



**iFLY**



## **D6.1 “Methodological Framework for Cost-Benefit Analysis”**

**AUEB-RC/TRANSLOG**

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**iFly Mid Term Review, Brussels, September 29, 2009**



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## D6.1 Scope & Objectives (1/2)

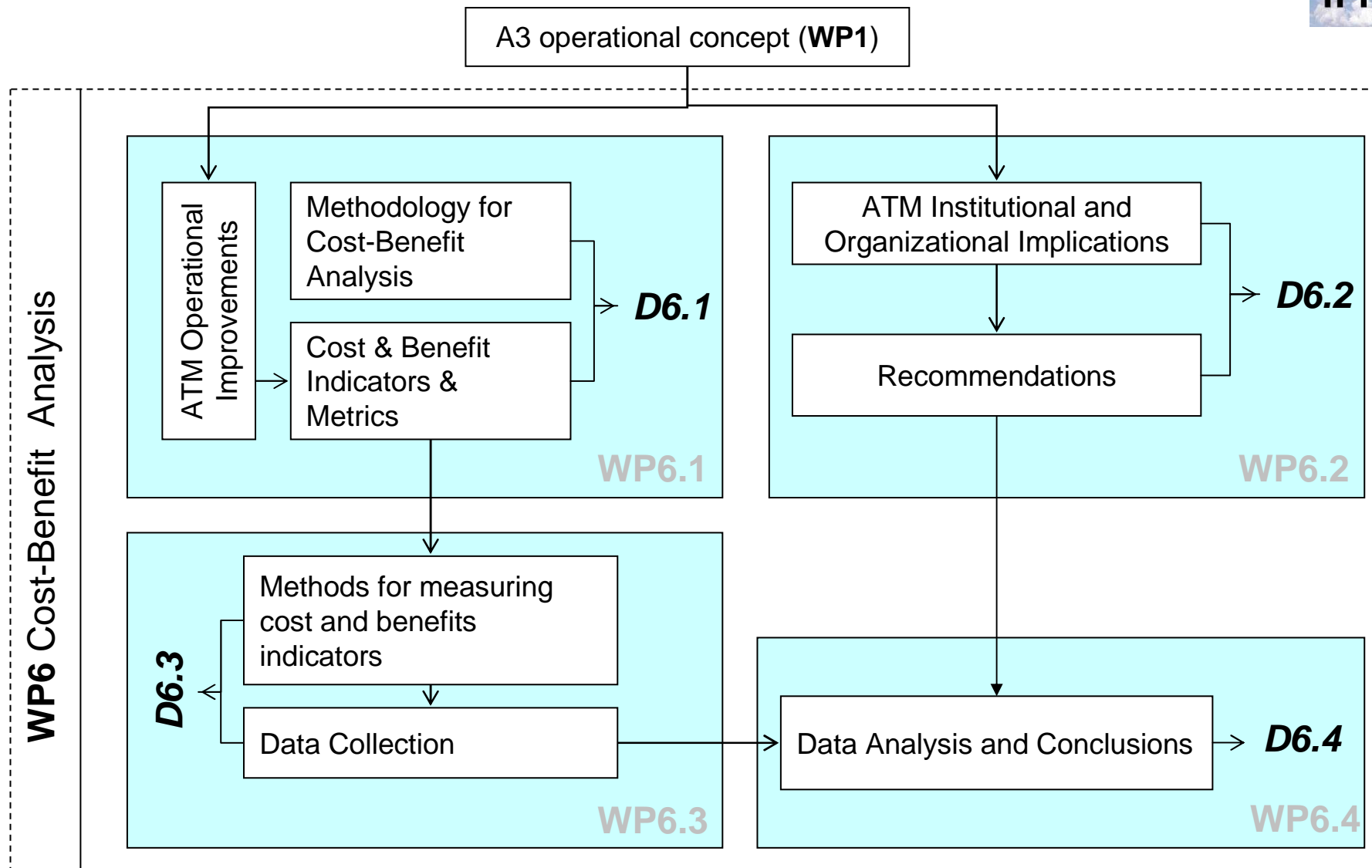
- Methodological Framework for assessing the economic impacts of the proposed A<sup>3</sup> ConOps
- The assessment methodology should take into account:
  - The objectives and priorities of the involved stakeholders
  - Alternative scenarios representing different achievement levels of the A<sup>3</sup> ConOps
  - Determination of the potential positive (benefits) and negative (costs) impacts of the A<sup>3</sup> operational concept
  - Quantification of the expected financial and operational impacts

