

# Computational Fluid Dynamics for Flight Dynamics

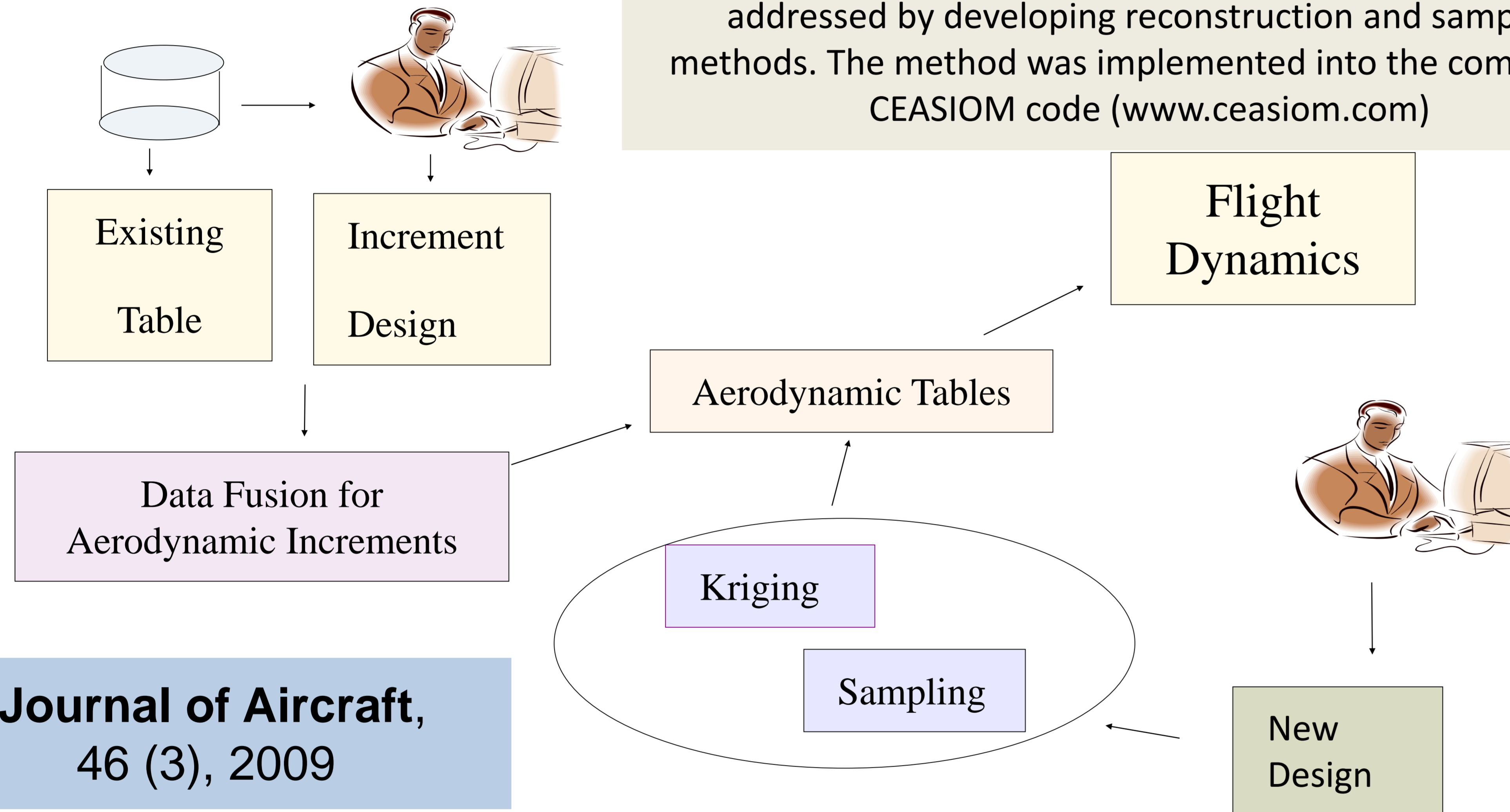
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## Objective

Aircraft Flight Dynamics Analysis requires the aerodynamic forces and moments dependence on the aircraft motion. Models are traditionally built from test data. CFD has the potential to produce better models more cheaply. Several advances are required to realise this: the **costs** of the calculations must be reduced; the predictions must be **validated**; **solution methodology** is needed to allow manoeuvres to be calculated

