ASAS capable aircraft). It is the responsibility of the airspace manager (ATCO + MSP + regional managers) make it safe.
		The responsibilities for A/C maybe be not clear
		4D fight and ASAS flight in one airspace
		Once again sorry, what transition is your question about?
		It has to be acknowledged that in en route airspace will co-exist flights with different ATM capability levels. As one of the de-conflicting measures, Airspace Organisers and Managers might have to establish zones where ATM capabilities match the same requirements. The better the aircraft is equipped the more separation modes (2D, 3D, 4D PTCs) can be adopted to perform operations. The less capable aircrafts which are flying conventional modes of separation are candidates for receiving tactical restrictions and are more dependants on real time traffic conditions in a mixed mode scenario. The rest of the aircrafts flying theirs RBTs (2D, 3D) operating the same environment, which are not capable of performing 4D operations, are also candidates for receiving trajectory changes or revisions due to tactical intervention and, if it is timely permitted, for receiving short to medium term negotiated de-confliction constraints. The principle will be the best equipped a/c, the lesser constraints will receive.
		This definitely a point of discussion. I do no see a mixed environment of the 4D trajectory management and ASAS. I see traffic flow management (managing traffic queues) and flight execution (including separation provisioning, which in turn may include ASAS applications).

Extended AMAN Horizon

Question	Description	*Answer*
Q2.1	What do you understand for "Extended AMAN horizon" within the context of "Flight in Managed Airspace".	*AMAN should begin to function as soon as times are received from an active, airborne flight. Thus an aircraft 2 hours out should start to figure into the plans for its arrival. Thus aircraft departing inside of an hour from the destination aerodrome would be given trajectory adjustments to fill the gaps (an easier solution than adjusting those in cruise). CTA should only be issued however within a short (to be determined) period of time before top of descent unless airport is absolutely at capacity and no room for flexibility exists, so as to permit the a/c to operate at its most efficient for as long as possible. This would allow the order to shift slightly in response to changes in wind and throttle settings.*
		The present horizon is 100 nm, extended horizon around 200 nm
		The horizon in time where an RTA can be issued to a flight
		Concern the time factors for AMAN, maybe advance time parameters
		AMAN and 4D trajectory management in common is that they need to calculate the precise trajectories so as to arrive at an accurate ETA
		The AMAN controls the aircraft earlier. This enables more options to optimize the sequence by enlarging the possible time "window" of an arriving aircraft at the merge point. *The improved controllability should be used to enable CDAs and 4D arrivals (RTA).* *The extension of the horizon should not lead to increased tactical queuing. Instead RBTs and the Trajectory Management process should be taken into account to improve the quality of the AMAN.*
		Enhance AMAN to provide arrival sequence time information into En Route decision making

Question	Description	Answer
		When departure airport is inside the AMAN horizon of arrival airport, the planned arrival sequence gains in accuracy, as CTA can be issued, instead of TTAs or CTOs, right after take off, so the flight can be introduced in a more stable and predictable arrival sequence. It is different from the AMAN horizon, where the CTA can be issued in a certain point of the en route phase, where the aircraft enters the AMAN horizon, but not right after take off because of time uncertainty. *At airports within same AMAN horizon, arrival and departures sequences are more stable, thus making estimated times more accurate and aircrafts can be introduced into the arrival sequence just after taking off from departure airport.*
		The term is a bit unclear to me, and does not seem to be well defined in DODs. My own understanding is that a refers to some kind of US-like pull system, in which the runway arrival sequence determines the traffic not only in the TMA but also, partly, en route.
Q2.2	Assuming that we have an "extended AMAN horizon", what uses could it have within the "Flight in managed Airspace" context?	*As mentioned in Q.2.1 would negotiate short trajectories to fill the gaps and assign CTA as appropriate when the aircraft that are filling the blanks become known.*
		AMAN will not be used in unmanaged airspace! *AMAN will give advisories which influence the trajectory. Normally AMAN planning is done at departure, due to the actual picture at the arrival airport changes may be needed.*
		Each flight will receive as earlier as possible its own RTA, and will be able to manage its trajectory in order to comply with it (even if it is still on the apron of the departure airport). As this data will be shared by all the tools and devices on the ground, each trajectory change will deal with this priority constraint.
		Maybe decrease the workload of ATCo and pilots
		I think AMAN is a prerequisite for the realization of 4D trajectory management
		Improved sequencing and merging of aircraft under tactical control. For example aircraft could be decelerated earlier. Better layout of the arrival routes possible
		Providing an enhanced and more consistent arrival sequence. Reducing holding by using speed control to absorb some of the queuing time.

Question	Description	Answer
		If we consider that airports sharing the same AMAN horizon because of their proximity can build the arrival sequence with greater stability, issuing CTAs instead of TTAs or estimated times, the traffic flow between these airports have a greater level of predictability and time reliability. *For building up the arrival sequence for incoming flights from airports outside the shared AMAN horizon, to get a slot in the arrival sequence can be issued easier because there is less uncertainty degree in the sequence.*
		I though it is the other way around: an optimised arrival patterns requires the planning ahead in the Flight in Managed Airspace.
Q2.3	With respect to the estimated times provided using the “extended AMAN horizon”, what would be the acceptable deviation from the estimated time to maintain the “extended AMAN horizon” usefulness?	*Wouldn't lock in this far out. Leave them alone as long as possible. The deviation figure that is relevant is that which would create a change in sequence: assuming 45 seconds between successive arrivals, any variation of 30 seconds could be compensated for easily through tactical manoeuvres closer in without causing a significant change in cost.*
		Deviation less than 3 minutes
		As 1minute of flying on cruse is 8Nm, and on final approach aircraft have about 5Nm separation, a precision of 30 seconds over the IAF seems to cope with a smooth management of arrivals. Extended AMAN horizon allows the pilot to use speed adjustments with more flexibility
		1 to 2 minutes
		ETA accuracy can meet the new mode of separation.
		ETA depends not on the horizon of the AMAN. The AMAN should take into account the trajectories provided by the Trajectory Management process. All equipped aircraft, being well separated in the enroute sector can provide a highly accurate ETA. All 4D aircraft will guide precisely the aircraft to the merge point. *The usefulness of an extended horizon is the enhancement in controllability.*
		This should be determined in the validation exercises performed over the EP 3 use case “Manage Traffic in En-Route with Respect to the AMAN Horizon”.

Question	Description	*Answer*
		According to what I hear from airlines, Boeing and FMS manufacturers, it is currently possibly to predict the time of arrival at some TMA boundary point within 10 to 20 seconds. From what I hear from AMAN developers, this should be sufficient. So, the nominal AMAN process does not seem to impose much difficulty for the en route (CTA) constraints, in terms of accuracy.

Change from 2D PTC to ASAS S&M operation

2D Routes (PTC-2D): 2D routes (with lateral containment) may be defined for a given airspace volume. Depending on the airspace and operational environment 2D routes may be fixed or temporary in nature (c.f. Flex tracks or NAT tracks) or user preferred routes. Whilst one specific route will be included in the RBT, alternative routes may be dynamically allocated in a trajectory revision process for separation provision reasons.

The allocation of 2D routes is a deconfliction method with vertical and longitudinal separation (if required) provided by conventional techniques to complement the 2D route. This may be achieved through surveillance based separation and/or the dynamic application of constraints.

Question	Description	*Answer*
Q3.1	In which operational (e.g. required actors, roles, procedures…) and technical (e.g. systems / subsystems, equipment …) environments could the “change from 2D PTC to ASAS S&M operation” be used?	*I don’t know*
		In a managed airspace / if all the aircraft trajectories are known and predictable / all aircraft involved in ASAS procedure are correctly equipped / pilots and controllers are equipped with a monitoring system of the trajectories
		Automation tools, procedures, actors, system are necessary
		1. fixed or temporary airspace *2. Flying low capacity airspace* *3. General Aviation airspace*
		Sorry, I don’t understand what you mean by “2D PTC limited ASAS S&M opportunities” (original name of the section)
		Regarding operational environment, the best opportunity to use change from 2D PTC to ASAS S&M operation will be when fixed routes have to be temporary established. ASAS limited application will contribute to assist the Controller in spacing actions for aircrafts routing the same fixed route and will contribute to build the arrival sequence. *Regarding technical environment, this separation mode can be applied by less equipped aircrafts so mixed mode operations can be developed in an easier way and more often way, decreasing controllers workload, and allowing more regular flow to the runway, and increasing the runway throughput.*

Question	Description	*Answer*
		In no environment. In my understanding, the S&M application in the SESAR concept (within the extend TMA; not outside) just requires some relatively large cones in which aircraft can fly according the S&M trajectories.
Q3.2	What would be the operational procedure to use the "change from 2D PTC to ASAS S&M operation"?	*N/A*
		Identification of the target / transmission of the clearance to the flight in charge of the manoeuvre/ agreement of the pilot and execution of the S&M procedure / monitoring of the separation
		Assessing-- fast simulation-get the conclusion-coordination—flow management--implementation
		Flexible 2D strategy
		From a certain point in the en route phase, when CTOs can be issued, the System can begin to stabilise the arrival sequence. The Controller will delegate to Pilot in maintain spacing from the precedent a/c, decreasing sequencing workload, but remains in charge of the separation responsibility from the rest of hazards. The Pilot can comply or deny the separation action, if presumes that a/C performance will not comply.
Q3.3	What new support tools could be needed to use it?	*N/A*
		A trajectory definition tool for the pilot , a device enabling the display of the new trajectory (on the radar picture for instance), a monitoring tool for the pilot and one for the controller
		Assessing tools/flow management procedure/special coordination procedure
		Very cheaply tool can provide flexible 2D strategy

Question	Description	*Answer*
		Airborne Tools: *CTA/CTO Management - Single constraint.* *Avionic Navigation supporting 2DRNP at least.* *Conformance Trajectory Monitoring* *ADS b/out for Surveillance spacing.* *Wake vortex detection- To increase capacity during spacing.* ***Ground Based Tools:*** *Complexity Reduction Console: MTCD & R for Complexity Manager and Planning Controller. De-conflicting options and solutions within a given anticipated period of time.* *Medium Term Separation Assurance Tool: For Executive Controller. Aid for separation and Sequencing in real time aircrafts.* *Swim linked Data Correlation Tool: for monitoring and correlate Trajectory Data from shared Airborne and Ground Systems.* *Intent and Conformance Monitoring Tool. Predict and detect deviations from RBTs.*
Q3.4	What are the high-level requirements of these new support tools?	*N/A*
		Responsibility sharing definition /
		Accurate/fast/effective
		Cheaply and easy to use
Q3.5	During the transition between 2D and the use of ASAS, what could happen in a mixed environment?	*N/A*
		The system in charge of the ATC (ATCO + tools) will be in charge of the consistency of the air situation, and of the transmission of the appropriate clearances.

Question	Description	Answer
		The responsibilities for A/C maybe be not so clear , and decrease the capacity in the airspace
		2D more and more use in low complexity airspace *However, ASAS use in high complexity.*
		Sorry, what transition is your question about?
		In a mixed mode, in the arrival sequence will coexist a/c performing conventional spacing with 2D PTC limited ASAS. Apparently, this will have no negative effect in stabilising and correcting the sequence, providing that limited ASAS operating a/c will have a stable trajectory evolution, and this will free Controller resources.