*(iFly Technical Annex “Description of Work”)* 





# D6.1 Scope & Objectives (2/2)

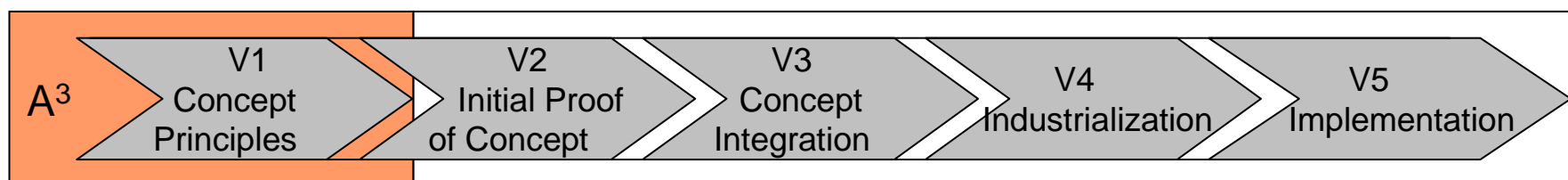




## Relations to the current State-of-the-art (1/3) : *E-OCVM*



- E-OCVM: a broader validation methodology for assessing ATM operational improvements under various levels of maturity
- The E-OCVM recognizes the customisation of the validation methodological steps throughout the following maturity levels of a ConOps:



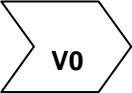
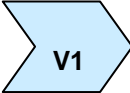
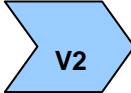
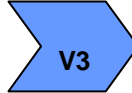
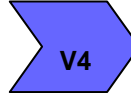
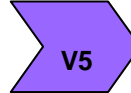
- The E-OCVM includes various validation cases: Environmental, Safety, Technology, Operational, Human Factors, and Business case.
- The assessment of the economic impacts of A3 corresponds to the E-OCVM business case under V1 maturity level





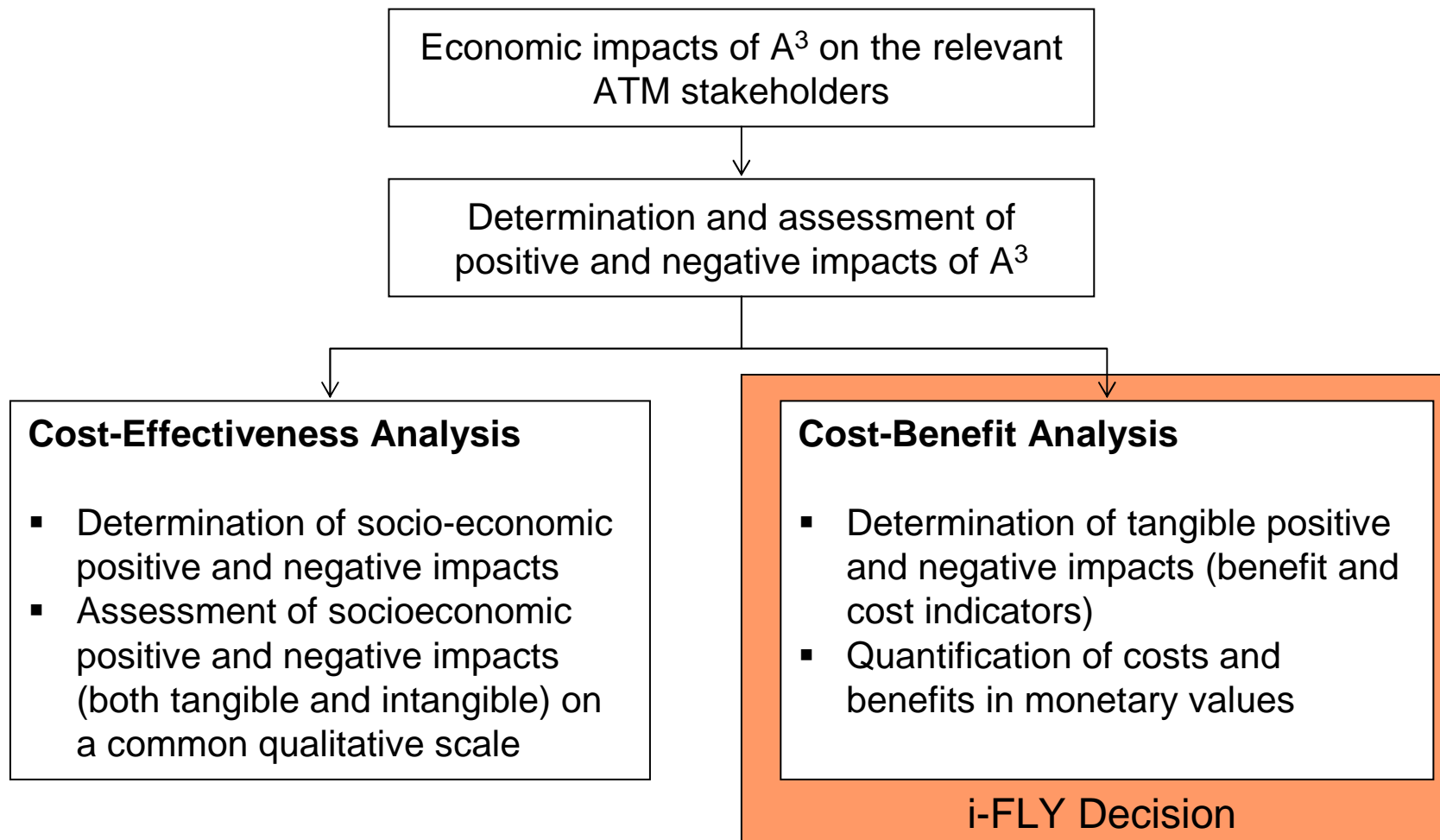
# Method of Impact Assessment Vs. Phase of Project Lifecycle



