



Improving ATM performance in Europe by Coordinated Capacity Ordering and Trajectory Pricing (COCTA) – An institutional framework

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Antwerp, Belgium, 7 July 2017**

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Topic: Economics and Legal Change in ATM

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Founding Members



COCTA consortium



Partners and people:

University of Belgrade – Faculty of Transport and Traffic Engineering

[Serbia - Coordinator]

Radosav Jovanović

Nikola Ivanov

Obrad Babić

Vojin Tošić

University of Warwick [UK]

Arne Strauss

Stefano Starita

University of Applied Sciences Worms [Germany]

Frank Fichert
(Presenter)

Thi Thuy An Vo

COCTA overview



Current situation

- Limited **coordination** between ANSPs on capacity provision combined with decentralized **average cost pricing**
- **ANSPs** have to plan their capacity provision rather early, **Aircraft Operators (AO)** prefer short-term trajectory decisions (**'divorced' planning horizon**)
- **No incentives** for AOs **to deviate** from their individual optimum, even if this improves overall efficiency.

Proposed changes

Strengthen the role of the **Network Manager** in order to

- provide **incentives** for AOs to reveal their trajectory preferences earlier, and/or accept changes
- order **capacity** from ANSPs based on AOs' demands and aiming at **network optimum**
- impose overall **trajectory pricing** instead of ANSPs' decentralized distance pricing and influence traffic (re)distribution in order to improve overall efficiency

COCTA modelling steps (selected)



1. Simplified model (Strauss et al. 2016 – SID website):

Centralized decision making regarding ANSPs' capacities and AOs' routes (trajectories) **reduces overall costs** of ATC provision

Model assumes **'perfect' information** of NM with respect to ANSPs' and AOs' costs

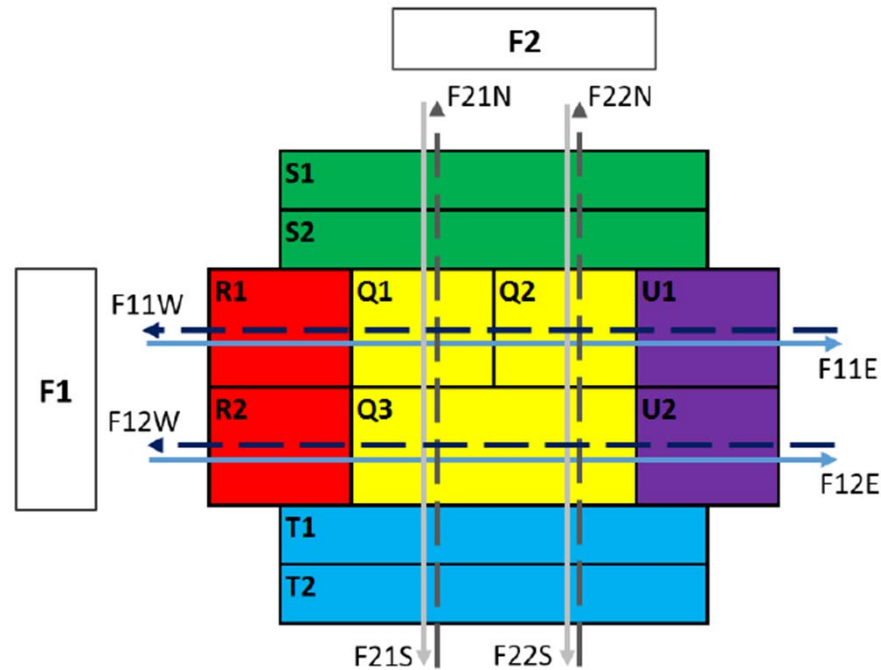


Figure 4-1 Airspace structure for the case study

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2. Re-design of ATM value chain (this presentation)

3. Modelling of capacity ordering and trajectory pricing within the redesigned value chain (work in progress)

COCTA process and role assignment



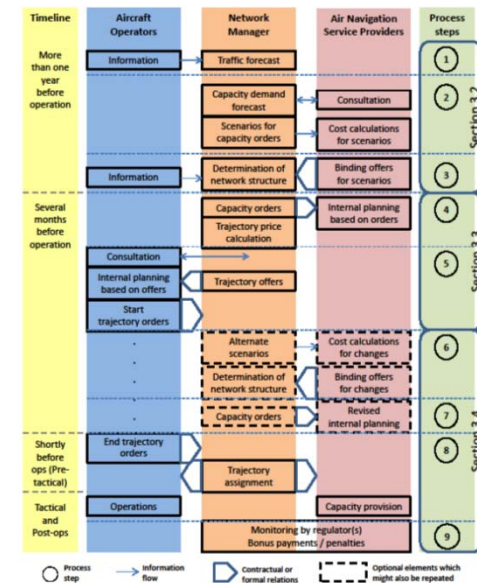
Several interdependencies between decisions