Strategic Complexity Reduction using 4D PTC

Strategic Complexity Reduction of traffic flows (2D and 3D route allocation for departures and arrivals) will reduce the need for tactical intervention on individual aircraft. Sectorisation may be dynamically adapted to changing traffic patterns and flows to make best use of the available ANSP resources. Close co-operation with military authorities assures the smooth transition to/from periods of airspace reservation with as much prior notice as possible so that any opportunities for efficiencies can fully exploited. During this phase, network management seeks to ensure the user business outcomes for individual flights and to maximize the net system benefit.[1]

Question	Description	Answer
Q4.1	What do you understand as "Strategic Complexity Reduction using 4D PTC"? Provide a brief description.	*Compare 4D-Trajectories and detect conflicts according limits (TMR). Time horizon before entry in controlled sector to solve complexity and consolidate sectors.*
		Issuing 4D clearances (new trajectory) that leads to put aircraft on separated trajectories (an off track trajectory will be assigned to an aircraft who needs to descend and cross one or several aircraft flying below him) , or to create safety separation on converging trajectories.(a speed change or alternate trajectory to pass at a pre define distance from an other aircraft). The time horizon corresponding to "strategic" has to be define.
		It is a procedure or procession that the network management can increase traffic flow, decrease conflicts, avoiding frequently transitions through fixed routes, sectorisation. At the same time it can reduce the coordination with military authorities.
		An algorithm used to calculate the precise model of 4D trajectories to ensure that there is no conflict between the track and track to achieve the purpose of optimizing
		4D-PTC enables the ANSP to clear an aircraft for a longer portion of flight. The cleared portion must be conflict free. Conflicting 4D aircraft could be de-conflicted by setting constraints (2D-routes, 3D-routes, Speed restrictions, RTAs) early (not before takeoff) on the RBT. 4D-PTC is not foreseen for arrivals and departures, but 3D routes and 2D routes are available in the TMA, Refer to SESAR ConOps [1].

[1] SESAR, DLT-0612-222-02-00, P.89-90.

Question	Description	*Answer*
		Sesar doesn't consider strategic de-confliction for the new separation modes oriented towards the elimination of ATC tactical intervention including 4D PTC (intended as 4D contracts).
		Issuing of 4D PTC can only be done to most capable aircraft because of the higher TMRs to comply with. When some trajectories share the same airspace, 4D PTCs can be issued to increase capacity. As 4D PTCs have tight flight parameters and wider possibilities to issue TMRs, are the most flexible trajectories to receive revised parameters due to de-confliction actions. In that sense, these flights are the most flexible to take in possible flow adjustments when less capable a/c are involved. *The best opportunity to 4D PTC trajectories is that time can be a manageable restriction method to de-conflict trajectories in advance.*
		4D PTC is not mentioned in the DODs; is it? I do not see the difference with RBT concept.
Q4.2	Do you have any suggestion to improve its SESAR definition (see above) or any comment on it?	*None*
		No
		No
		No
		Maybe strategic Complexity Reduction shall be considered for those traffic without 4D contract in a mixed environment.
Q4.3	Define the major business / system processes.	*Tool to calculate complexity, Definition of Complexity*
		A data exchange which enables a very accurate knowledge of the 4D trajectories of all the aircraft for the next 20 to 40 minutes (time necessary for a flight to go through a FAB or ACC), and a high-performance computer able to detect conflicts and propose solutions, taking in account the expected trajectories, and all the constraints to cope with in the same time horizon (military activities, weather conditions, flow management). That supposes all the aircraft fly 4D trajectories in the same airspace.

Question	Description	*Answer*
		Request—assessment—fast simulation—get conclusion—coordination—using tools/operating procedures—implementation
		1. Complexity Reduction *2. Optimize trajectories* *3. Close co-operation with military authorities* *4. Maximum net system benefit*
		RBTs expecting to use 4D PTC should be known in advance and considered as constraints in order to allow strategic Complexity Reduction of the rest of the traffic
		MAJOR BUSINESS: *Its major business is to free Controller resources by reducing the tactical intervention on trajectories and Complexity Reduction workload. Therefore, Capacity is foreseen to be increased, enabling Controller resources to be distributed on performing tactical separation over less capable aircrafts that follow more resource demanding modes of operation (Conventional, 2D, 3D), thus demanding more reactive Controller actions. 4D trajectories precision relies on intent and conformance monitoring tools that supervise the RBT actually flown and the datalink transmission of time constraints.* *SYSTEM PROCESSES:* *FMS 4D route intent and conformance monitoring process.* *Automated Ground Based Tools 4D Route intent and conformance monitoring process.* *Combined Air / Ground trajectory data correlation process. SWIM environment. Information sharing.* *4D Nominal Route revision request process triggered by: Separation Provision / Sequencing / /Short to Medium Complexity Reduction action / Weather / Changing arrival constraints / User / Pilot Request / Controller Request / Disruptive events, etc…*
Q4.4	What roles are involved in the process?	*Complexity Manager, Multi sector planner, Supervisor*

Question	Description	*Answer*
		ATCO / Pilots / assistance tools for the ATCO / assistance tool for the pilot (to display the proposed new trajectory and analyse the compliance with the flight constraints) *It is possible to imagine that the all procedure are delegated to machines, under control of controllers and pilots.*
		Pilot, ATCo, the ATC operational manager, technical support staff, the regional network manager, the network manager…
		All the stakeholder
		• *Airspace users operations* • *ATS regional units* • *Network operation managers*
		Flight Crew: Monitoring flight, comply with CTAs/CTOs/Waypoints and TMRs. *Executive Controller: Trajectory Clearance Process. Separation. Tactical intervention.* *Planning Controller: Monitoring Flights in sector/s under his responsibility. Short to medium term de-confliction actions. Negotiating trajectory changes.* *Airborne Systems: PT Calculation, RBT Correlation, RTA Function.* *Ground Systems: Display Scenarios and De-confliction / Separation Options. RBT calculation and correlation.*
Q4.5	What would be the operational procedure to use the "Strategic Complexity Reduction using 4D PTC"?	*See 4.1*
		Detection of separation loss (with a specific tool)/ definition by the system on the ground of a safe new 4D trajectory / proposition to the concerned pilot / agreement (or rejection) from the pilot and insertion of the new active 4D trajectory in the FMS.
		Flow management, using tools, coordination, operating

Question	Description	Answer
		1. new mode of separation *2. 4D trajectory management* *3. algorithm model.*
		Already answered in Q4.3
		Once the RBT is loaded into the FMS in the cockpit, the strategic Complexity Reduction process actuates all over the flight. If nothing is to be revised a/c proceed to the next authorised flight section of the trajectory. If Planning Controller detects conflicts in advance in any point of the trajectory, RBT revision process occur either manually or automated, proposing changes in CTOs/TTAs/CTAs to the AOC/Pilot or in other flight parameters of the Trajectory. In addition, new TMRs can be given in order to save events that require tight parameters. *The best procedure for managing constraint changes is when RBTs updates/changes are done automatically and they do not deviate much from initial agreed RBT. Strategic Complexity Reduction is applied always in advance solving all conflicts and flight efficiency is maintained. (Closed Loop deviations mostly)* *When Open Loops are issued, the strategic process requires more coordination from Planning Controller and AOC/Pilot to achieve agreements.*
		An aircrew –or its AOC- files a preferred 4D trajectory for a certain flight. This RBT is then in a number of iterations adapted (because the most preferred rwy slots might not be available, the aircraft on the gate is slightly delayed, weather changes, the taxi time is longer then expected, the line up is slightly delayed due to e.g. bird control, whatever). These RBT changes are executed between aircrew –or its AOC- in terms of requests, acknowledgements and options to choose from. A last resort is “no RBT available” corresponding to the lack of an airway clearance.
Q4.6	How accurate do you think that the trajectory conformance must be to ensure the benefit of this process?	*Accuracy must be higher than 90%. If lesser than no confidence will be there.*
		Very precise, because 1minute flight is about 8Nm; a monitoring of the trajectories will be mandatory. The more accurate will be the predictions, the more important will be the capacity gain (because less imprecision margins will have to be taken)

Question	Description	*Answer*
		30 seconds to 1 minute
		trajectory conformance is very important reason for 4D PTC. *4D function need share the trajectories at all of users.*
		Trajectory conformance is given by the TMRs and 4D-PTC rules. As long as the aircraft manages to fly within the defined restrictions everything works as foreseen. In high traffic situations the TMRs will be very tight. Route and altitude conformance is of very high precision, especially enroute. Time conformance depends on the accuracy of wind forecasts, which will be improved in SESAR. *I would not expect problems due to trajectory conformance issues, but I would expect difficulties in* *- a coherent set of constraints for the overall flight (for example not to decelerate an aircraft and accelerate it again)* *- to deconflict aircrafts and not cancelling the RTA* *- to negotiate constraints with the user (if foreseen)*
		To be determined according to specific requirements but obviously very high
		The accuracy will increase over time. Around 2020, there will be no need to strategically deconflict each and every pair of aircraft for the whole flight. Instead, it will turn out to be sufficient if the predicted aircraft trajectories are sufficiently robust and flexible, in order to have medium and short term conflict resolution mechanisms to be effective. This requires accuracies in the order of 1NM lateral, 100 ft vertical, and 1-2 minutes in time.
Q4.7	Can this process be implemented using the “4D initial process”?	*No, a well planned 4D-PTC must be available*
		It will work when a perfect knowledge of each aircraft behaviour will be predictable (link with the FMS,RNP); so, if “initial” means “first steps”, the answer is no, and if “initial” means “a first issuance of the 4D trajectory of a flight” , the answer is yes.
		No
		Yes this is the first condition

Question	Description	Answer
		I don't think so, probably full 4D capability will be required
		It can be implemented during the 4D Initial process. There should be a trade off study between whether initial 4D a/c trajectories should take in Complexity Reduction actions (through RBT revision) due to its better flexibility to adapt changes or should be the less capable a/c. It is presumed that it will depend of the number of better equipped a/c that passes through a determined sector. Strategic de- confliction methods will be more effective and have lesser adverse effect if a high number of a/c are equipped with the required systems to perform 4D PTCs.
Q4.8	Can it be applied to deconflict local events?	*Depending of the time horizon*
		yes
		Maybe
		Yes ,Different stakeholders have their own interests, the need to coordinate the different stakeholders can make to maximize the benefits
		In time critical situations tactical intervention will be better. Aircraft which are flying a 4D-PTC should be prioritised. Conflicts between 4D-PTC flying aircraft should not exist.
		Sorry, what you mean by "deconflict local events"?
		In principle. That is: there is not yet a guarantee that conflicts are avoided all the gate-to-gate-track, however, the number and complexity of potential conflicts is that low that medium term conflict resolution via SWIM or ASAS can tactically jump in for separation provisioning.
Q4.9	What could be the timeframe of application?	*More than 10 minutes ahead*
		For local events? 10 to 20 minutes, if local means "in a specific place, for a determined time frame , in a short time horizon"
		I think It is able to come truth quickly

Question	Description	*Answer*
		2008-2010 2D ,3D initial 4D trajectory management *2010-2015 4D trajectory management* *2015-2020 ASAS*
		It will depend on the required accuracy for trajectory prediction and trajectory conformance and the availability of that information (still under research)
		In the outset, it can be applied because it depends on the a/c position certainty. It does not depend on the geographical context if the uncertainty levels are low enough. In that sense, local events that are predicted sufficiently in advance can be de-conflicted using this method. But again it will depend on the level of a/c ATM capability of the flights involved to take in 4D TMRs changes.
Q4.10	What kind of uncertainties can be encountered?	*Accuracy and compliancy to the trajectory, see 1.4*
		Uncertainties on the aircraft performances, on the wind
		Sectorisation tools maybe not be ready, and the operation procedure with military authorities
		1. New aircraft will be created can achieve ASAS *2. Train with the plane as fast as*
		• *Unexpected events (thunderstorm, emergency, etc.)* • *Aircraft performance* • *Data link failure*
Q4.11	Which parameters (e.g. average delay, individual delay, minimum flight distance…) could be used to provide an optimal (from the user's point of view) deconflicted situation?	*I think it will be average delay and the amount of deconflicting*
		1. The average delay time *2. Minimum Separation distance* *3.A high rate of change*

Question	Description	Answer
		It depends on the individual RBTs involved in the conflict. May be there is time to ask the user involved in the conflict.
		• *Accurate flight time and distance (predictable)* • *Minimum flight time and distance*

3 QUESTIONNAIRE 2

This section reflects the outcomes of the 2nd questionnaire before the meeting. Some of the final answers changed in the meeting. These final answers can be found in the minutes [4] and presentation [5] of the second expert group meeting. The final expert group report, [1], reflects the final agreed answers.