|                                     |              |  | Phases of the Project Lifecycle   |   |  |   |  |  |
|-------------------------------------|--------------|--|---|---|--|---|--|--|
|                                     |              |  | ATM Needs<br><br>V0<br>Gather and assess ATM Performance Needs | Scope<br><br>V1<br>Scope Operational Concept and Develop Validation Plan | Feasibility<br><br>V2<br>Iteratively develop and evaluate concept | Integration<br><br>V3<br>Build, consolidate and test | Pre-Operational<br><br>V4<br>Industrialisation and approval | Operational<br><br>V5<br>Implementation |
| Applicable Impact Assessment Method | Qualitative  | Scoring Techniques                                   | ✓   | ✓   |  |   |  |  |
|                                     |              | Cost Effectiveness with Judgemental KPI Values       |   | ✓   | ✓  |   |  |  |
|                                     |              | Cost-Benefit with Judgemental KPI Values             |   | ✓   | ✓  | ✓   |  |  |
|                                     | Quantitative | Cost-Benefit Analysis with Monetary Weights          |   |   |  | ✓   | ✓  | ✓  |
|                                     |              | Cost-Effectiveness Analysis with Measured KPI Values |   |   | ✓  | ✓   |  |  |



## Relations to the current State-of-the-art (2/3): Cost-Effectiveness vs. Cost Benefit Analysis





## **Relations to the current State-of-the-art (3/3): ATM Cost-Benefit Analysis Methods**



- **ATOBI**A: CBA-tool designed for assessing Airborne Separation Assurance Systems (ASAS)
- **MEDINA**: focused on the impacts for the Air Navigation Service Providers
- **EMOSIA** (European Models for ATM Strategic Investment Analysis): A generic tool for cost-benefit analysis of ATM ConOps



- ✓ **The EMOSIA toolset is suitable for high level analysis**
- ✓ **The EMOSIA approach best addresses the Stakeholders expectations**