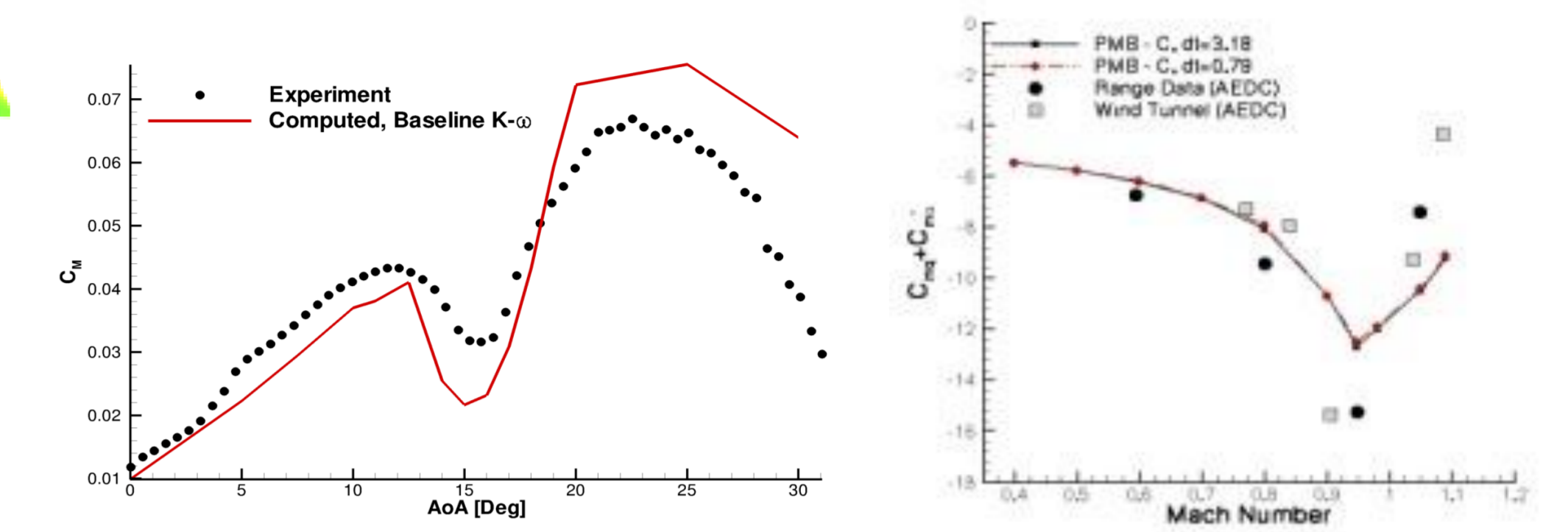
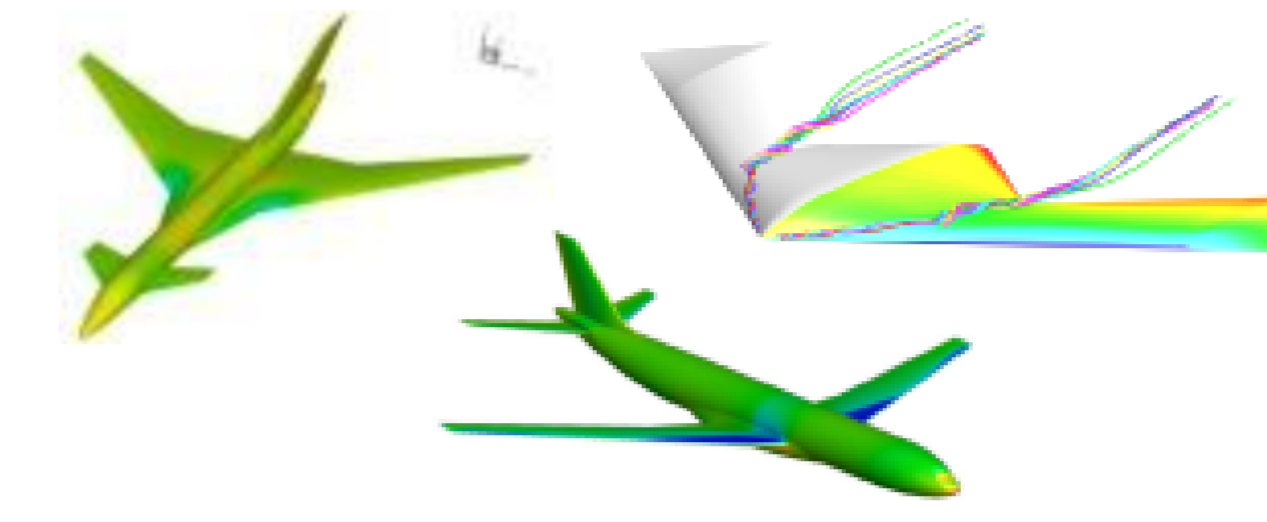
## Table Generation

