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# Enhancing European Modelling Capabilities in Support of ICAO's Committee on Aviation Environmental Protection

Session 1: Tools, Goals and Data

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# Enhancing European Modelling Capabilities in Support of ICAO's Committee on Aviation Environmental Protection



- WISDOM
- Advanced Emissions Model
- IMPACT
- Aircraft Assignment Tool (AAT)



# What is WISDOM?

## World Interconnected Sources Database of Operational Movements



- An historical archive of global aircraft operational movements & trajectories
  - Six selected representative weeks (Feb, Apr, Jun, Sep, Oct, Dec) for Trajectories
  - Full year of aircraft operational movements
- Used for ICAO CAEP - Environmental assessments
  - Linked with AEM - EUROCONTROL Advanced Emissions Model
  - To estimate Fuel burn and Greenhouse Gas emissions

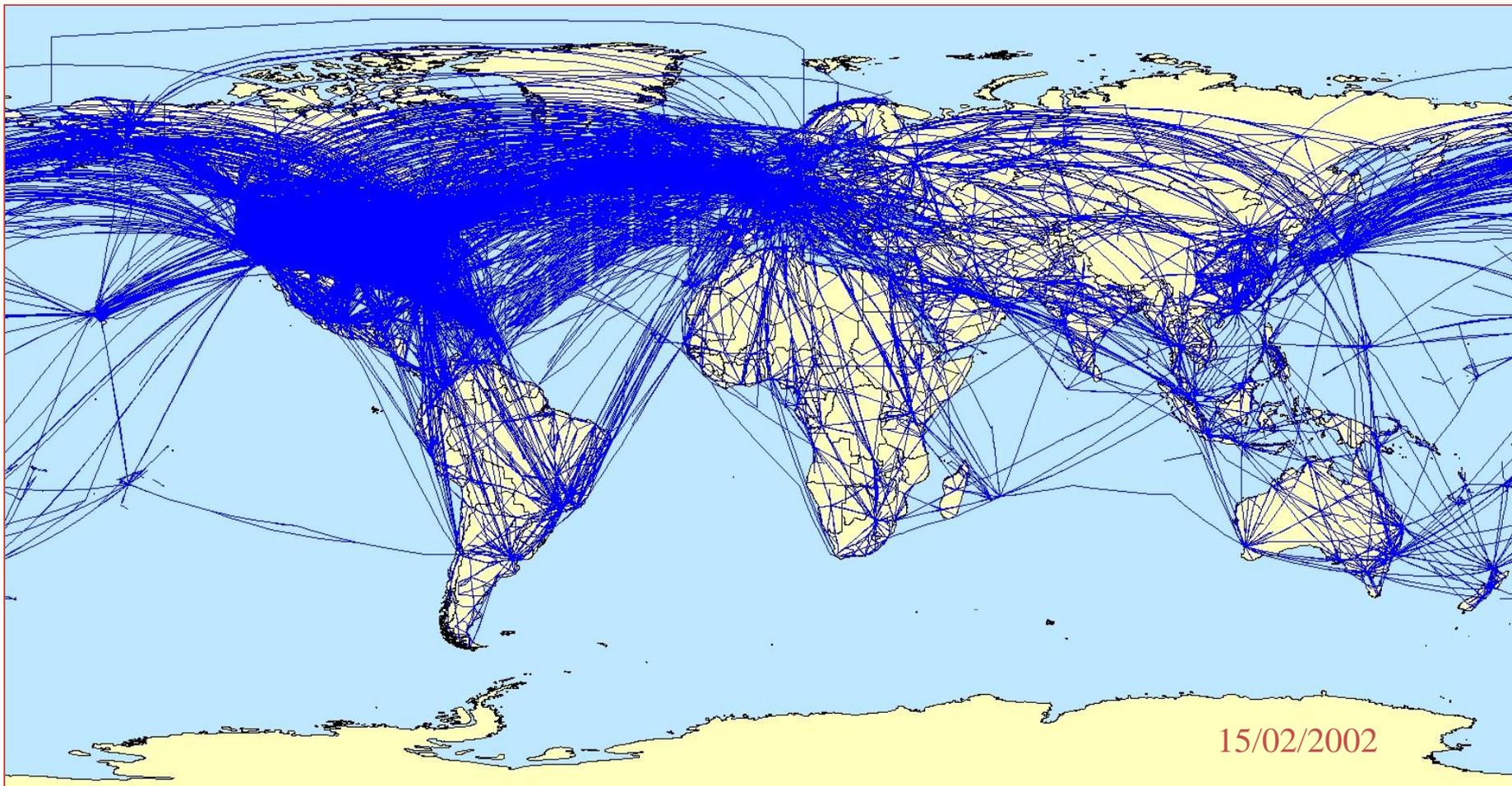


# CAEP COD Common Operations Database



# WISDOM Data Coverage

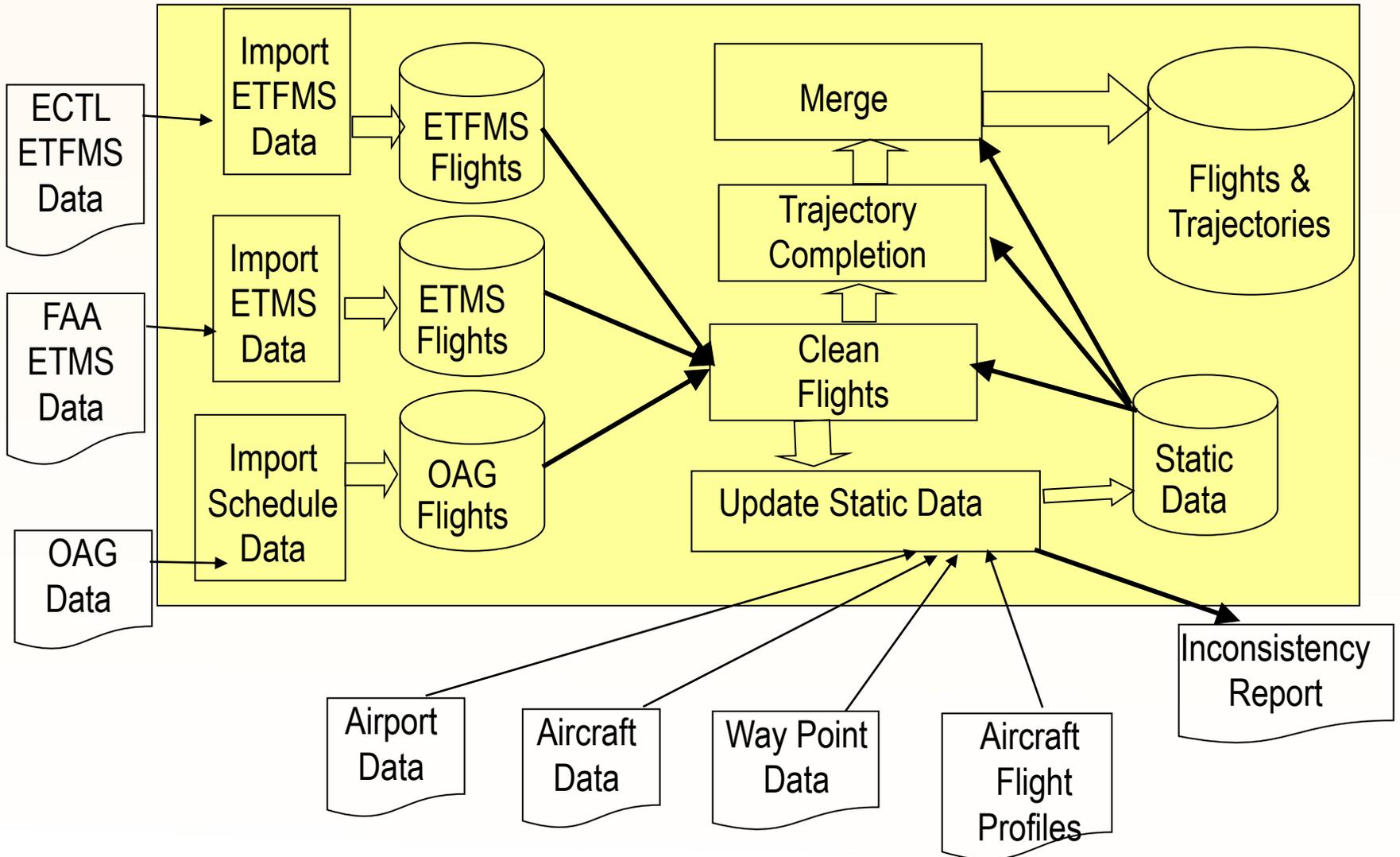
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# WISDOM

## Data Crunching Processes





# WISDOM

## Trajectory Completion and Merging





# ADVANCED EMISSIONS MODEL (AEM)



## Advanced Emissions Model (AEM) is used to:

- estimate fuel burn/ $\text{CO}_2$  and  $\text{H}_2\text{O}$ ,  $\text{SO}_x$ ,  $\text{NO}_x$ , HC, CO, Benzene, VOC, and TOG; and
- analyse flight profile data on a flight-by-flight basis;

for air traffic scenarios ranging from local studies around airports to global emissions from air traffic.