Key assumptions:

- Only ANSPs know costs of capacity provision and costs of adapting capacity at some later stage
- Only AOs know their optimum trajectory – depending also on ATC costs
- NM aims at minimizing overall costs

Key elements of **COCTA process and role assignment**:

- Sequence
- Timing
- Incentives and regulation
- Need for consultations between stakeholders



COCTA process – part 1



Capacity offers and ordering - Overview:

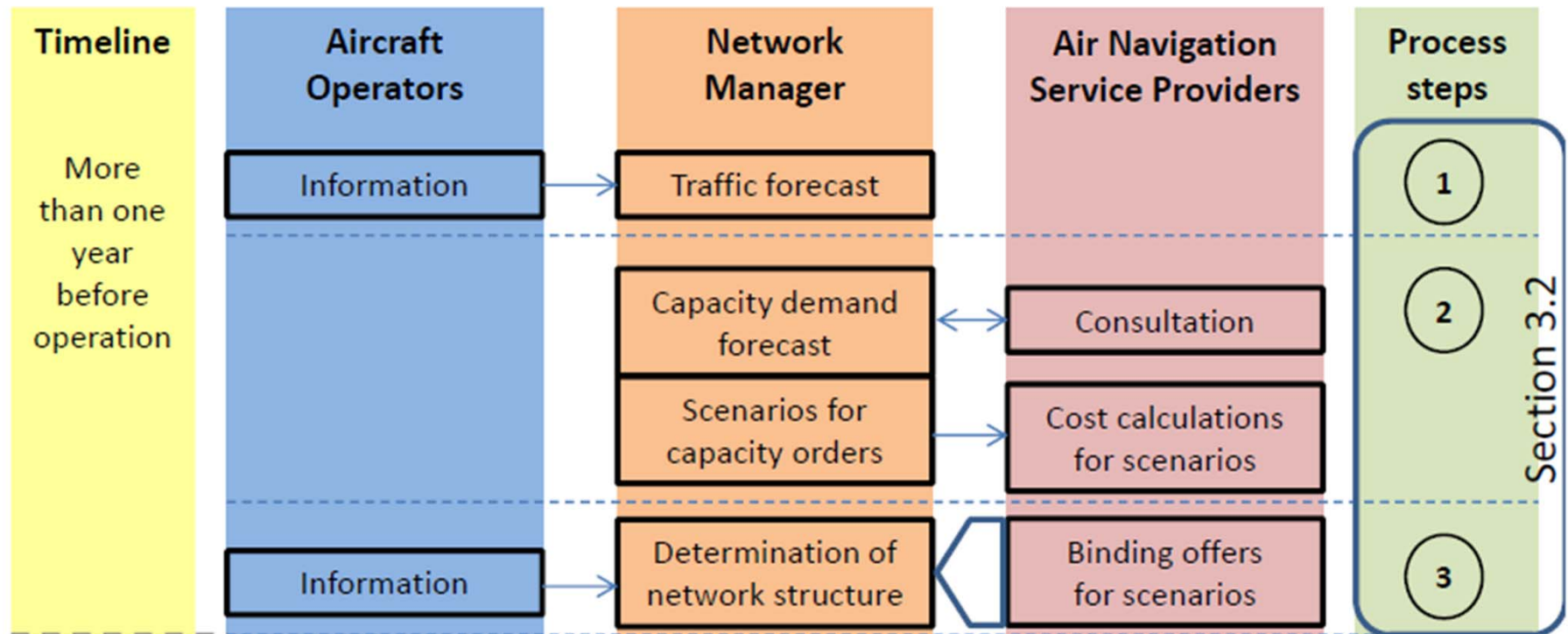
- NM prepares traffic forecast and determines capacity demand (assuming AOs minimize costs)
- NM asks ANSPs for binding offers for capacity provision (different scenarios)
- NM determines network structure, orders capacity and calculates trajectory charges based on cost recovery principle

(similarities to current process of **capacity planning** – but optimization on network level, not on ANSP level)