The cost of calculating entries in multi-dimensional tables was addressed by developing reconstruction and sampling methods. The method was implemented into the commercial CEASIO code ([www.ceasium.com](http://www.ceasium.com))



## Validation

Detailed comparisons against wind tunnel data for 5 major cases



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## CFD Manoeuvre Calculation

Methods have been developed to allow manoeuvres to be calculated in a time accurate CFD calculation using the Liverpool CFD code to test the assumptions of the tables

Immelman turn of EADS Ranger2000

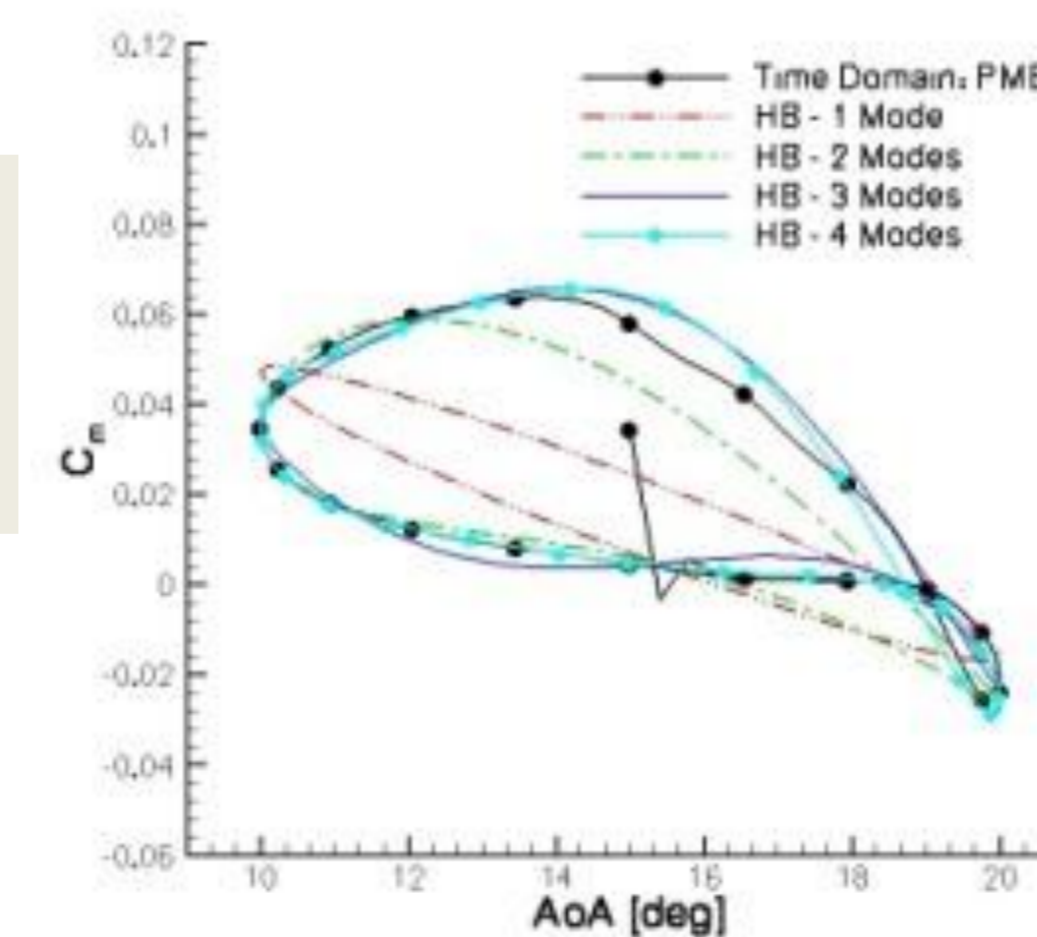


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## Frequency Domain Solvers

Methods that reduce the CPU cost of calculating periodic motions for dynamic derivatives by an order of magnitude have been developed and implemented in the Liverpool CFD code

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## Current Work

Flight dynamics of very flexible aircraft  
Aerodynamic model reduction for aggressive manoeuvres