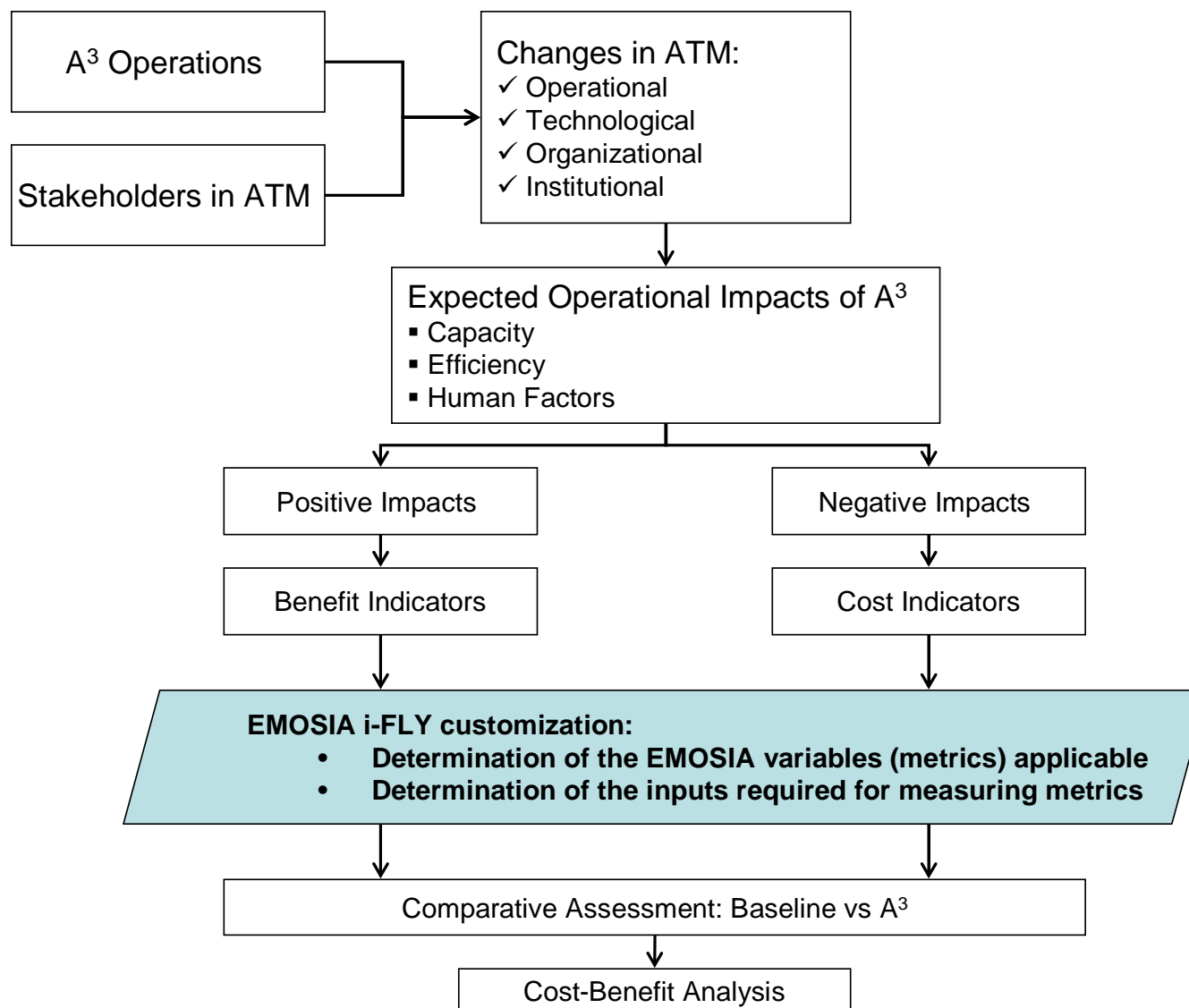
*(SESAR Definition Phase WP1.4.1/D1 Cost Benefit Modeling)*