In questions which answers can be yes or no, the associated percentage is related to the number of "Yes" obtained. NA means Non Agreement reached, this will happened if the percentage is between 30 and 70.

4D Trajectory Management

Q1.1 We understand that 4D trajectory management is the implementation of the 4D capability

Yes 89%

Q1.2 The 4D function is an a/c system function.

Yes 100%

Q1.3 The 4D "function" is the ability of the a/c to fly its RBT

NA. 67%

Q1.4 The RBT can only be changed / updated by the pilot. Ground can only suggest.

NA. 44%

Q1.5 From the air point of view: the 4D function is how the a/c implements the ground suggestions through the RBT.

NA. 67%

Q1.6 From the ground point of view the 4D function is the a/c capability that is used by the ground to accommodate (to support adherence) the RBT.

NA. 67%

Q1.7 Each one of the following corresponds to a possible business / system process. For each process, (a) indicate if it should be grouped with other process and (b) rank the importance of the process. To group a process with other process use the number assigned to the process. The cell should include the number of the process it is grouped with. To Rank a process select a number (only once) from 1-n. 1 highest n lowest.

No agreement was reached regarding the grouping.

	Rank	Mode	Var
Separation management Controller tools to display trajectory information and change trajectories	2,1	4	4,3
Complexity management Sector traffic planning Capacity / Demand balancing Queue management being able to reach a given point at a requested time (single RTA management)	3,6	4	16,7
Performance based clearances	4	2	6,6
Aircraft performance	4,5	2	14,3

	Rank	Mode	Var
FMS-Ground Connection to deliver and exchange trajectory information Ground based trajectory prediction tool, which should process also FMS data if available,	4,7	6	4,5
Time conditions	4,8	1	18,9
Definition of common (board and ground) initial 4D trajectory by computing SBT / aircraft capabilities / ATC constraints .	5,6	1	38,3
3D routes	7,8	-	42,7
Automation tools	8,2	-	9,7
Data link close loop between the airborne and ground systems, enabling to share the same RBT.	8,2	-	73,7
Airspace	8,5	3	38,6
Downlink of 4D data: current position, predicted positions (Altitude, Latitude, Longitude, Time Over significant Point, Point Type), and FMS status (managed, selected, etc.)	9	-	66,2
Update “initial” 4D trajectory until take-off; after take-off, it will be the RBT 4D trajectory (it will be updated during the flight as often as necessary).	9,4	3	95,0
Air-ground negotiation of 3D trajectory and time constraint.	10,2	6	99,2
Uplink of successive clearances for each ATSU Area of Responsibility	10,2	23	102,0
Air-ground negotiation of 3D trajectory (route and level clearances) and time constraint (downlink of ETAmin, ETAmax, uplink of CTA constraint)	10,8	3	58,5
Airborne re-negotiation of the trajectory and the corresponding 4D contract.	12	-	72,2
Established a contract for one flight, will be considered as “non-deviating” and will thus have priority over other flights.	12,2	3	83,7

Q1.8 Each one of the following corresponds to a possible disruptive (degraded / non-nominal) event that could impact the “initial 4D trajectory management” from being applied. For each event, (a) indicate if it should be grouped with other events and (b) rank the importance of the events. To group a process with other process use the number assigned to the process. The cell should include the number of the process it is grouped with. To Rank a process select a number (only once) from 1-n. 1 highest n lowest

	Avrg	Mode	Var
4D trajectory management can not respond to a specific complexity situation.	2	2	0,4
Aircraft have not enough performance to response "4D trajectory management" .	2,3	2	3,7
Airborne systems data not available	2,5	-	1,7
Additional load at the airport (passenger, freight)	2,7	2	1,3
Aircraft equipment does not comply with requirement for trajectory delivery (low ATM-Capability Level)	2,7	1	3,7
Air-Ground data link not available	3,3	-	127,0
4D function experiment show "this function is not enough safe"	3,5	1	8,3
4D trajectory management is more inefficient.	3,5	-	142,3

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	Avrg	Mode	Var
ATC system can not provide enough performance to response 4D requirement.	4,2	1	2,3
Controller consider 4D trajectory management tools are not easy to use.	4,8	-	104,3
Conflict resolution in the TMA	5	-	116,3
ATC system failure	5,3	-	128,0
Conflicting priorities for the ATCO	5,3	2	9,9
ATCo abilities are not fit	5,5	6	120,3
Controller work overloading.	5,5	4	4,7
Confusion over priorities for the aircraft (how mandatory is the CTA)	6	-	20,3
Complexity issues, with snowball effect	6,5	-	15,0
Ground systems TP data not available	6,8	-	132,7
FMS or needed avionics malfunction. Inability to comply with 4D operation through TMRs.	7,3	-	134,9
Convective weather activities	7,8	-	234,3
Aircraft non-compliance with cleared route	8,3	2	43,7
Aircraft performance changes due to last minute changes	8,7	2	28,7
Change of runway configuration which also suddenly influences the departure routes of a/c which remain cleared for the same runway as before	9	2	34,3
Degraded Aircraft Fight Performances. Inability to comply with CTAs, CTOs and TMRs generally.	9	-	36,7
Aircraft failures	9,3	-	6,3
Delayed Take-off (for several reasons)	9,5	2	59,0
Closure of destination airport	9,8	-	141,7
Emergency situation onboard the a/c; e.g. technical failures, medical situations, security reasons,…	10	-	252,3
Communications Link lost or degraded (Airborne or Ground based).	10,3	2	215,3
Aircraft change	11	-	225,7
Failure of controller tools to construct 4D trajectory proposal and communicate it to the aircraft	11	-	301,0
Electro-magnetic interference (natural or vindictive)	11,3	-	352,3
Deconfliction constraints (if this function is available)	11,7	4	251,6
Flight Crew or Controller Indisposition. Inability to proceed normal operation.	12	1	300,7
Airspace conditions are not permitted	12,3	3	301,3
DL failure	12,3	4	294,9
Failure of coordination across multiple ACC boundaries	12,3	-	326,7
Formation flights	12,3	-	86,3
Departure time was not kept due to any reason	13	3	342,3
Aircraft type change	14	-	68,3

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	Avrg	Mode	Var
Traffic flow restrictions (implemented , cancelled or changes)	16,3	-	968,0
To achieve 4D trajectory management is too expensive	17	-	2450,0
In the FMS, non-conformance can be the result of ATC open loop clearances or it may be due to other factors (weather or aircraft operational limitations).	18	-	679,0
SBT or RBT change	19,3	-	1922,0
Pilot need more time to execute 4D trajectory management, so they have no time to do it.	20,3	-	1860,5
The longitudinal separation is not permitted	21,3	-	882,0
Traffic Complexity Increase to unmanageable nominal or accorded level. TMRs changing.	22	-	882,0
There are not enough automation tools	22,3	-	-
There are not enough surveillance facilities	22,3	-	1200,5
There are no 3D routes	22,3	-	1505,3
Traffic complexity resulting in ATCO selecting non-4D solution as being simpler/faster to apply	22,5	-	706,3
Military constraints changes	24	-	1250,0
Military procedure at emergencies (RadioCom Failures etc.)	25	-	1250,0
Unexpected scenario constraints making it impossible to find out a solution (a clearance for a trajectory segment)	25	-	902,3
Open Loop deviation due to unpredicted events that causes major changes in TMRs.	25,5	-	1458,0
High priority traffic in the TMA, as police or emergency helicopters	27	-	1512,5
Runway blocked (inspection, emergency, arrival flow with a lot of heavies...)	27	-	954,3
Runway change	28	-	1512,5
Some emergency situations	28	-	1064,3
The aircraft performance are not enough	28,5	-	1122,3
Passengers do not believe 4D trajectory management.	29,3	-	1182,3
TRA entry and exit conditions and their observation	29,5	-	1740,5
There are a great deal of traffic in one airspace	31,5	-	433,0
Incorrect data input	33	-	1624,5
Time conditions are not permitted	33,5	-	882,0
Intruding traffic; e.g. lost VFR, military disobedience,	34,5	-	760,5
Weather	35	-	574,3
Weather conditions (in airports or in route)	35,5	-	2520,5
We have other efficient "Function" to replace "4D function"	36	-	1588,0
Unexpected aircraft performance.	36,5	-	2178,0
Unpredictable wind situation in different altitude layers, rapidly changed ground wind	36,5	-	2112,5

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	Avrg	Mode	Var
Unpredictable temperature in different altitude layers, ground temperature	37	-	1800,0
Icing conditions	38	-	2048,0
Multiple simultaneous conflicts without closed loop solution	47	-	2112,5

Q1.9 Each one of the following corresponds to a possible role. For each role, rank the importance of the role. To Rank a process select a number (only once) from 1-n: 1 highest, n lowest.

	Avrg	Mode	Var
CFMU	3,6	4	25,9
Flight Crew:	3,9	-	57,9
Queue, Trajectory and Separation Manager	4	6	34,6
Airline Operations Centre	4,4	5	3,3
Executive Controller	4,6	5	17,9
ATFMS	5,2	2	19,1
Trajectory planning	5,3	2	22,2
Airport	5,3	3	26,1
ATC-Controllers	5,3	1	17,8
Planning Controller	5,3	1	20,3
SWIM	5,9	1	18,9
Airborne Systems	6	2	34,8
Military	6,2	-	38,7
4D contract coordinator	6,5	1	18,8
Traffic management	6,6	3	49,9
Ground Systems	6,7	4	29,8
MET	7,5	2	44,3
Descent profile planning	8,7	1	26,3
Technical Services	9,6	2	62,3

Q1.10 For the following roles indicate if you agree / disagree with the related statements.

Queue, Trajectory and Separation Manager (QTSM)

It only talks to the Airline Operation Centres (AOC)	No	13%
It is the means to negotiate the RBT changes with the AOCs	Yes	78%
It can talk to both the AOC and the Multi-Sector Planner (MSP)	Yes	78%

The Multi-Sector Planner (MSP)…		
only talks to the Flight Crew / Executive controller	No	13%
only talks to the Flight Crew / Executive controller using the CPDLC	No	25%
All negotiations with the Flight Crew are carried using CPDLC	NA	44%
Does not provide clearances	NA	63%
If the solution she/he provides is negotiable then it is sent to the QTSM	NA	67%
If the solution she/he provides is non-negotiable then it is communicated to the Flight Crew / Executive controller through CPDLC	NA	44%
All MSP solutions are reflected through changes in the RBT	Yes	89%

Q1.11 Each one of the following corresponds to an identified OI. Rank each one to show their degree of impact. To Rank an OI select a number (only once) from 1-n: 1 highest, n lowest. A "0" will indicate that the OI is not considered relevant

	Rank	Mode	Var
CM-0401: Use of Shared 4D Trajectory as a Mean to Detect and Reduce Potential Conflicts Number	2,6	1	28,3
IS-0302 Use of Aircraft Derived Data (ADD) to Enhance ATM Ground System Performance	3	3	14,6
IS-0303 Use of Predicted Trajectory (PT) to Enhance ATM Ground System Performance	3,1	2	16,5
AUO-0302: Successive Authorisation of Reference Business / Mission Trajectory (RBT) Segments using Data link	4,1	11	18,6
CM-0301: Sector Team Operations Adapted to New Roles for Tactical and Planning Controllers	4,1	1	12,6
CM-0302:Ground based Automated Support for Managing Traffic Complexity Across Several Sectors	4,9	7	11,9
AOM-0801: Flexible Sectorisation Management	4,9	1	3,5
AUO- 0303: Revision of Reference Business / Mission Trajectory (RBT) using Data link	5	1	18,8
IS-0301 Interoperability between AOC and ATM Systems (FDPS)	5,2	2	17,8
AUO-030: Voice Controller-Pilot Communications (En Route) Complemented by Data Link	5,4	2	13,6
AOM-0504: Optimum Trajectories in Defined Airspaces at Particular Times	5,4	1	16,4
AOM-0701: Continuous Descent Approach (CDA)	6,1	3	1,3
AUO-0304: Initiating Optimal Trajectories through Cruise-Climb Techniques	6,6	4	3,1

Q1.12 Indicate if you agree with the following remarks about the general characteristics of the OIs related to this operational concept.