COCTA process – part 1



Capacity offers:



COCTA process – part 2



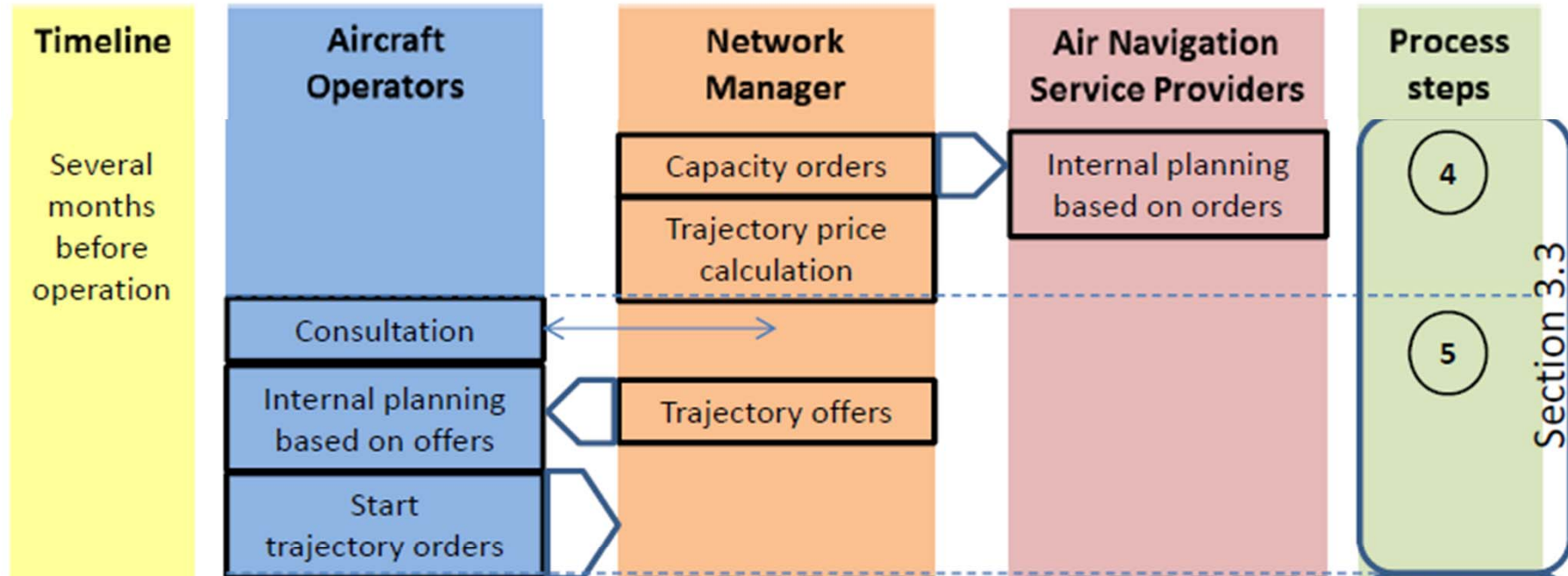
Trajectory ordering - Overview:

- NM offers trajectories to AOs
 - Charges in general based on airport-pairs (and MTOW), but differentiation possible (time and space)
 - Incentives for 'early booking' (discount) if PST (purchased specific trajectory – with limited flexibility for assignment by NM) with 'first booked, first served'
 - FAT (flexibly assigned trajectory), i.e. NM allocates trajectory shortly before operations within agreed level of flexibility
- (several new elements of **demand management**)

COCTA process – part 2



Capacity ordering and trajectory ordering:



COCTA process – part 3



Potential **redesign of network**, if demand significantly deviates from forecast (rerun capacity ordering process)

Operations and assessment - Overview:

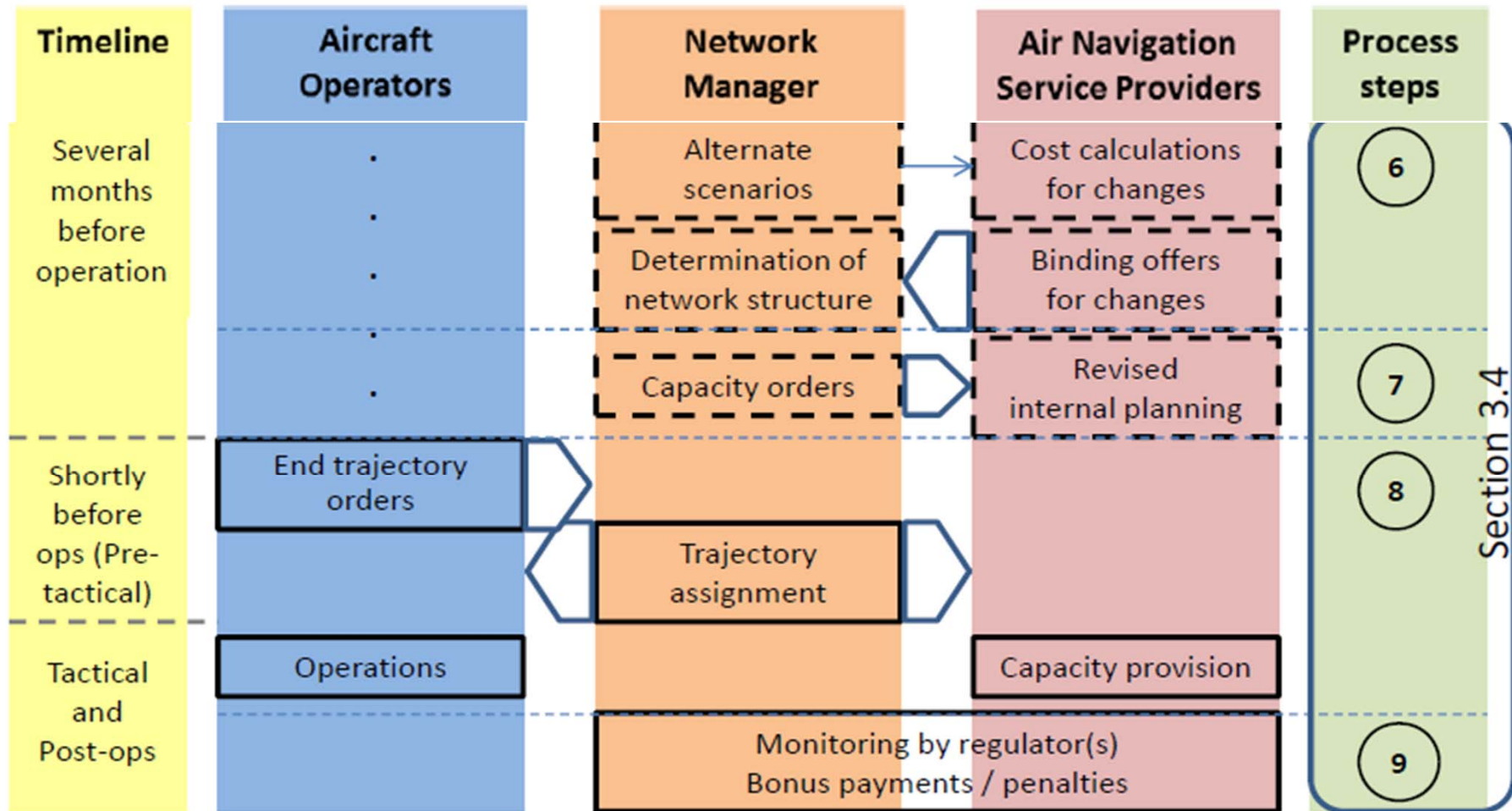
- NM assigns trajectories (FAT and PST)
- ANSPs provide capacity based on contract with NM
- Monitoring of NM and ANSPs by regulators with incentive schemes

(some similarities with current **regulation** of ANSPs)

COCTA process – part 3



Network redesign, operations and assessment:



COCTA process – outlook



2nd generation COCTA optimizing model:

- Three options for **maximum** capacity provision based on traffic forecast scenarios (sector hours during e.g. one day or several hours)
- NM **chooses** one option (based on traffic forecast)
Total costs: Fixed costs plus (variable) costs per actual use of capacity
- AOs **purchase trajectories** – NM is informed about actual demand (with Business Aviation as further complication due to late decision)
- NM determines **actual amount of capacity provision** (orders within maximum capacity boundary) and allocates flights to trajectories: aiming at minimum cost for users (= costs for capacity provision plus displacement costs – time and space)

Invitation to COCTA Stakeholder Workshop



- **September, 27, 2017 (Wednesday)**
House of Logistics and Mobility (HOLM)
Frankfurt airport, Germany
- More information on project and news:
www.cocta-project.eu



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Thank you very much for your attention!



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