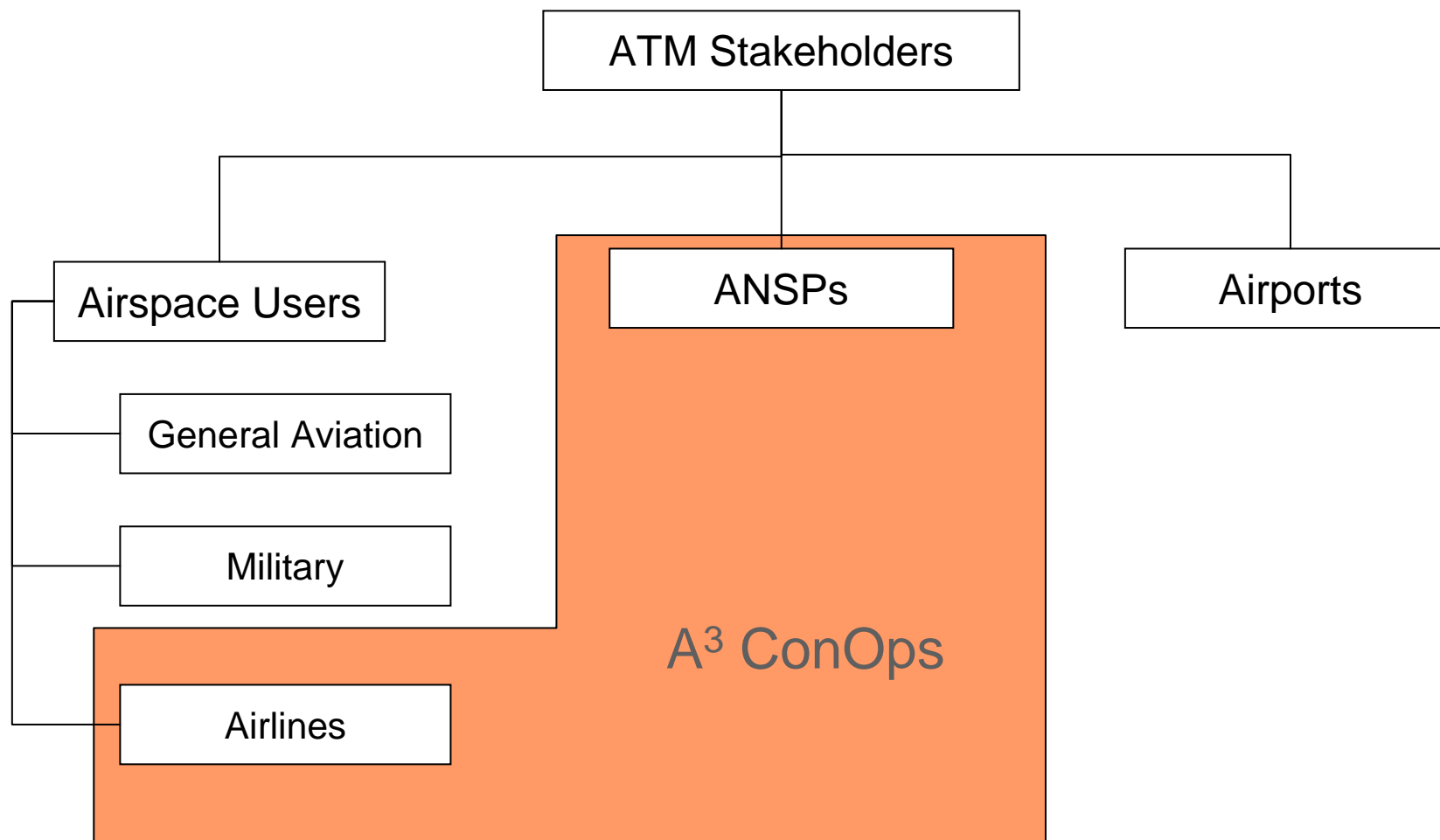


# Results and Knowledge Gained (1/7): Cost-benefit Analysis Methodology





# Results and Knowledge Gained (2/7): *ATM stakeholders in A<sup>3</sup> ConOps*





## Results and Knowledge Gained (3/7): *iFLY CBA methodology Requirements*



- Requirements of the A<sup>3</sup> CBA assessment

- Take into account benefits arising from several operational improvements (i.e., flight inefficiency reduction, en-route delay reduction, en-route ATC charges reduction, ANSPs cost savings)
- Apply cost-benefit analysis covering the point of view of the ATM stakeholders involved in A<sup>3</sup> ConOps
- Quantify cost and benefit metrics with uncertainty (e.g., flight inefficiency reduction)



The iFLY CBA metrics cover the A<sup>3</sup> operational impacts



The iFLY CBA treats Airlines and ANSPs separately



The iFLY CBA uses:

- Expert judgments and alternative analysis scenarios
- Sensitivity analysis

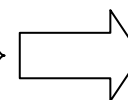




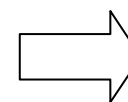
## Results and Knowledge Gained (4/7): Categories of iFLY CBA Variables



- Global Variables (e.g., *air traffic growth, discount rate*)
- Time Variables (e.g., *time horizon of the analysis, pre-implementation period, implementation period*)
- Baseline Variables (e.g. *Baseline Annual Flights, Average Flight Length, Aircraft Baseline Number*)
- Cost and Benefit Uncertain Variables (e.g., *flight efficiency gain %, en-route delay reduction %*)



**Building blocks  
of Analysis  
Scenarios**



**Building blocks  
of Sensitivity  
Analysis**





# Results and Knowledge Gained (5/7): Airlines Costs & Benefits



## COSTS

| Cost Element                | Indicative Metrics  | Source of Data |
|-----------------------------|---|----------------|
| Pre-Implementation Cost     | Total Pre-implementation cost (participation/consulting R&D, system validation)   | Experts        |
| One-off Implementation Cost | Annual One-Off Implementation Cost in M-Euro (including training, transition management)  | Experts        |
| Capital Cost                | Forward Fit Cost K-Eu/aircraft  | Experts        |
|                             | Retrofit Cost K-Eu/aircraft   | Experts        |
|                             | Ground Space Cost (including any ground-based systems required for trajectory planning, data link communication with the pilot, SWIM* access) | Experts        |

