Self Separation and Highly Automated ATM

SIXTH FRAMEWORK PROGRAMME

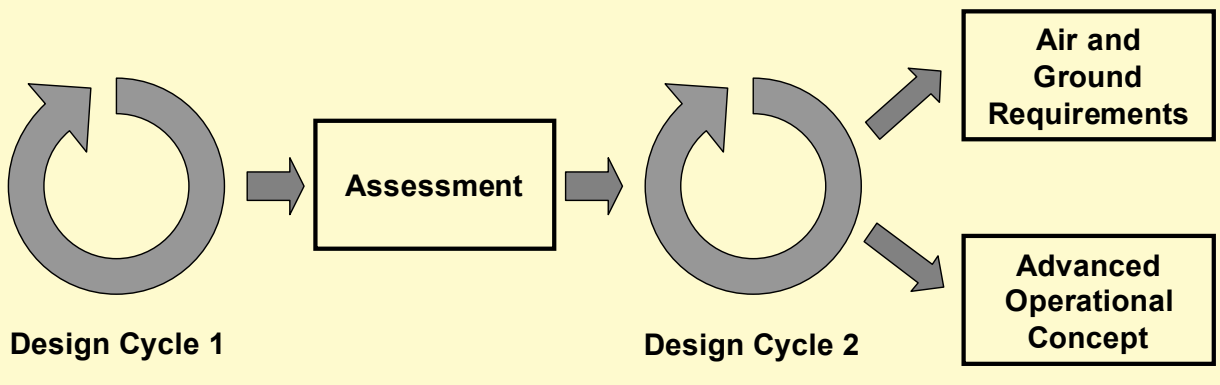
Specific targeted research project in 2007-2010 funded from the 6th Framework Programme for Research and Development of the European Community.

Motivation

During recent years the ATM community research trend is to direct large airborne self separation research projects to situations of less dense airspace. Typical examples of this trend are the EC research projects MFF (Mediterranean Free Flight) and ASSTAR (Advanced Safe Separation Technology and Algorithms). This is remarkable because airborne self separation has been "invented" as a potential solution for high density airspace. iFly aims to develop a step change in this trend, through a systematic exploitation and further development of the advanced mathematical techniques that have emerged within the HYBRIDGE project of EC's 5th Framework Programme http://www.nlr.nl/public/hosted-sites/hybridge/

Objective

For en-route traffic, iFly has the objective to develop an advanced airborne self separation design together with a vision how the well-equipped aircraft can be integrated within SESAR concept thinking. The goal is to accommodate a three to six times increase in current en-route traffic levels. This incorporates analysis of safety, complexity and pilot/controller responsibilities and assessment of ground and airborne system requirements and which make part of an overall validation plan. The proposed iFly research combines expertise in air transport human factors, safety and economics with analytical and Monte Carlo simulation methodologies providing for "implementation" decision-making, standardisation and regulatory frameworks.



Research & Development of Technology

iFly will perform two operational concept design cycles and an assessment cycle comprising human factors, safety, efficiency, capacity and economic analyses. During the first design cycle, state of the art Research, Technology and Development (RTD) aeronautics results will be used to define a "baseline" operational concept. For the assessment cycle and second design cycle, innovative methods for the design of safety critical systems will be used to refine the operational concept with the goal of managing a three to six times increase in current air traffic levels. These innovative methods find their roots in robotics, financial mathematics and telecommunications.

Design cycle 1
The aim is to develop an Autonomous Aircraft Advanced (A^3) en-route operational concept which is initially based on the current "state-of-the-art" in aeronautics research. An important starting and reference point for this A^3 ConOps development is formed by the human responsibility analysis.

Innovative methods
Develop innovative architecture free methods towards key issues that have to be addressed by an advanced operational concept:

- Develop a method to model and predict complexity of air traffic.
- Model and evaluate the problem of maintaining multi-agent Situation Awareness and avoiding cognitive dissonance.
- Develop conflict resolution algorithms for which it is formally possible to guarantee their performance.

Assessment cycle
Assess the state-of-the-art in Autonomous Aircraft Advanced (A^3) en-route operations concept design development with respect to human factors, safety and economy, and identify which limitations have to be mitigated in order to accommodate a three to six times increase in air traffic demand:

- Assess the A^3 operation on economy, with emphasis on the impact on organisational and institutional issues.
- Assess the A^3 operation on safety as a function of traffic density increase over current and mean density level.

Design cycle 2
The aim is to refine the A^3 ConOps of design cycle 1 and to develop a vision how A^3 equipped aircraft can be integrated within SESAR concept thinking. Preliminary safety and performance requirements will be developed on the applicable functional elements of the A^3 ConOps, focused on identifying the required technology.

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For more information on iFly, see the web site at
http://ifly.nlr.nl/