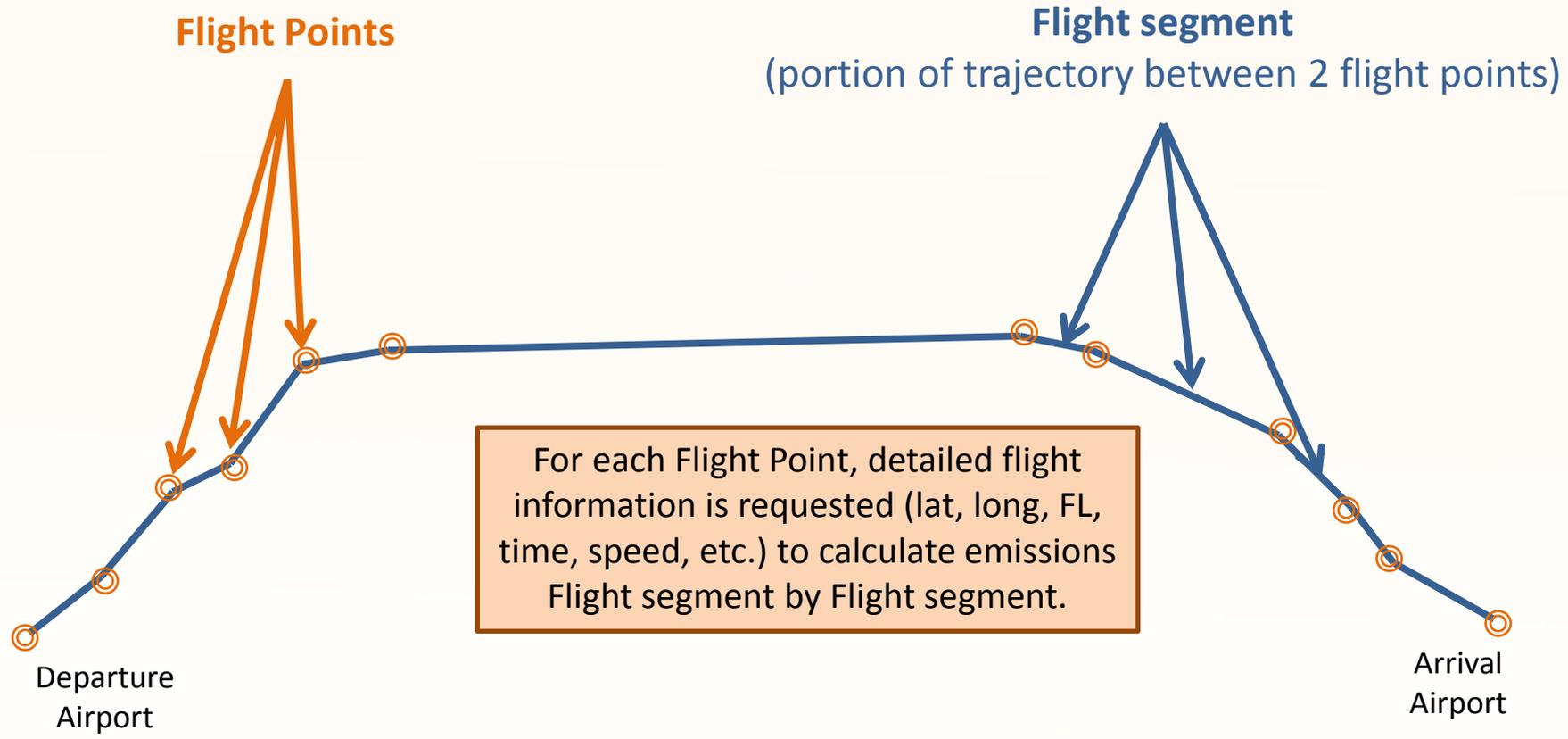
The screenshot shows the AEM Kernel 2.3.1 software interface. The window title is "AEM Kernel 2.3.1". The interface is divided into several sections:

- Study description:** Includes fields for "Name (prefer short name)", "Author", "Description", and "Date" (set to 29/04/2013).
- Input:** Contains two radio buttons: "SO6:" (selected) and "AEM PC:". Under "SO6:", there are fields for "SO6 file:", "traffic file:", and "flight file:", each with a "Browse" button.
- Output folder (study and SO6):** Includes a "Location:" field with a "Browse" button.
- Progress bar:** Located at the bottom, showing 0% completion.
- Buttons:** "Compute emissions" and "Exit" buttons are located at the bottom right.