## BENEFITS

| Benefit Element               | Indicative Metrics   | Source of Data   |
|-------------------------------|--|--|
| Flight Inefficiency Reduction | Cost per Flight Min  | Standard Inputs for EUROCONTROL Cost Benefits Analyses ▶   |
|                               | Incremental Efficiency Gain %  | Experts  |
| En-route Delay reduction      | Cost per Unpredictable Delay Min (EUROCONTROL Standard inputs, 2007)                   | Standard Inputs for EUROCONTROL Cost Benefits Analyses     |
|                               | Incremental (en-route) Delay Reduction %   | Experts  |
| Cost savings                  | Annual Service Cost Difference: The annual charges reduction for en-route ATC services | ATM Cost-Effectiveness Benchmarking report (EUROCONTROL) ▶ |



\* System Wide Information Management System



# Results and Knowledge Gained (6/7): ANSPs Costs & Benefits



## COSTS

| Cost Element                | Indicative Metrics   | Source of Data |
|-----------------------------|--|----------------|
| Pre-Implementation Cost     | Total Pre-implementation cost (participation/consulting R&D, System validation)          | Experts        |
| One-off Implementation Cost | Annual One-Off Implementation Cost in M-Euro (including training, transition management) | Experts        |
| Capital Implementation Cost | Ground-Space Implementation Cost (SWIM access, administration)                           | Experts        |

## BENEFITS

| Benefit Element          | Indicative Metrics                     | Source of Data  |
|--------------------------|--|---|
| Operating Cost Reduction | Operating (non-staff) Cost Avoidance % | Experts, ATM Cost-Effectiveness Benchmarking report (EUROCONTROL) |
|                          | Staff Cost Avoidance %                 | Experts, ATM Cost-Effectiveness Benchmarking report (EUROCONTROL) |





## **Results and Knowledge Gained (7/7): *How to create the Analysis Scenarios***



- Specify assumptions regarding the time and global parameters
- Baseline case (“Do Nothing”), taking into account the avionics baseline used by early ADS-B implementations in Europe and USA, (regulated respectively by EC surveillance implementing rule and FAA ADS-B mandate)
- Estimation of the alternative values for the cost (i.e. additional costs) and benefit (cost savings) metrics in the A3 case. Experts will provide three values (pessimistic, moderate , optimistic) for each metric.
- Develop a basic analysis scenario → the cost and benefit metrics will be given the moderate estimated values
- Sensitivity Analysis will involve increasing or decreasing one or more of the cost and benefit metrics





## Open Issues/Next Steps



- Definition of analysis scenarios (Task 6.3, D6.3“Report in Data Collection”)
- Customization of EMOSIA spread sheets (Task 6.3, D6.3“Report in Data Collection”)
- Development of Data Collection and Analysis instruments, i.e. questionnaire for collecting estimates for the cost/benefit variables (Task 6.3, D6.3“Report in Data Collection”)
- Identification of Experts involved in the measurement of the cost-benefit analysis variables (Task 6.3, D6.3 “Report in Data Collection”)
- Data Analysis (Task 6.4, D6.4 “Cost-benefit results presentation”)







## Points of Alignment with SESAR



- Similar metrics with SESAR CBA for costs and benefits (Deliverable1.4.2-D3, “Consolidate and Update the CBA Model with Data Supporting the Trade-Off and Financial Plans”) ▶
- Use SESAR assumptions for the baseline scenario (Deliverable1.4.2-D3, “Consolidate and Update the CBA Model with Data Supporting the Trade-Off and Financial Plans”)
- Take into account SESAR developments in specifying the cost-benefit analysis time horizon (Separation modes beyond 2020, SESAR D3 “The ATM Target Concept”) ▶





# ADS-B Technology



- A surveillance technology that allows pilots and ATC to identify with precision the aircraft position
- ADS-B stands for:
  - Automatic: no operator intervention is needed
  - Dependent: the aircraft determine their position based on a GNSS(Global Navigation Satellite System) constellation
  - Surveillance
  - Broadcast: it broadcasts the position and other data of the aircraft (e.g., speed, heading, altitude) to any other aircraft or ground station.





# References



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