OIs that facilitate the air to ground or ground to ground data exchange	Yes	100%
OIs that provide a common view of aircraft trajectories (between ground and board)	Yes	100%
Collaborative decision making (CDM) related Ois	Yes	88%
Complexity management related OIs	Yes	88%
Airspace capacity management related OIs	Yes	75%
New separation modes related OIs	Yes	88%
Minimising segregation related OIs	Yes	71%

Q1.13 Identify the expected impact of the operational concept on each of the following Key Performance Areas.

	Impact	Mode	Var
Access & Equity	0,3	0	2,2
Capacity	2,4	2	0,3
Cost Effectiveness	1,4	1	0,3
Efficiency	2,3	2	0,5
Environmental Sustainability	0,6	1	0,8
Flexibility	1,3	2	1,4
Interoperability	1,1	2	3,6
Participation	0,9	2	2,1
Predictability	2,5	3	0,6
Safety	2	2	1,1
Security	0,4	0	0,6

Q1.14 Each one of the following corresponds to a technical or to an operational constraint. Please (a) classify the constraint as either technical or operational and (b) rank their importance.

	TECH	OPER	Rank	Mode	Var
4D trajectory management tool that does not increase controller workload	8	1	4,3	1	33,9
Procedural redundancy in case of individual a/c failures.	3	6	4,5	-	21,2
Failure to provide a system to system communications capability for the exchange of trajectories.	9	0	4,6	2	15,5
Overall integrity of the RBTdata.	9	0	4,7	2	20,0
Threshold of availability at which efficiencies will be realised	3	5	5,2	-	27,1
Need to provide procedural redundancy in case of local or global failures of SWIM and its related communication means.	5	3	5,3	1	62,7
Ability to keep Speed and height	8	1	5,7	2	27,0

	TECH	OPER	Rank	Mode	Var
Ratio of 4D equipped aircraft	2	6	5,7	3	30,3
Multiple source information needed to define and update 4D trajectory.	7	1	5,8	1	41,9
Inaccurate automation system and facilities	9	0	6	-	59,5
Unreliable and slow at ever data exchanges means.	8	0	6,3	2	63,7
Legal limits of the uses for the down loaded information: what parameters are needed to implement profiled climbs and descent: what is safe?	2	6	6,4	-	39,9
Several separation models in one airpace,4D/3D/2D/ASAS…	1	8	6,7	-	65,1
Need to pay extra attention to focus on the 4D flights	1	8	6,8	3	41,0
Stability of scaling long term, medium term and short terms adaptations.	4	4	7,2	-	83,8
The management & hierarchy of priorities in case of global changes, due to e.g. weather, airport closure, airspace closure,…	0	9	7,4	8	5,2
Time/Speed constrains due to other functions	5	4	7,5	3	73,9
Stability of solutions in case a simultaneously required adaptations.	4	5	7,5	4	103,9
The difficulty to narrow the size of possible deviations (tubes, time windows, TMR) in order to increase capacity while maintaining sufficient robustness and resilience.	5	4	7,7	12	24,6
Developing of Operational rules in En Route airspace requires high level of coordination and harmonisation between involved stakeholders to achieve seamless operation in ECAC airspace.	0	9	8,3	2	20,6
Airborne Systems and Ground Systems are developed unparallel or at different speeds not achieving the same required level for implementing the Operational Improvement in a substantial way.	9	0	8,3	2	23,5
Not enough accuracy and predictability	7	0	8,4	1	24,2
Limited degrees of freedom for pilots to choose alternative conflict resolutions.	1	8	8,7	2	59,9
The FMS can manage only single RTA at a time for all the flight. A new time constraint for the same flight can be issued only after the termination of the previous constraint.	9	0	8,7	-	103,3
Unlawful interference (data systems are not safe, any emergencies, …)	5	4	9,2	3	56,6
Rude aircrew rude behaviour.	0	8	10,5	-	59,5

Q1.15 Please rank the following ideas for supporting tools. To Rank a process select a number (only once) from 1-n. 1 highest n lowest

	Avrg	Mode	Var
Communicate trajectory directly to the a/c CDTI for direct loading into the FMS.	3	2	2,4
Conflict detection and resolution.	3,1	-	22,8

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	Avrg	Mode	Var
FMS capable of down/Uplink of trajectory data (TMR changes, Time and speed constraints). FMS Capability of RTA function to comply with CTOs/CTAs/Waypoints and speed adjustments.	3,3	2	8,5
Trajectory Management tools to display 4D-information and to Modify 4d-Trajectories.	3,9	1	11,8
De-confliction Console: MTCD & R for Complexity Manager and Planning Controller. De-conflicting options, negotiation and solutions within a given anticipated period of time.	4,1	3	16,3
SWIM linked Data Correlation Tool: for monitoring and correlate Trajectory Data from shared Airborne and Ground Systems.	4,3	-	20,6
Intent and Conformance Monitoring Tool. Automatic Prediction and detection of deviations from RBTs. Propose changes.	4,6	3	19,9
Enhanced MTCD.	4,8	-	15,0
Medium Term Separation Assurance Tool: For Executive Controller. Aid for separation and Sequencing in real time aircraft.	4,9	2	11,1
Automated 4D contract Management.	5,5	1	15,1
Comparison of trajectories.	6,1	2	12,2
What if probing.	6,4	2	12,6
CDM process support tools.	6,8	2	5,1

Q1.16 Please rank the following high-level requirements for the associated supporting tools. To Rank a process select a number (only once) from 1-n. 1 highest n lowest

	Rank	Mode	Var
Accurate	1,5	1	7,3
Effective	2,7	2	0,3
Easy to use	3	3	5,1
Improved trajectory prediction	3,4	1	3,6
Able to integrate and analyse a great number of requests and constrains, and find quickly an appropriate trajectory.	3,6	4	4,3
Fast	3,6	1	5,1
Efficient	3,7	1	5,0
Smart	5,6	8	6,3

Q1.17 In this context the "transition from ASAS to the initial 4D trajectory management is understood as the period of time ranging from the decision to separate an aircraft using ASAS to the decision to separate the same aircraft using the initial 4D trajectory management.

Within this context, please agree / disagree with the following statements.

When ASAS separation is performed by a pilot , the manoeuvre will be integrated in the 4D trajectory	Yes	75%
When the aircraft inter a unmanaged airspace from a controlled	NA	50%

airspace by ANSP		
ATCo and pilot make a decision	Yes	88%
Improve 4D trajectory management more and more	NA	57%
When an aircraft is flying a 4D trajectory, once entered a non complex sector.	NA	33%
Controller or Flight crew may request to delegate the separation function to the Pilot.	Yes	100%
Determine and agree time duration	Yes	86%
Flight Crew is responsible of performing the separation action	Yes	75%
Separation responsibility has to return to Controller when clearance expires but providing 4D Contracts (conflict-free) are the best way to maintain long ASAS operations	Yes	71%
SESAR and the DODs are still immature in the description of how traffic flow management (e.g strategic deconfliction and separation management (PT, TC-SA, ASAS) work together.	Yes	88%

Q1.18 Who will be responsible for the aircraft during the transition from ASAS to 4D trajectory management?

The flight crew is always responsible for the a/c	NA	50%
The ATM services (i.e. an ATCO), until the beginning of the ASAS period of the flight	Yes	75%
The responsible for separation will be the Controller, until transfer is acknowledged by Pilot	Yes	71%

Q1.19 When could be the responsibility transferred?

At a specified point of the trajectory	Yes	86%
At a specified (and commonly agreed) time	Yes	100%
When the actor who is going to keep the responsibility declares he is ready for that.	Yes	88%

Q1.20 Please order the following transition from ASAS to initial 4D trajectory management phases

To "order" select a number (only once) from 1-n. 1 first n last. Write below the phase's name your understanding of its meaning.

	Avrg	Mode	Var
Request: Pilot / AUO request ASAS separation or Controller proposal.	1,6	3	0,3
Request Assessment	2,6	4	1,2
Fast simulation	4,2	5	0,5

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	Avrg	Mode	Var
Coordination	4,2	-	6,7
Preparation Phase	4,5	8	0,3
Get the conclusion	5	1	0,8
Transfer Phase or Denial of Transfer.	5,6	6	1,3
Implementation	7,8	-	12,3

Q1.21 If the transition from ASAS to the initial 4D trajectory management occurred in an environment in which different aircraft with different equipage and capabilities existed…

The responsibilities for A/C maybe be not clear	NA	33%
As one of the reduction complexity measures, Airspace Organisers and Managers might have to establish zones where ATM capabilities match the same requirements.	Yes	78%
The less capable aircraft which are flying conventional modes of separation are candidates for receiving tactical restrictions and are more dependant on real time traffic conditions in a mixed mode scenario.	Yes	78%
The aircraft flying theirs RBTs (2D, 3D) which are not capable of performing 4D operations, are also candidates for receiving trajectory changes or revisions due to tactical intervention and, if it is timely permitted, for receiving short to medium term negotiated de-complexity constraints.	Yes	89%
The principle will be the best equipped a/c, the lesser constraints it will receive.	Yes	75%
Mixed equipped traffic can be handled with no significant impact on ATC Workload because of the use of extensive automation support	No	29%

Extended AMAN horizon

Q2.1 Aircraft departing inside of an hour from the destination aerodrome are given trajectory adjustments to fill the gaps (an easier solution than adjusting those in cruise).

NA. 63%

Q2.2 The extended AMAN horizon is the horizon in time where an RTA can be issued to a flight.

Yes. 75%

Q2.3 The Extended AMAN horizon means that the AMAN controls the aircraft earlier.

No. 25%

Q2.4 RBTs and the Trajectory Management process should be taken into account to improve the quality of the AMAN.

Yes. 100%

Q2.5 The extended AMAN horizon is used to provide arrival sequence time information into En Route decision making.

Yes. 100%

Q2.6 Through the extended AMAN horizon, CTA can be issued, instead of TTAs or CTOs, right after take off, so the flight can be introduced in a more stable and predictable arrival sequence.

NA. 67%

Q2.7 Each individual flight will arrive to a point 200 NM out of the airport with an accuracy of ± 2 min. with respect to planning

Yes. 50%

Q2.8 The AMAN will provide a planned time for the IAF that the aircraft will meet with an accuracy of ±30 sec. (mixed equipped traffic).

Yes. 75%

Q2.9 Negotiate short trajectories to fill the gaps and assign CTA as appropriate when the aircraft that are filling the blanks become known.

NA. 56%

Q2.10 AMAN will give advisories which influence the trajectory.

Yes. 78%

Q2.11 Flight will receive as earlier as possible its own RTA, and will be able to manage its trajectory in order to comply with it (even if it is still on the apron of the departure airport).

NA. 67%

Q2.12 It will decrease the workload of ATCo and pilots.

Yes. 75%

Q2.13 AMAN is a prerequisite for the realization of 4D trajectory management

No. 25%

Q2.14 Improved sequencing and merging of aircraft under tactical control.

Yes. 78%

Q2.15 Providing an enhanced and more consistent arrival sequence.

Yes. 89%

Q2.16 Reducing holding by using speed control to absorb some of the queuing time.

Yes. 89%

Q2.17 If we consider that airports sharing the same AMAN horizon because of their proximity can build the arrival sequence with greater stability, issuing CTAs instead of TTAs or estimated times, the traffic flow between these airports have a greater level of predictability and time reliability.

NA. 67%

Q2.18 The extended AMAN horizon will be useful for building up the arrival sequence for incoming flights from airports outside the shared AMAN horizon.

Yes. 78%

Q2.19 To get a slot in the arrival sequence can be issued easier because there is less uncertainty degree in the sequence.