# AEM

## Trajectory Input Data

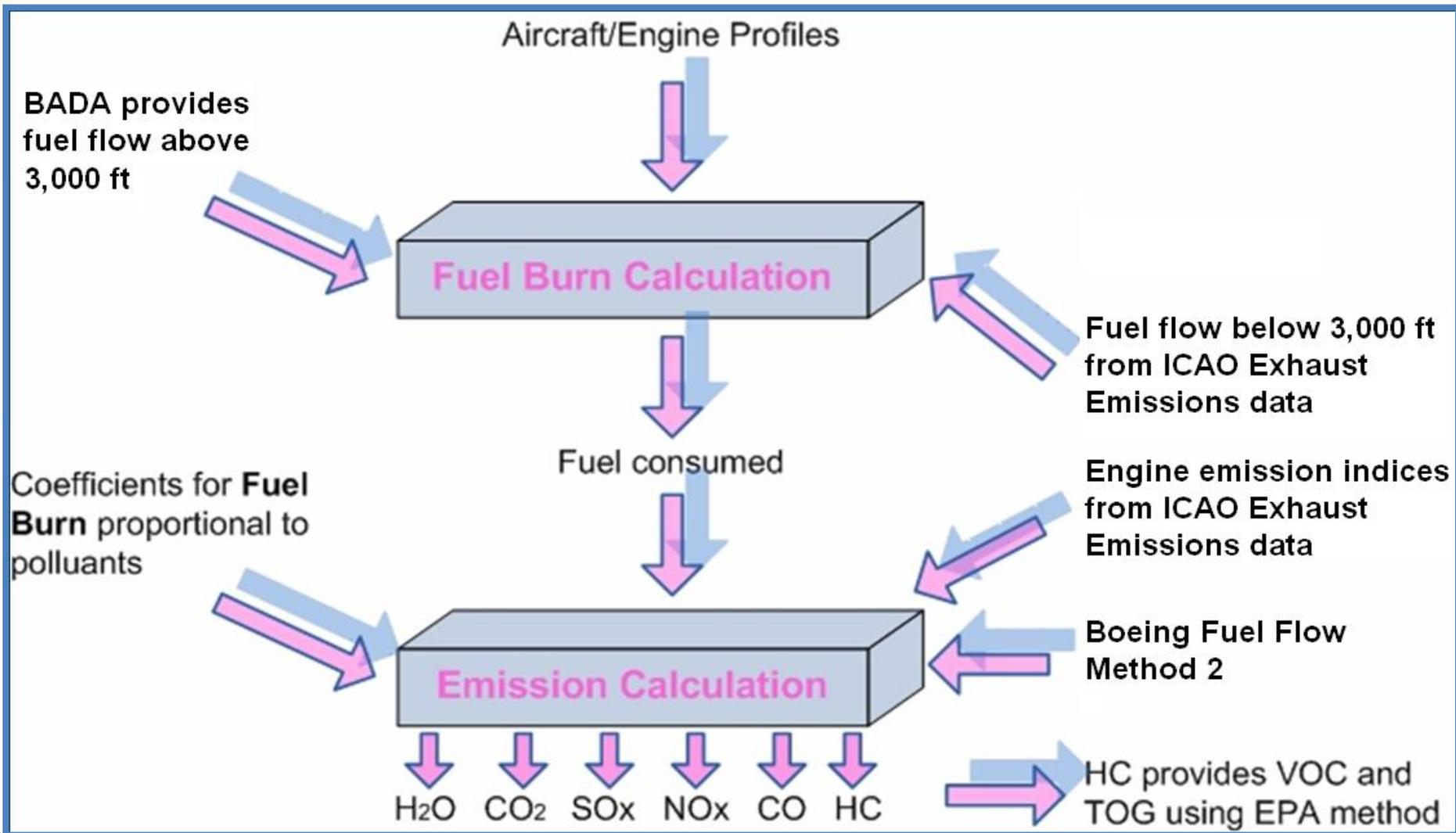




# AEM



## Data Crunching Processes

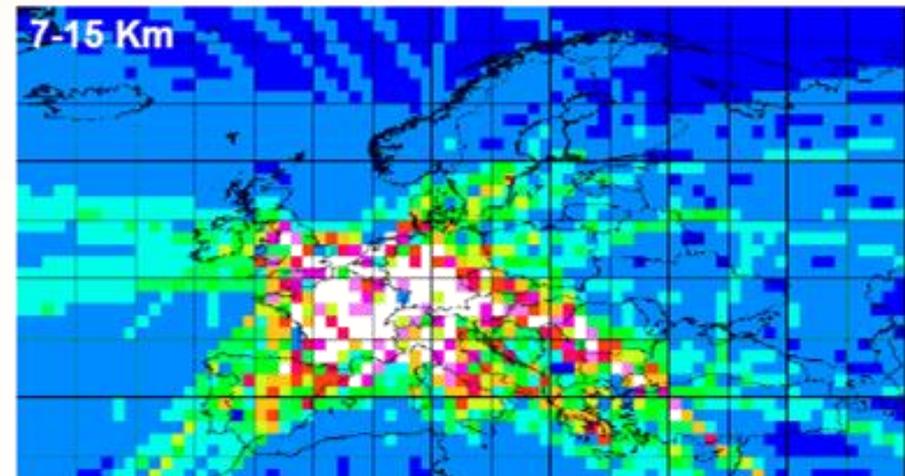
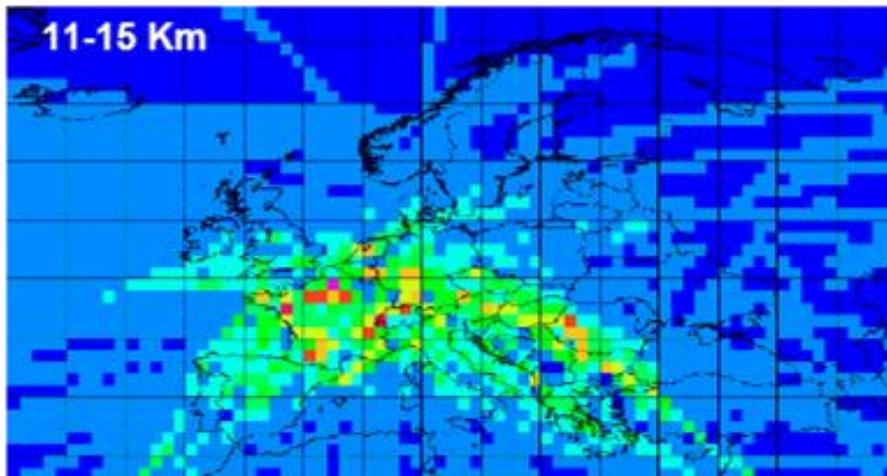
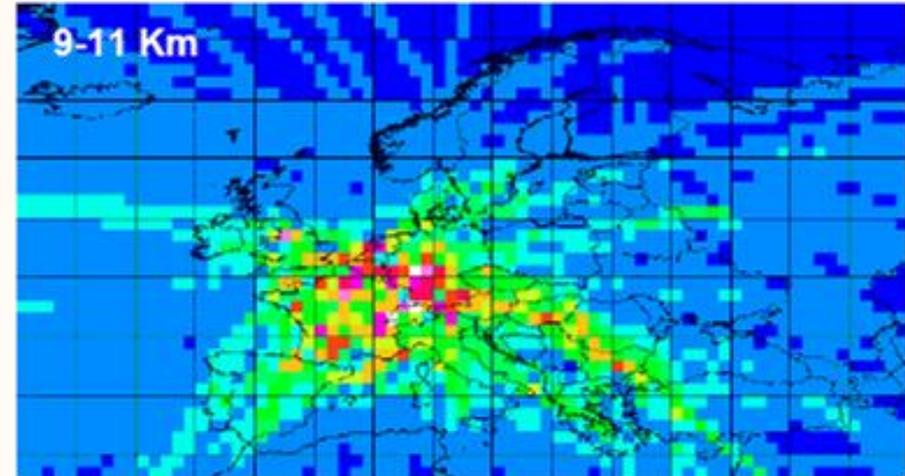
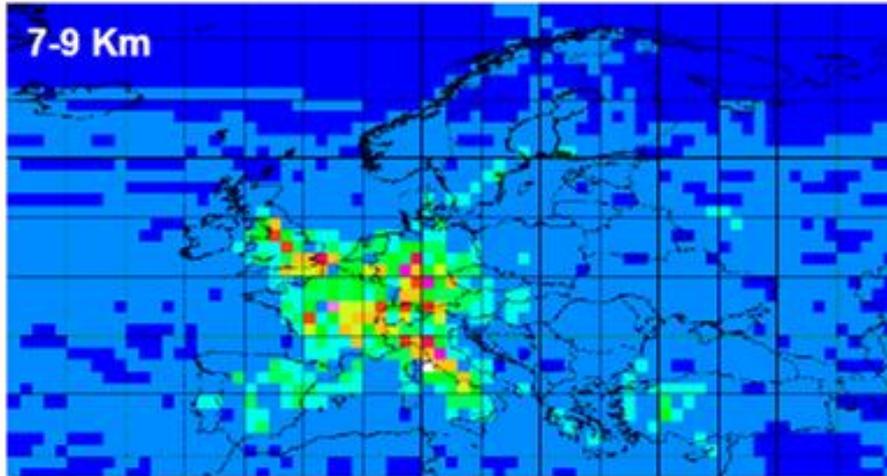




# AEM



## Gridded Emissions Inventories





# IMPACT

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## IMPACT

THE NEW ENVIRONMENTAL ASSESSMENT PLATFORM FROM EUROCONTROL

### IMPACT = STAPES + AEM IN THE CLOUD

IMPACT was developed in context of the European SESAR programme.

The main objective was to develop and deliver a modelling system designed to support assessment of the impact of SESAR operational improvements (OIs) on noise and emissions.

IMPACT is planned to be used in the context of future ICAO environmental policy assessments.

IMPACT availability:

→ Now for SESAR users;

→ From 2014 for the wider user community

IMPACT enables both the EUROCONTROL emission (AEM) and noise (STAPES) models to be run from the same modelling platform via a secure web portal. IMPACT provides a common aircraft operation and trajectory data environment to be used jointly by both models.