Yes. 78%

Q2.20 When will the CTA become a priority? When there is a deviation of more than 3 minutes

No. 0%

Q2.21 When will the CTA become a priority? This should be determined through the EP3 validation exercises.

Yes. 89%

Operational Change from2D-PTC to ASAS

Q3.1 In which operational (e.g. required actors, roles, procedures…) and technical (e.g. systems / subsystems, equipment …) environments could the “change from 2D PTC to ASAS S&M operation” be used?

In a managed airspace / if all the aircraft trajectories are known and predictable / all aircraft involved in ASAS procedure are correctly equipped / pilots and controllers are equipped with a monitoring system of the trajectories	Yes	86%
Automation tools, procedures, actors, system are necessary	Yes	86%
Fixed or temporary airspace	NA	60%
Flying low capacity airspace	Yes	83%
General Aviation airspace	NA	40%
The best opportunity to use change from 2D PTC to ASAS S&M operation will be when fixed routes have to be temporary established. ASAS application will contribute to assist the Controller in spacing actions for aircraft routing the same fixed route and will contribute to build the arrival sequence.	NA	67%
Regarding technical environment, this separation mode can be applied by less equipped aircraft so mixed mode operations can be developed in an easier way and more often way, decreasing controllers workload, and allowing more regular flow to the runway, and increasing the runway throughput.	NA	50%
In no environment. In my understanding, the S&M application in the SESAR concept (within the extend TMA; not outside) just requires some relatively large cones in which aircraft can fly according the S&M trajectories.	NA	60%

Q3.2 Please rank the following supporting tools associated to the change from 2D PTC to ASAS S&M operation

	Rank	Mode	Var
Conformance Trajectory Monitoring	2,2	1	5,2
Avionic Navigation supporting 2DRNP at least.	2,7	-	8,5

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	Rank	Mode	Var
ADS b/out for Surveillance spacing.	2,7	5	3,1
A trajectory definition tool for the pilot	3	4	7,2
Monitoring tool for the pilot and the controller	3,5	2	14,3
Device enabling the display of the new trajectory (on the radar picture for instance)	4	4	23,8
Assessing tools/flow management procedure/special coordination procedure	4	1	7,5
Tool that provides flexible 2D strategy	4,4	3	0,7
Swim linked Data Correlation Tool: for monitoring and correlate Trajectory Data from shared Airborne and Ground Systems.	4,8	2	3,1
Intent and Conformance Monitoring Tool. Predict and detect deviations from RBTs	5	3	23,5
CTA/CTO Management - Single constraint.	5,4	-	24,2
Complexity Reduction Console: MTCD & R for Complexity Manager and Planning Controller. De-conflicting options and solutions within a given anticipated period of time.	5,8	13	36,8
Medium Term Separation Assurance Tool: For Executive Controller. Aid for separation and Sequencing in real time aircraft.	6,4	1	22,2
Wake vortex detection- To increase capacity during spacing.	7	2	21,5

Q3.3 Please rank the following high-level requirements for the associated supporting tools.

Please rank the following high-level requirements for the associated supporting tools.	Rank	Mode	Var
Accurate	1,7	1	3,6
Responsibility sharing definition	2,4	1	0,6
Easy to use	2,6	2	1,6
Effective	2,6	1	1,6
Able to integrate and analyse a great number of requests and constrains, and find quickly an appropriate trajectory.	2,7	1	2,6

Q3.4 During the transition between 2D and the use of ASAS, what could happen in a mixed (in which aircraft have different equipage levels) environment?

The system in charge of the ATC (ATCO + tools) will be in charge of the consistency of the air situation, and of the transmission of the appropriate clearances.	Yes	86%
The responsibilities for A/C maybe be not so clear , and decrease the capacity in the airspace	NA	50%
2D more and more used in low complexity airspace However, ASAS use in high complexity.	NA	57%
In a mixed mode, in the arrival sequence will coexist a/c performing conventional spacing with 2D PTC and ASAS. Apparently, this will have no negative effect in stabilising and correcting the sequence,	NA	57%

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providing that ASAS operating a/c will have a stable trajectory evolution, and this will free Controller resources.

Strategic Complexity Reduction using 4D PTC

Q4.1 Compare 4D-Trajectories and detect complexity according limits (TMR). Time horizon before entry in controlled sector to solve complexity and consolidate sectors..

Yes. 80%

Q4.2 Issuing 4D clearances (new trajectory) that leads to put aircraft on separated trajectories (an off track trajectory will be assigned to an aircraft who needs to descend and cross one or several aircraft flying below him), or to create safety separation on converging trajectories.(a speed change or alternate trajectory to pass at a pre define distance from an other aircraft). The time horizon corresponding to “strategic” has to be defined.

NA. 60%

Q4.3 It is a procedure or process through which network management can increase traffic flow, decrease complexity, avoiding frequent transitions through fixed routes, sectorisation. At the same time, it can reduce the coordination with military authorities.

Yes. 70%

Q4.4 An algorithm used to calculate the precise model of 4D trajectories to ensure that there is no complexity between tracks to achieve the purpose of optimizing.

Yes. 78%

Q4.5 4D-PTC enables the ANSP to clear an aircraft for a longer portion of flight. The cleared portion must be conflict free. Conflicting 4D aircraft could be de-complexified by setting constraints (2D-routes, 3D-routes, Speed restrictions, RTAs) early (not before takeoff) on the RBT. 4D-PTC is not foreseen for arrivals and departures, but 3D routes and 2D routes are available in the TMA.

NA. 67%

Q4.6 SESAR doesn’t consider strategic de-confliction for the new separation modes oriented towards the elimination of ATC tactical intervention including 4D PTC (intended as 4D contracts).

NA. 33%

Q4.7 Strategic de-confliction shall be considered for those traffic without 4D contract in a mixed environment.

NA. 67%

Q4.8 Please rank the following business / system processes associated to the “Strategic de-confliction using 4D PTC”?

	Rank	Mode	Var
4D Nominal Route revision request process triggered by: Separation Provision / Sequencing / /Short to Medium Complexity Reduction action / Weather / Changing arrival constraints / User / Pilot Request / Controller Request / Disruptive events, etc…	3,6	2	5,6
A data exchange which enables a very accurate knowledge of the 4D trajectories of all the aircraft for the next 20 to 40 minutes (time necessary for a flight to go through a FAB or ACC), and a high-performance computer able to detect conflicts and propose solutions, taking in account the expected	3,9	1	14,1

	Rank	Mode	Var
trajectories, and all the constraints to cope with in the same time horizon (military activities, weather conditions, flow management). That supposes all the aircraft fly 4D trajectories in the same airspace.			
Tool to calculate complexity, Definition of Complexity	4	1	18,0
Automated Ground Based Tools 4D Route intent and conformance monitoring process.	4,3	2	10,6
Fast simulation	4,4	1	12,6
Combined Air / Ground trajectory data correlation process. SWIM environment. Information sharing.	4,6	12	14,8
Get de-complexity	4,7	8	9,7
Assessment	5	2	14,1
FMS 4D route intent and conformance monitoring process.	5,1	3	14,2
Cooperation with military	6,3	11	14,1
Optimise trajectories	6,9	10	8,3
Request	7,4	6	2,9

Q4.9 Rank the roles involved in the "Strategic de-confliction using 4D-PTC"

	Rank	Mode	Var
Multi sector planner	3,7	1	21,4
Ground Systems: Display Scenarios and De-confliction / Separation Options. RBT calculation and correlation.	4,2	3	34,5
Airborne Systems: PT Calculation, RBT Correlation, RTA Function.	4,6	-	47,4
Complexity Manager	4,8	19	59,4
ATC operational manager	5,4	2	18,6
Assistance tool for the pilot	5,6	6	15,4
Assistance tools for the ATCO	5,6	2	14,6
Network operation managers	5,6	1	46,2
Flight Crew: Monitoring flight, comply with CTAs/CTOs/Waypoints and TMRs.	5,7	-	39,9
ATCo – Executive Controller: Trajectory Clearance Process. Separation. Tactical intervention.	6,3	1	14,5
Network manager	6,4	1	26,6
Airspace users operations	7,1	9	11,7
Planning Controller: Monitoring Flights in sector/s under his responsibility. Short to medium term de-confliction actions. Negotiating trajectory changes.	7,7	2	13,9
Regional network manager	7,9	3	32,6
Supervisor	7,9	4	27,3
ATS regional units	8,8	2	50,7
All procedure are delegated to machines, under control of controllers and pilots.	10,2	3	33,1

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Technical support staff	10,7	10	22,1
All stakeholders	13,2	18	49,9

Q4.10 Please rank the following operational process activities associated to the "Strategic de-confliction using 4D PTC"? To Rank a process select a number (only once) from 1-n. 1 highest n lowest.

	Rank	Mode	Var
Once the RBT is loaded into the FMS in the cockpit, the strategic de-confliction process actuates all over the flight. If nothing is to be revised a/c proceed to the next authorised flight section of the trajectory. If Planning Controller detects conflicts in advance in any point of the trajectory, RBT revision process occur either manually or automated, proposing changes in CTOs/TTAs/CTAs to the AOC/Pilot or in other flight parameters of the Trajectory. In addition, new TMRs can be given in order to save events that require tight parameters.	1,9	1	3,7
Detection of separation loss (with a specific tool)/ definition by the system on the ground of a safe new 4D trajectory / proposition to the concerned pilot / agreement (or rejection) from the pilot and insertion of the new active 4D trajectory in the FMS.	2,6	1	4,3
Flow management, using tools, coordination, operating	3	2	3,8
The best procedure for managing constraint changes is when RBTs updates/changes are done automatically and they do not deviate much from initial agreed RBT. Strategic de-confliction is applied always in advance solving all conflicts and flight efficiency is maintained. (Closed Loop deviations mostly)	3,1	1	0,8
New mode of separation – 4D Function – algorithm model	3,2	2	4,5
When Open Loops are issued, the strategic process requires more coordination from Planning Controller and AOC/Pilot to achieve agreements.	4,1	4	4,5
An aircrew –or its AOC- files a preferred 4D trajectory for a certain flight. This RBT is then in a number of iterations adapted (because the most preferred runway slots might not be available, the aircraft on the gate is slightly delayed, weather changes, the taxi time is longer then expected, the line up is slightly delayed due to e.g. bird control, whatever). These RBT changes are executed between aircrew –or its AOC- in terms of requests, acknowledgements and options to choose from. A last resort is "no RBT available" corresponding to the lack of an airway clearance	4,6	5	1,6

Q4.11 Very precise, because 1minute flight is about 8Nm; a monitoring of the trajectories will be mandatory. The more accurate will be the predictions, the more important will be the capacity gain (because less imprecision margins will have to be taken)

Yes. 100%

Q4.12 Accuracy must be higher than 90%.

Yes. 100%

Q4.13 Trajectory conformance is given by the TMRs and 4D-PTC rules. As long as the aircraft manages to fly within the defined restrictions everything works as foreseen.

Yes. 90%

Q4.14 The accuracy will increase over time. Around 2020, there will be no need to strategically deconflict each and every pair of aircraft for the whole flight. Instead, it will turn out to be sufficient if the predicted aircraft trajectories are sufficiently robust

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and flexible, in order to have medium and short term conflict resolution mechanisms to be effective. This requires accuracies in the order of 1NM lateral, 100 ft vertical, and 1-2 minutes in time.

NA. 50%

Q4.15 Coherent set of constraints for the overall flight (for example not to decelerate an aircraft and accelerate it again)

Yes. 75%

Q4.16 Deconflict aircraft and not cancelling the CTA

NA. 38%

Q4.17 Negotiate constraints with the user (if foreseen)

Yes. 90%

Q4.18 Can this process be implemented using the “4D initial process”?

NA. 63%

Q4.19 Rank the uncertainties that can be encountered.

	Rank	Mode	Var
Accuracy and compliancy to the trajectory	1,6	1	0,7
Unexpected events (thunderstorm, emergency, etc.)	2,5	2	1,8
Aircraft performance	2,9	4	3,2
Uncertainties on the aircraft performances, on the wind	3	7	5,5
Sectorisation tools maybe not be ready, and the operation procedure with military authorities	4,1	1	2,7
New aircraft will be created can achieve ASAS	4,4	2	2,1
Data link failure	4,8	6	4,7

Q4.20 Rank the parameters that could be used to provide an optimal (from the user’s point of view) deconflicted situation?

	Rank	Mode	Var
Accurate flight time and distance (predictable)	2,1	4	1,9
Minimum Separation distance	3	2	2,1
Minimum flight time and distance	3	1	5,2
The average delay time	3,1	2	6,7
Average delay and the amount of deconflicting	3,7	6	3,8
A high rate of change	4,2	1	2,5
It depends on the individual RBTs involved in the conflict. May be there is time to ask the user involved in the conflict.	4,8	1	4,4

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4 QUESTIONNAIRE 3

This section reflects the outcomes of the 3rd questionnaire before the meeting. Some of the final answers changed in the meeting. These final answers can be found in the minutes [4] and presentation [5] of the second expert group meeting. The final expert group report, [1], reflects the final agreed answers.

In questions which answers can be yes or no, the associated percentage is related to the number of "Yes" obtained. NA means Non Agreement reached, this will happened if the percentage is between 30 and 70.

4D Trajectory Management

Q1.1 Initial 4D "function" is an aircraft system function that provides the capabilities needed to fly its RBT following one single time constraint at each route clearance with the required avionics performance (FMS with RTA function).

Yes. 90%.

Q1.2 Only one system time constraint may exist within the aircraft at any one time, in an initial 4D environment

Yes. 80%.

Q1.3 Time constraints are: TTAs, CTAs, CTOs and/or Speed Adjustments

Yes. 70%. CIM

Q1.4 Ground can request and/or instruct/clear an RBT change due to tactical reasons.

Yes. 100%.

Q1.5 From the air point of view the 4D trajectory management is the capability to implement the ground requests / instructions / clearances.

Yes. 80%

Q1.6 If possible ground must try bringing an aircraft back to its original RBT

Yes. 100%. CIM

Q1.7 A significant change is defined as any change that results in a Time Constraint change.

NA. 50%.

Q1.8 4D trajectory management is the capability of sharing the trajectory to the NOP to enable the trajectory to be used for planning including tactical purposes.

Yes. 70%. CIM

Q1.9 From the air point of view it is how the a/c receives and processes ground suggestions through the RBT and from the ground perspective it is how the ground system receives the current RBT and issues proposed changes.

Yes. 89%.

Q1.10 Each one of the following corresponds to a possible business / system process. For each process, rank the importance of the process. To Rank a process select a number (only once) from 1-n. 1 highest n lowest.

	Avrg	Mode	Var
Separation management Controller tools to display trajectory information and change trajectories	3,10	2	5,7
Complexity management Sector traffic planning Capacity / Demand balancing Queue management Being able to reach a given point at a requested time (single RTA management)	3,40	3	3,6
Performance based clearances	5,25	3	17,6
Aircraft performance	4,63	1	31,1
FMS-Ground Connection to deliver and exchange trajectory information Ground based trajectory prediction tool, which should process also FMS data if available	3,20	1	4,2
Time conditions	6,00	3	18,3
Definition of common (board and ground) initial 4D trajectory by computing SBT / aircraft capabilities / ATC constraints	4,00	2	10,0
3D routes	5,63	3	18,3
Automation tools	5,56	1	21,8
Data link close loop between the airborne and ground systems, enabling to share the same RBT	4,63	4	12,3
Airspace	8,88	4	40,4
Downlink of 4D data: current position, predicted positions ·(Altitude, Latitude, Longitude, Time Over significant Point, Point Type), and FMS status (managed, selected, etc.)	5,00	3	21,0
Update “initial” 4D trajectory until take-off; after take-off, it will be the RBT 4D trajectory (it will be updated during the flight as often as necessary).	6,00	3	22,5
Air-ground negotiation of 3D trajectory and time constraint	7,50	5	29,1
Uplink of successive clearances for each ATSU Area of Responsibility	6,75	2	36,2
Air-ground negotiation of 3D trajectory (route and level clearances) and time constraint (downlink of ETAmin, ETAmax, uplink of CTA constraint)	7,50	5	25,7

Q1.11 Each one of the following corresponds to a possible disruptive (degraded / non-nominal) event that could impact the “initial 4D trajectory management” from being applied. For each event, rank the importance of the events. To Rank a process select a number (only once) from 1-n. 1 highest n lowest.

	Avrg	Mode	Var
4D trajectory management can not respond to a specific complexity situation.	3,50	2	6,6
Aircraft have not enough performance to response "4D trajectory management" .	7,25	2	44,5

	Avrg	Mode	Var
Airborne systems data not available	6,78	3	35,9
Additional load at the airport (passenger, freight)	12,14	3	112,1
Aircraft equipment does not comply with requirement for trajectory delivery (low ATM-Capability Level)	8,33	1	47,3
Air-Ground data link not available	6,00	1	47,0
4D trajectory management experiment show "this function is not enough safe"	2,71	1	4,9
4D Trajectory management is more inefficient.	5,63	11	12,6
ATC system can not provided enough performance to response 4D requirement.	5,50	2	32,9
Controller consider 4D trajectory management tools are not easy to use.	5,63	3	12,8
Conflict resolution in the TMA	7,71	2	42,9
ATC system failure	7,14	1	64,1
Conflicting priorities for the ATCO	8,57	2	55,0
ATCo abilities are not fit	6,83	2	29,0
Controller work overloading.	6,86	2	33,5
Confusion over priorities for the aircraft (how mandatory is the CTA)	8,57	-	52,3
Complexity issues, with snowball effect	10,29	4	53,6
Ground systems TP data not available	7,33	17	53,3
FMS or needed avionics malfunction. Inability to comply with 4D operation through TMRs.	8,00	1	69,3
Convective weather activities	16,25	4	123,9
Aircraft non-compliance with cleared route	10,00	-	76,0
Aircraft performance changes due to last minute changes	10,78	2	79,2
Change of runway configuration which also suddenly influences the departure routes of a/c which remain cleared for the same runway as before	15,71	26	135,9
Degraded Aircraft Fight Performances. Inability to comply with CTAs, CTOs and TMRs generally.	11,44	2	127,0
Aircraft failures	9,56	1	104,0
Delayed Take-off (for several reasons)	16,71	3	182,2
Closure of destination airport	16,71	3	174,2

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	Avrg	Mode	Var
Emergency situation onboard the a/c; e.g. technical failures, medical situations, security reasons,…	11,25	6	127,9
Communications Link lost or degraded (Airborne or Ground based).	9,89	2	87,1

Q1.12 Each one of the following corresponds to a possible role. For each role, rank the importance of the role. To Rank a process select a number (only once) from 1-n: 1 highest, n lower

Each one of the following corresponds to a possible role. For each role, rank the importance of the role.	Avrg	Mode	Var
CFMU	6,00	2	36,3
Flight Crew:	3,60	1	8,5
Queue, Trajectory and Separation Manager	5,70	1	41,8
Airline Operations Centre	6,80	7	18,6
Executive Controller	3,00	1	5,1
ATFMS	7,56	15	29,5
Trajectory planning	4,44	4	8,0
Airport	7,71	-	28,9
ATC-Controllers	3,38	2	7,1
Planning Controller	5,20	3	21,3
SWIM	6,30	8	26,2
Airborne Systems	4,56	2	23,0
Military	8,75	12	38,8
4D contract coordinator	7,43	3	54,0
Traffic management	6,11	11	23,6
Ground Systems	4,56	2	17,3
MET	8,44	3	41,8
Descent profile planning	10,63	18	66,8
Technical Services	7,11	2	45,1

5 QUESTIONNAIRE 4

This section reflects the outcomes of the 4th questionnaire before the meeting. Some of the final answers changed in the meeting. These final answers can be found in the minutes [6] and presentation [7] of the third expert group meeting. The final expert group report [1], reflects the final agreed answers.

In questions which answers can be yes or no, the associated percentage is related to the number of "Yes" obtained. NA means Non Agreement reached, this will happened if the percentage is between 30 and 70.

4D Trajectory Management

Q1.1 If possible, ground must try bringing an aircraft back to its original RBT

Yes. 86%.

Q1.2 From the air point of view the 4D trajectory management deals with how the aircraft receives and processes ground suggestions through the RBT

Yes. 71%.

Q1.3 From the ground perspective it is related with how the ground system receives the current RBT and issues proposed change

Yes. 71%.

Q1.4 From the ground perspective it is related with how the ground system receives the current RBT and issues proposed change

Yes. 71%.

Q1.5 Each one of the following corresponds to a possible 4D trajectory management processes. Choose a percentage (once each one) for the five processes you consider the most important. To rank a process select a percentage (only once) from 50%, 30%, 10% or 5% (50% highest, 5% lowest)

	Avrg	Mode	Var
Downlink of 4D data: current position, predicted positions (Altitude, Latitude, Longitude, Time Over significant Point, Point Type), and FMS status (managed, selected, etc.)	25,8	10	424
Providing the controllers with accurate trajectory information, intent information, and trajectory change mechanisms.	24,2	30	344
Data link close loop between the airborne and ground systems, enabling to share the same RBT for the purpose of using it in the Ground based Trajectory prediction tool.	22,5	10	458
Queue, Trajectory and Separation management (Getting solution from the catalogue, Dynamic Airspace management, etc.)	3,3	5	7
Trajectory preparation process (including SBT and RBT/4D trajectory)	10,8	5	374
Taking into account Aircraft capabilities to adhere to the RBT (performance base clearances)	11,7	0	217

Q1.6 Each one of the following statements corresponds to an identified Supporting Tools for the Long/Medium Term, understanding Long Term as 50 min in advance, and Medium Term 20-30 min before the executive controller takes charge of the aircraft.

Choose a percentage (once each one) for the five you consider the most important. To rank a process select a percentage (only once) from 50%, 30%, 10% or 5% (50% highest, 5% lowest)

	Avrg	Mode	Var
Comparison of trajectories.	16,43	5	531
Trajectory Management tools to display 4D-information and to Modify 4D-Trajectories.	28,57	50	473
CDM process support tools.	17,71	10	327
Enhanced MTCD.	12,14	5	290
Medium Term Separation Assurance Tool: For Executive Controller. Aid for separation and Sequencing in real time aircrafts.	7,14	0	115
What if probing.	19,29	30	187

Q1.7 Each one of the following statements corresponds to an identified Supporting Tools for the Medium/Short and Execution Term, understanding Medium Term 20-30 min and Short Term 10 min before the executive controller takes charge of the aircraft. Choose a percentage (once each one) for the five you consider the most important. To rank a process select a percentage (only once) from 50%, 30%, 10% or 5% (50% highest, 5% lowest)

	Avrg	Mode	Var
Communicate trajectory directly to the a/c CDTI for direct loading into the FMS.	1,43	0	14
Conflict detection and resolution.	13,57	0	373
Trajectory Management tools to display 4D-information and to Modify 4D-Trajectories.	9,29	0	337
What if probing.	3,57	5	13
CDM process support tools.	1,43	5	8
Enhanced MTCD.	10,00	0	377
De-confliction Console: MTCD&R for Complexity Manager and Planning Controller. De-conflicting options, negotiation and solutions within a given anticipated period of time.	18,57	0	581
Medium Term Separation Assurance Tool: For Executive Controller. Aid for separation and Sequencing in real time aircrafts.	12,14	0	399
SWIM linked Data Correlation Tool: for monitoring and correlate Trajectory Data from shared Airborne and Ground Systems.	-	0	0
Intent and Conformance Monitoring Tool. Automatic Prediction and detection of deviations from RBTs. Propose changes.	11,43	5	173
FMS capable of down/Uplink of trajectory data (TMR changes, Time and speed constraints). FMS Capability of RTA function to comply with CTOs/CTAs/Waypoints and speed adjustments.	12,14	5	157