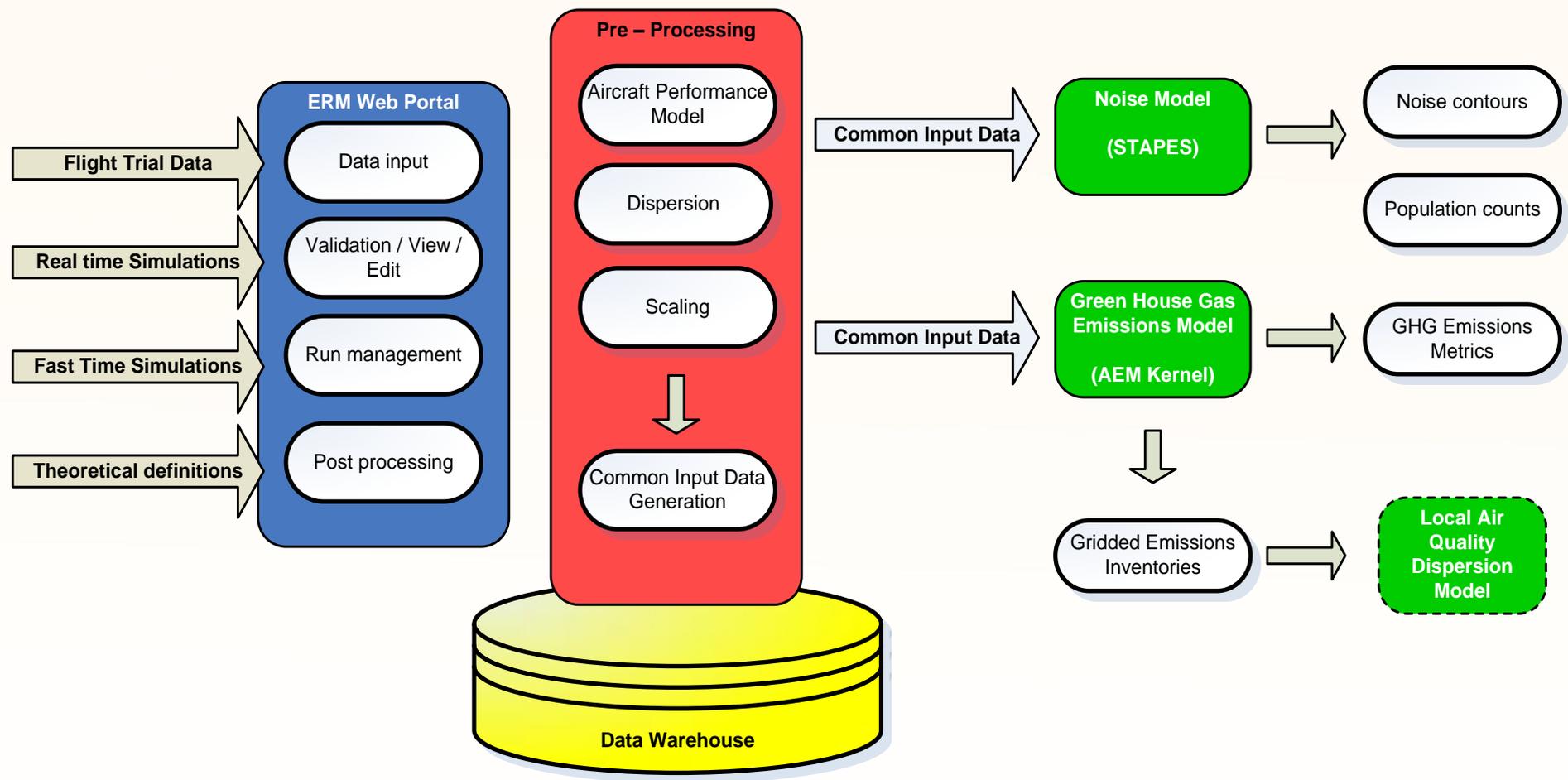
IMPACT addresses the following SESAR-specific requirements:

- Provide an appropriate level of granularity (sensitivity) to correctly respond to SESAR operational changes relative to a baseline;
- Cover all phases of flight (gate-to-gate) for fuel burn and emissions;
- Support studies on different scales, from the local level (airport or TMA-specific) up to the global level (European network level and beyond);
- Enable consistent trade-off analyses between fuel burn/emissions and noise;
- Handle input data from different sources including FDR data, fast-time or real-time simulator data;
- Enable the theoretical definition of operational concepts to be used in place of recorded input data, if required (eg. by using procedural steps)
- Make the system available to different users involved in operational projects for performing environmental impact assessments of their operational concepts.