Q1.8 Each one of the following corresponds to a technical constraint. Choose a percentage for the five you consider the most important. To Rank a process select a percentage (only once) between 50%, 30%, 10% or 5% (50% highest, 5% lowest)

	Avrg	Mode	Var
4D trajectory management tool that does not increase controller workload.	15,00	0	575
Failure to provide a system to system communications capability for the exchange of trajectories.	25,71	50	629
Overall integrity of the RBT data.	20,00	30	158
Need to provide procedural redundancy in case of local or global failures of SWIM and its related communication means.	1,43	0	14
Ability to keep speed and height.	0,71	0	4
Multiple source information needed to define and update 4D trajectory.	-	0	0
Inaccurate automation system and facilities.	1,43	0	14
Unreliable and slow at ever data exchanges means.	10,71	0	187
Stability of scaling long, medium and short terms adaptations.	-	0	0
Time/Speed constraints due to other functions.	0,71	0	4
The difficulty to narrow the size of possible deviations (tubes, time windows, TMR) in order to increase capacity while maintaining sufficient robustness and resilience.	0,71	0	4
Airborne Systems and Ground Systems are developed unparallel or at different speeds not achieving the same required level for implementing the Operational Improvement in a substantial way.	2,14	0	15
Not enough accuracy and predictability.	10,00	0	325
The FMS can manage only single RTA at a time for all the flight. A new time constraint for the same flight can be issued only after the termination of the previous constraint.	2,86	0	15
Unlawful interference (data systems are not safe, any emergencies…)	7,86	0	349

Q1.9 Each one of the following corresponds to a operational constraint. Choose a percentage (once each one) for the five you consider the most important. To Rank a process select a percentage (only once) between 50%, 30%, 10% or 5% (50% highest, 5% lowest)

	Avrg	Mode	Var
Procedural redundancy in case of individual a/c failures.	19,00	0	373
Threshold of availability at which system wide efficiencies will be realised.	7,00	0	125
Ratio of 4D equipped aircraft.	24,00	50	515
Legal limits of the uses for the down loaded information: what parameters are needed to implement profiled climbs and descent? What is safe?	8,00	0	120
Several separation models in one airspace, conventional separation/2D PTC/3D PTC…	22,00	0	554
The management & hierarchy of priorities in case of global changes, due to e.g. weather, airport closure, airspace closure…	7,00	5	17
Stability of solutions in case a simultaneously required adaptations.	20,00	0	229
Developing of Operational rules in En Route airspace requires high level of coordination and harmonisation between involved stakeholders to achieve seamless operation in ECAC airspace.	29,00	50	504

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Change from 2DPTC to ASAS procedure

Q2.1 In which operational (e.g. required actors, roles, procedures…) and technical (e.g. systems / subsystems, equipment …) environments could the "Change from 2D PTC to ASAS S&M operation" be used?

	Avrg	Mode	Var
In a managed airspace / if all the aircraft trajectories are known and predictable / all aircraft involved in ASAS procedure are correctly equipped / pilots and controllers are equipped with a monitoring system of the trajectories	32,86	50	324
Fixed or temporary airspace	5,00	5	8
Flying low capacity airspace	11,43	5	298
The best opportunity to use the change from 2D PTC to ASAS S&M operation will be when fixed routes have to be temporary established. ASAS application will contribute to assist the Controller in spacing actions for aircrafts routing the same fixed route and will contribute to build the arrival sequence.	22,86	5	415
Regarding technical environment, this separation mode can be applied by less equipped aircrafts so mixed mode operations can be developed in an easier way and more often way, decreasing controllers workload, and allowing more regular flow to the runway, and increasing the runway throughput.	26,43	30	223

Q2.2 Each one of the following corresponds Supporting Tools associated to the Change from 2D PTC to ASAS S&M operation. Choose a percentage for the five you consider the most important.

	Avrg	Mode	Var
A trajectory definition tool for the pilot	14,00	0	207
Device enabling the display of the new trajectory (on the radar picture for instance)	11,00	0	404
Monitoring tool for the pilot and the controller	18,00	0	382
Assessing tools/flow management procedure/special coordination procedure	10,00	0	417
Tool that provides flexible 2D strategy	6,00	0	150
CTA/CTO Management - Single constraint.	6,00	0	150
Avionic Navigation supporting 2DRNP at least.	7,00	5	8
Conformance Trajectory Monitoring	2,00	0	6
ADS b/out for Surveillance spacing.	29,00	0	504
Wake vortex detection- To increase capacity during spacing.	2,00	0	17
De-complexity Console: MTCD & R for Complexity Manager and Planning Controller. De-conflicting options and solutions within a given anticipated period of time.	10,00	0	417
Medium Term Separation Assurance Tool: For Executive Controller. Aid for separation and Sequencing in real time aircrafts.	2,00	0	17
SWIM linked Data Correlation Tool: for monitoring and correlate Trajectory Data from shared Airborne and Ground Systems.	11,00	0	349

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	Avrg	Mode	Var
Intent and Conformance Monitoring Tool (Predict and detect deviations from RBTs)	8,00	0	147

Flight in Managed Airspace

Q3.1 Network Manager only acts when there is a possibility of having network effects.

Yes. 75%

Q3.2 The complexity manager can detect complex situations up 50' before activation of the corresponding RBTs.

NA. 57%

Q3.3 The solution catalogue available to the MSP will be different than the one available during DCB.

Yes 75%

Q3.4 Short-term DCB will smooth traffic to congested destinations in order to achieve low variability of planned arrivals.

Yes. 100%

Q3.5 Possible changes in the airspace structure must be able to be implemented in a short period (TBD).

Yes. 71%

Q3.6 The air traffic situation can be planned within a horizon up to a maximum of 50'.

NA. 43%

Q3.7 An RBT change is significant if it changes a Controlled Time (Over/Arrival).

Yes. 75%

Q3.8 The solution catalogue should be structured in sections according to the possible conflict origins

NA. 57%

Q3.9 The solution catalogue available to one role involved in a complexity situation will be different than the one available for others (depending of the airspace managed by each one and the different problems they will face).

Yes. 86%

Q3.10 Decision Tools will offer controllers different ways to solve conflicts depending on the constraints (density, complexity, capacity…) that cause the problem.

Yes 100%

Q3.11 It is the tool which is in charge to provide the cause what is making the conflict (in order to allow the controller makes the right decision

NA. 50%

Q3.12 CDM Tool should be consistent (understanding by consistent use the same constraint for the same problem in order to reach a common solution)

Yes. 80%

Q3.13 QTSM and MSP deal with complexity. Their main goal is to maintain the NOP.

NA. 67%

Q3.14 Executive Controllers deal with separation. Their main concern is safety/separation, and afterwards, maintain the NOP.

Yes. 89%

Q3.15 QTSM issues regulations/solutions on flows

Yes. 100%

Q3.16 QTSM can make RBT changes, and play with the entry/exit times in one sector.

Yes. 88% CIM

Q3.18 QTSM works with flows, a certain accuracy of prediction and a set of catalogues.

Yes. 100%

Q3.19 MSP works with more accuracy and a different catalogue. MSP receives QTSM regulations and proposes changes in RBTs.

Yes. 75%

Q3.20 QTSM and MSP must be ATCo because they issue clearances.

NA. 38%

Q3.22 Agree (Y) or Disagree (N) with the following remarks about the possible solutions included in MSP catalogue.

From no-route to structured airspace.	NA	67%
Active predefined routes around military areas.	Yes	89%
Dynamic resectorization – local.	Yes	78%
Change in RBTs.	Yes	78%
Include dynamic constraints in RBTs.	Yes	100%

Extended AMAN horizon

Q4.1 Short-term DCB will smooth traffic to congested destinations in order to achieve low variability of planned arrivals.

Yes. 100%

Q4.2 Days of heavy 'bunching' into congested aerodromes will be gone with SESAR.

NA. 63%

Q4.3 What kind of traffic delivery can we expect on entry into AMAN horizon of congested aerodromes?

- Close to Minimum radar separation
- LOW SPEED+LOW ALTITUDE
- A/C enters AMAN horizon at a certain CTO at a certain point separated from other A/C.
- Aircraft will arrive at the AMAN horizon and receive either an amended trajectory containing a specific fix time to be achieved, when the airport is at capacity, or confirmation of current trajectory when sequencing can be more dynamic and the aircraft permitted to maintain its most efficient profile.

- According to CONOPS, until the flight is Out of AMAN horizon, no TTA is given. So we can hope that the arriving flows rates meet in average value the capacity of the destination airport. As soon as it reaches this horizon a TTA is requested if a AMAN sequence is in action and a de-bunching is beginning. see description Conops F4.2.2

Q4.4 Will there be any spacing / de-bunching at all except for what the NOP can do?

- The NOP can predict conflict and bunching In the future, then keep safe spacing and de-bunching
- YES
- Entry into de AMAN horizon will stabilize the arrival sequence, and help queue managers to manage flights with the credibility enough to plan and issue the appropriate CTAs and CTOs. Apart from arrival sequence building up through the NOP, queue managers can propose tactical changes to Executive and Planning Controllers in order to smooth the arrival sequence.
- Absolutely. The NOP cannot deliver a/c at the precise time intervals required to maintain a maximum flow rate AND minimum spacing. The controller is required to fine tune the sequence. What the NOP provides rather is a balanced flow.
- No, spacing / de-bunching for destination will be achieved giving a TTA to each flight arriving at the AMAN horizon if/when congestion and sequencing is on at destination. When each flight arrives at the AMAN sequencing horizon this TTA becomes a more precise time constraint (eg+/-10 sec): CTA

Strategic complexity reduction using 4D PTC

Q5.1 Many conflicts will be solved optimizing take-off time

NA. 50%

Q5.2 Reducing conflicts through optimizing take-off time, sector workload will be reduced.

Yes. 88% CIM

6 QUESTIONNAIRE 5

This section reflects the outcomes of the 5th questionnaire before the meeting. Some of the final answers changed in the meeting. These final answers can be found in the minutes [8] and presentation [9] of the fourth expert group meeting. The final expert group report, [1], reflects the final agreed answers.

In questions which answers can be yes or no, the associated percentage is related to the number of "Yes" obtained. NA means Non Agreement reached, this will happened if the percentage is between 30 and 70.

4D Trajectory Management

Q1.1 When a time constraint is needed is the ground system which gives the constraint (not the controller). This means; The ground system proposes a time constraint to the controller and then the controller sends this constraint to the pilot (via CPDLC)

Yes. 73%.

Q1.2 Most aircrafts adhered to trajectories using mainly vertical and then lateral instructions to resolve problems

NA. 50%.

Q1.3 En-route controllers should deliver a/c as a flow sequence to TMA controllers

Yes. 100%.

Q1.4 If possible, CDM process has to be used in order to obtained an agreed solution to a problem

Yes. 100%.

Q1.5 When there is a tactical reason and it is needed change the RBT, ground should keep as close as possible the last RBT to resolve the problem

Yes. 100%.

Q1.6 In the future Data-Link will be used as the main tool, leaving Voice communications as back-up

Yes. 90%.

Q1.7 CTA is managed by pilots. If they can not achieve it, should they notify the controller?

NA. 50%.

Q1.8 Information displayed to controllers is the result of all information available about the a/c the system has

NA. 67%.

Q1.9 Airspace capacity increases through 4D trajectory and network capacity initiatives and reduced controller task load achieved by a reduced requirement for controller tactical intervention.

Yes. 100%.

Q1.10 Predictability increase through tentative adherence to the user preferred routing and use of predefined 4D trajectories, and consequently to improve the quality of delivery of aircraft to TMA entry.

Yes. 91%.

Q1.11 Each one of the following statements corresponds to an identified Supporting Tools for the Medium/Short Term, understanding Medium Term 20 min and Short Term 5 min before the executive controller takes charge of the aircraft. Choose a percentage (once each one) for the five you consider the most important. To rank a process select a percentage (only once) from 50%, 30%, 10% or 5% (50% highest, 5% lowest).

	Avrg	Mode	Var
Communicate trajectory change through data link to the a/c for loading by the pilot into the FMS.	11,1	0	189
Problem detection and resolution.	5,6	0	82
Trajectory Management tools to display 4D-information and to Modify 4D-Trajectories.	12,8	5	242
What if probing.	8,3	5	75
CDM process support tools.	3,3	0	19
Enhanced "Extended Potential Problem Detection".	1,7	0	10
De-confliction Console: MTCD&R for Complexity Manager and Planning Controller. De-conflicting options, negotiation and solutions within a given anticipated period of time.	43,3	50	387
Medium Term Separation Assurance Tool: For Executive Controller. Aid for separation and Sequencing in real time aircrafts.	8,3	0	141
SWIM linked Data Correlation Tool: for monitoring and correlate Trajectory Data from shared Airborne and Ground Systems.	13,9	0	300
Intent and Conformance Monitoring Tool. Automatic Prediction and detection of deviations from RBTs. Propose changes.	7,2	0	224
FMS capable of down/Uplink of trajectory data (TMR changes, Time and speed constraints). FMS Capability of RTA function to comply with CTOs/CTAs/ on a Waypoints and speed adjustments.	35,6	50	504

Q1.12 Each one of the following statements corresponds to an identified Supporting Tools for the Execution Term. Choose a percentage (once each one) for the five you consider the most important. To rank a process select a percentage (only once) from 50%, 30%, 10% or 5% (50% highest, 5% lowest).

	Avrg	Mode	Var
Communicate trajectory directly to the a/c CDTI for direct loading into the FMS.	13,5	0	488
Problem detection and resolution.	18,5	0	400
Trajectory Management tools to display 4D-information and to Modify 4D-Trajectories.	8,5	0	228
What if probing.	6,0	5	82
CDM process support tools.	5,5	0	274
Enhanced MTCD.	3,0	0	90

	Avrg	Mode	Var
De-confliction Console: MTCD&R for Complexity Manager and Planning Controller. De-conflicting options, negotiation and solutions within a given anticipated period of time.	5,0	0	250
Medium Term Separation Assurance Tool: For Executive Controller. Aid for separation and Sequencing in real time aircrafts.	31,5	50	578
SWIM linked Data Correlation Tool: for monitoring and correlate Trajectory Data from shared Airborne and Ground Systems.	11,0	0	432
Intent and Conformance Monitoring Tool. Automatic Prediction and detection of deviations from RBTs. Propose changes.	15,5	0	325
FMS capable of down/Uplink of trajectory data (TMR changes, Time and speed constraints). FMS Capability of RTA function to comply with CTOs/CTAs/Waypoints and speed adjustments.	22,0	5	340

Q1.13 Each one of the following corresponds to an Initial 4D Trajectory Management processes. Please sequence them in the time. To order the processes in the time select a number from 1 to 5 (1 the first one to happen usually and 5 the last one).

	Avrg	Mode	Var
Downlink of 4D data: current position, predicted positions (Altitude, Latitude, Longitude, Time Over significant Point, Point Type), and FMS status (managed, selected, etc.)	2,9	3	1,5
Providing the controllers with accurate trajectory information, intent information, and trajectory change mechanisms.	3,2	2	1,2
Data link close loop between the airborne and ground systems, enabling to share the same RBT for the purpose of using it in the Ground based Trajectory prediction tool.	3,6	5	2,5
Trajectory preparation process (including SBT and RBT/4D trajectory)	2,4	1	3,1
Taking into account Aircraft capabilities to adhere to the RBT (performance base clearances)	2,9	2	1,9

Flight in Managed Airspace

Q2.1 The solution catalogue should be structured in sections according to the possible problem origins.

Yes. 70%

Q2.2 Solutions will not be limited to the ones in the catalogue.

Yes 80%

Q2.3 CDM Tool should be consistent (understanding by consistent use the same data)

Yes. 90%

Q2.4 CDM Tool should be consistent (understanding by consistent use the same constraint for the same problem in order to reach a common solution)

Yes 56%

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Q2.5 QTSM is a role/function (not an actor) which can be assigned to different actors depending on the time horizon

Yes 100%

Q2.6 QTSM function is more related with strategic deconfliction than separation

Yes. 70%

Q2.7 What do you understand by "flying a natural sequence"?

- Following the expected RBTs as define in the NOP , so sticking with the traffic organization decided in advance
- The balancing of two principles:
- First come first serve (in the air, not in the rbt planning process)
- Optimizing the sequence in relation to the type of aircraft (small, medium, heavy)
- Flying the optimal trajectory (without ATC constraint, except those contained in the published procedure)
- The order achieved over a common point without intervention.
- I think it means that all aircrafts can flight smoothly and safety, especially no delays and any sequence restrictions, but this must be supported by a system, including CDM.4D trajectory management SWIM system….(advanced technology and means)
- Depends on sector size and the conflict detection tool horizon; could be 2 could be many.
- Flying a natural sequence means that flight progresses without much deviation from its RBT and possible modifications to trajectory come uplinked and are integrated into the FMS but without open loop changes. That means that, modifications to the trajectory are within acceptable margins.

Q2.8 Queue management is the establishment and maintenance of a safe, orderly and efficient flow of traffic.

Yes. 89%

Q2.9 En route queue management in the execution phase includes the management of queues generated by: Network Queues from the NOP.

Yes 89%

Q2.10 En route queue management in the execution phase includes the management of queues generated by: AMAN horizons extending into en route airspace.

Yes 78%

Q2.11 En route queue management in the execution phase includes the management of queues to facilitated the delivery of traffic to airports without AMAN

Yes 80%

Q2.12 DCB arrival queues are planned by the Sub-regional Network Manager at the request and in coordination with the APOC staff (typical time horizon up to 2h)

NA 50%

Q2.13 DCB queue is a pre-sequence flight list over a constraint point

Yes. 78%

Q2.14 Seamless coordination between TMA controllers and adjacent en-route control authorities will be in place to facilitate the adjustments required to meet the assigned time constrains

Yes. 89%

Q2.15 This coordination includes that MSP and ExCo will progressively integrate the arrival flows (previously defined by subregional manager and AMAN) using one or more merging points as part of the dynamic or predefined routes.

Yes 100%

Q2.16 In the execution phase this coordination will be performed mainly through:

The definition of the activated resources (merging points)	Yes. 78%
The availability of the planned queues per merging point from subregional manager and AMAN. The information in these queues includes the order and the TTA/CTA.	Yes. 89%
Do you foresee any other type of coordination?	No
	There will be sector/sector coordination to initiate queue requirements further upstream and between complexity manager and AOC to prioritize intra-company flights where possible

Q2.17 In a Non-Structured airspace, all kind of separation modes can coexist.

Yes. 78%

Q2.18 Due to complexity, the Executive Controller may group all flights within the same type of separation.

Yes 78%

Q2.19 When the operation takes place within a structured airspace, all the aircrafts have to use the same type of separation.

No 30%

Q2.20 When flights are inside a non-structured airspace, each one can flight using the separation mode the AU prefers.

NA 33%

Q2.21 Military Control will inform the civil control about high prioritized military flights e.g SAR (search and rescue) and scramble.

Yes 100%

Q2.22 Military flights flying under civil rules (OAT IFR en-route flight), will be subject to the same constraints as civil flights. NOTE: Corrected to OAT GAT

Yes. 70%.

Q2.23 Having flexibility in MIL area definition, some adjustments of the MIL area boundaries can be negotiated to fine-tune the sectorisation and cope with demand/capacity imbalances using density and complexity management.

Yes. 90%

Q2.24 Aircrafts flying through a corridor opened in a military area will be monitored by a civil controller

Yes 89%

Q2.25 Transition of responsibilities between civil ExCo and military ExCo, will be performed via data link, as between two civil ExCo.

Yes. 80%. CIM

Structured & Non-structured Airspace

Q3.1 The activation of a temporary route structure is a complexity reduction measure.

Yes. 89%

Q3.2 This change can be implemented by the complexity manager (typical time horizon from 1:30h to 20 minutes before) in coordination with:

Subregional/regional managers	80%
APOC	40%
Planning controller	70%
civil/military airspace managers	78%
Other	Depending on which airspace the complexity conflict occurs the Conflict manager should always contact at least with Subregional/regional manager and planning controller of the sectors involved.

Q3.3 The activation of a temporary route structure will go through a CDM process with the involved actors (defined above).

NA 60%

Q3.4 This CDM process will include the Airspace Users if time available (before 40 min)

Yes 70%

Q3.5 Changes to the RBTs to accommodate to the route structure will be defined by the subregional manager.

Yes 78%

Q3.6 When the Airspace User do not participate in the CDM process to accommodate the RBT, they will participate in the CDM process to accommodate the exit conditions from the route structure

Yes. 78%.

Q3.7 When this structure is deployed, all aircrafts must accommodate to the one with the lowest performance.

No. 22%. It isn't up to the aircraft to accommodate it is up to the ATCO to integrate various performances

Q3.8 When this structure is deployed, aircrafts will be segregated according to their performance: 2D-PTC and 3D-PTC

NA 50%

Q3.9 ASAS separation (S&P, ASEP-ITP) will help controllers in these structures

Yes. 78%.

Q3.10 There will be predefined exit points from the temporary route structure to facilitate the return to the user preferred trajectory when leaving the complexity volume.

Yes 100%

Q3.11 This CDM process will include the Airspace Users if time available (before 40 min)

Yes 70%

Q3.12 The temporary route structure will not affect the route structure for conventional flights

NA 50%

MSP role

Q4.1 Please answer the following questions regarding the Multi-sector planner.

Please, could you estimate the number of sectors of the MSP area? (Note: two different numbers would be enough to define two validation scenarios to be performed)	All depends on the complexity this sector can generate, and the type of sectors. For purely en route sectors, I would say between 3 and 5, for sector in which they are many traffics in vertical evolution (e.g. around big airports), 2 or 3 sectors seems to be the maximum.
	3
	'4-6
	According to the specific circumstances change
	3 or 5
	Depends on sector size and the conflict detection tool horizon; could be 2 could be many.
	3 or 4
	2, 4
	No more than five
In a MSP area, do you consider that the individual planning controllers will be still required in the future?	yes, as long as coordination (whatever the way used) will be necessary between control sectors and relevant actors (as MSP, or Sub regional managers , or other sectors)
	No
	I think individual planning controllers will be necessary in the future, this position mainly responsible for coordinate multiple sectors. They optimize route structure that can reduce controller workload.
	Yes
	In theory no; the planning function at a sector level could be undertaken by the EC. Probably in practice, yes.
	I think too many controller position is not necessary, because it will cause the procedures more complexity.

7 REFERENCES AND APPLICABLE DOCUMENTS

[1] **Episode 3** En-Route Expert Group Report D4.3.1-02

[2] **Episode 3** 1st EG meeting minutes E3-WP4-MWKS20081015-MIN-V0.02-wp431-eg-meeting-minutes

[3] **Episode 3** 1ST questionnaire presentation E3-WP4-MWKS20081015-PRS-V1.00-eg-01

[4] **Episode 3** 2nd EG meeting minutes E3-WP4-MWKS20081119-MIN-V0.01-wp4-3-1-2nd-expert-group-meeting-minutes

[5] **Episode 3** 2nd & 3rd questionnaires presentation E3-WP4-MWKS20081119-PRS-V0.01-2nd-and-3rd-questionnaires

[6] **Episode 3** 3rd EG meeting minutes E3-WP4-MWKS20090115-MIN-V0.01-3rd-eg-wsp-minutes.doc

[7] **Episode 3** 4th questionnaire presentation E3-WP4-MWKS20090115-PRS-V0.01-3rd-eg-presentation

[8] **Episode 3** 4th EG meeting minutes E3-WP4-MWKS20090414-MIN-V0.01-4th-wp4-3-1-er-qtsm-eg-minutes

[9] **Episode 3** 5th questionnaire presentation E3-WP4-MWKS20090414-PRS-V0.02-5th-questionnaire-presentation

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