IMPACT's data warehouse contains all reference and default data such as BADA 4.0 and ANP v2.0 required by the STAPES and AEM models



# IMPACT Data Flows

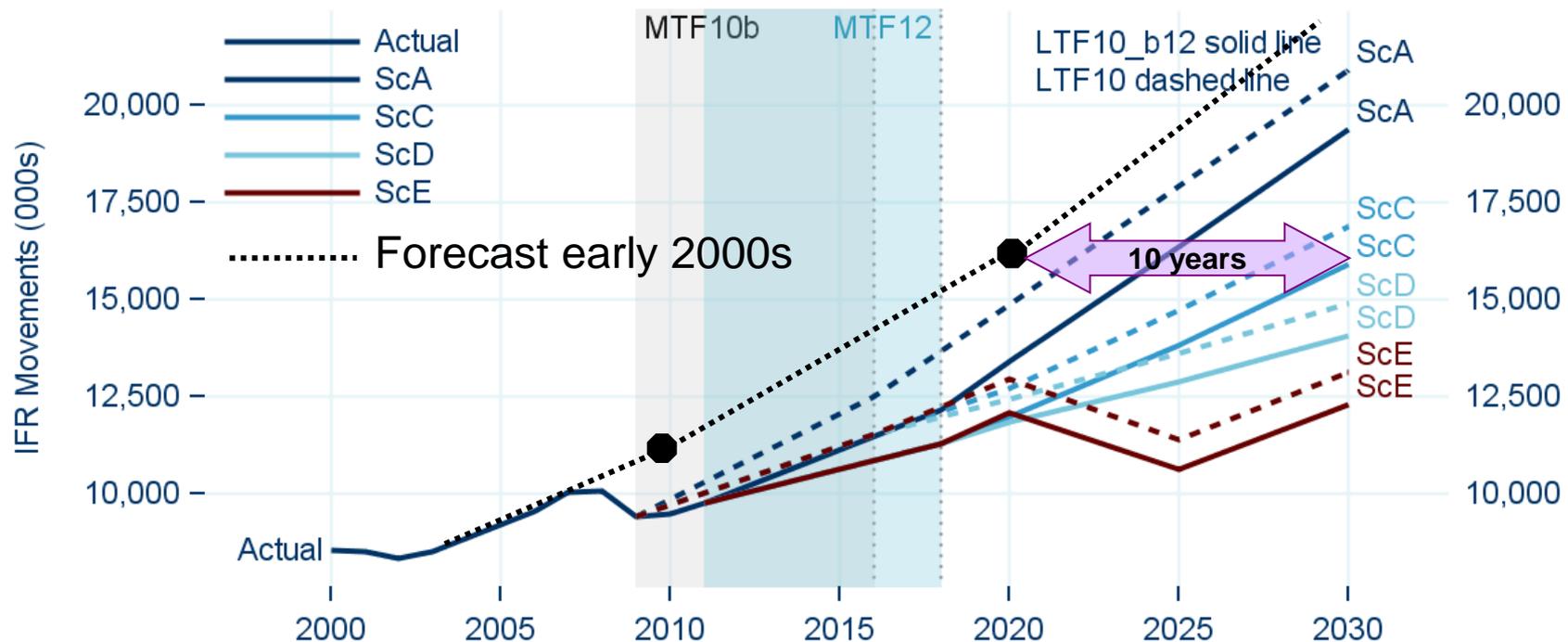




# MODELLING FUTURE EMISSIONS



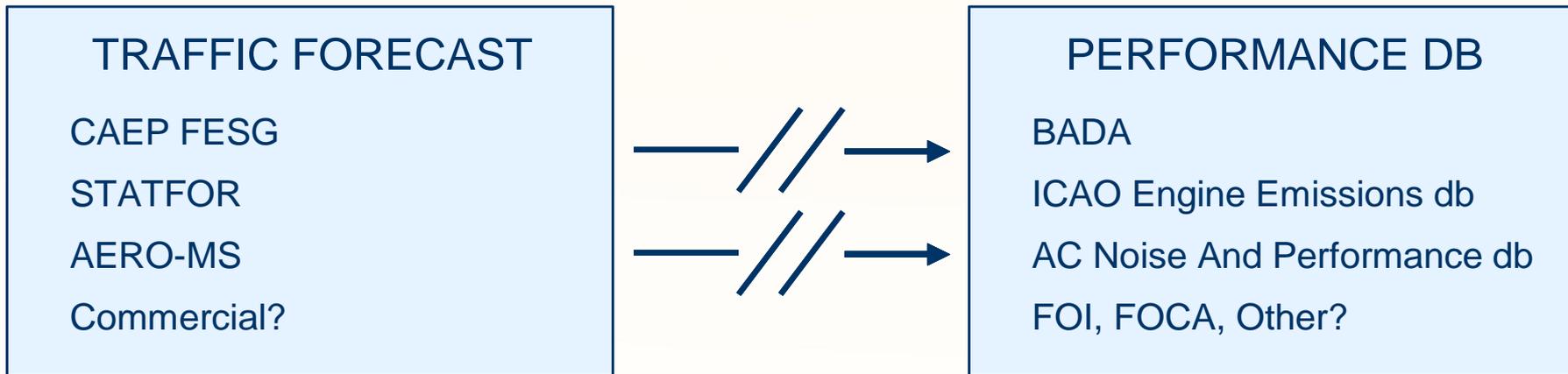
ESRA08 - Grand Total





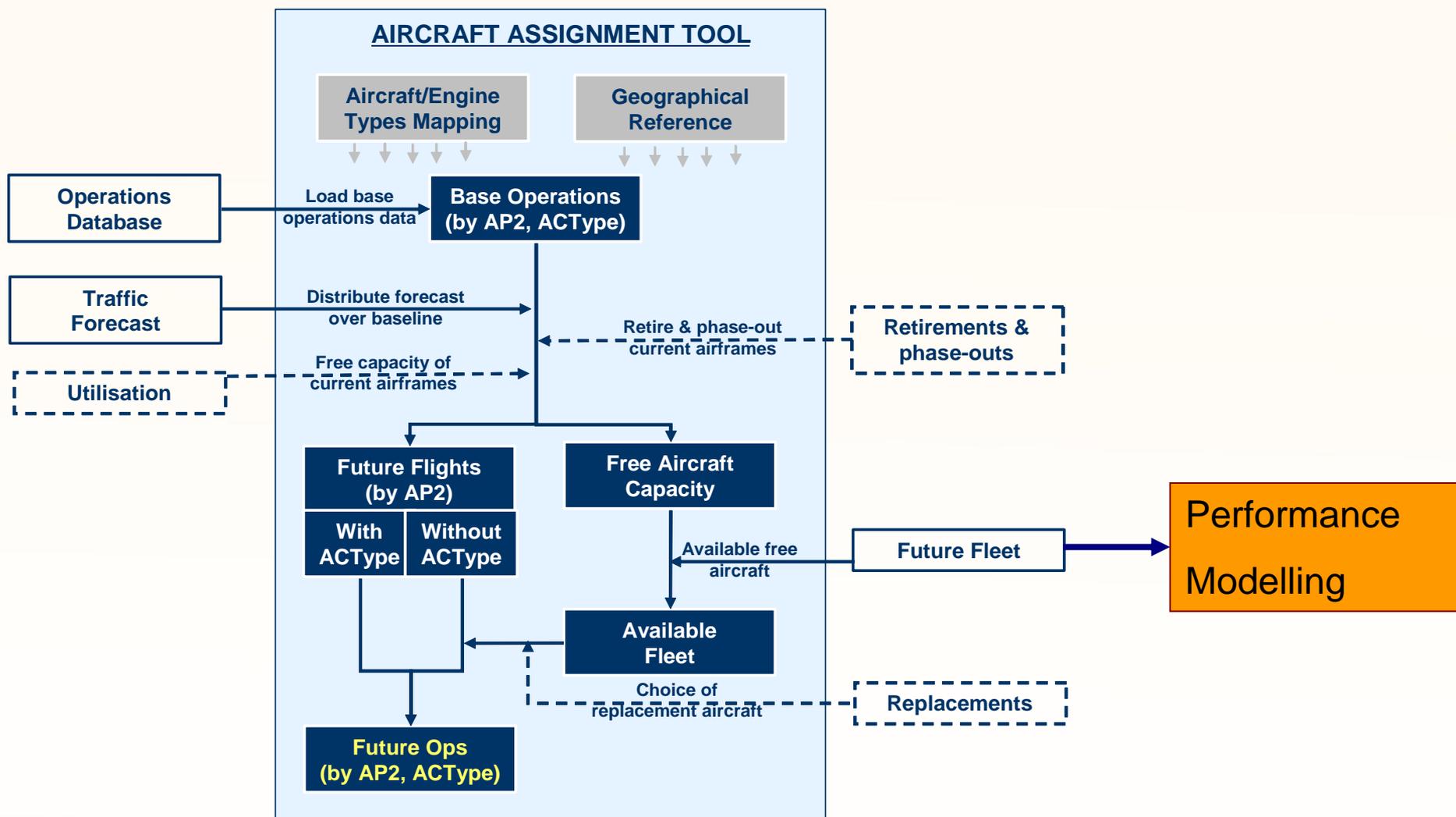
# FUTURE EMISSIONS

## The Capability Gap



# AIRCRAFT ASSIGNMENT TOOL

## Bridging the Capability Gap



# CONCLUSIONS

## Enhancing European Modelling Capabilities in Support of CAEP



- WISDOM build of 2012 global traffic under way
- IMPACT cloud-based assessment capabilities
  - STAPES (Noise) – Now
  - AEM (Fuel burn & emissions) – Dec 2013
- Forecasting future fleet & emissions
  - Aircraft Assignment Tool (late 2013)
- IMPACT & AAT to be stress-tested in CAEP (2013-14)
- EUROCONTROL, EASA, EC working together