



Understanding the impacts of enhanced automation in future ATM

Project AUTOPACE

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FRAMily 2017

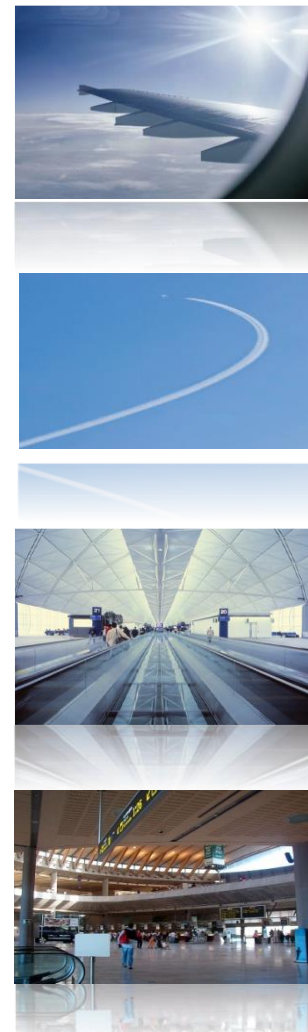
Rome 24-26 of May 2017



Founding Members



AUTOPACE Consortium



Reference Centre for Research, Development and Innovation in ATM



ugr

Universidad de Granada

CIMYC - Center of Research Mind, Brain and Behaviour.- Faculty of Psychology University of Granada



Alma Mater Studiorum University of Bologna



GINA - Air Navigation Investigation Group Technical School of Space and Aeronautics Engineers Technical University of Madrid.



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- The ATM system moves towards an increasingly high level of automation
- Automation will unavoidably change the ATCo work environment and the role of the human will be focused on more complex and high-value tasks



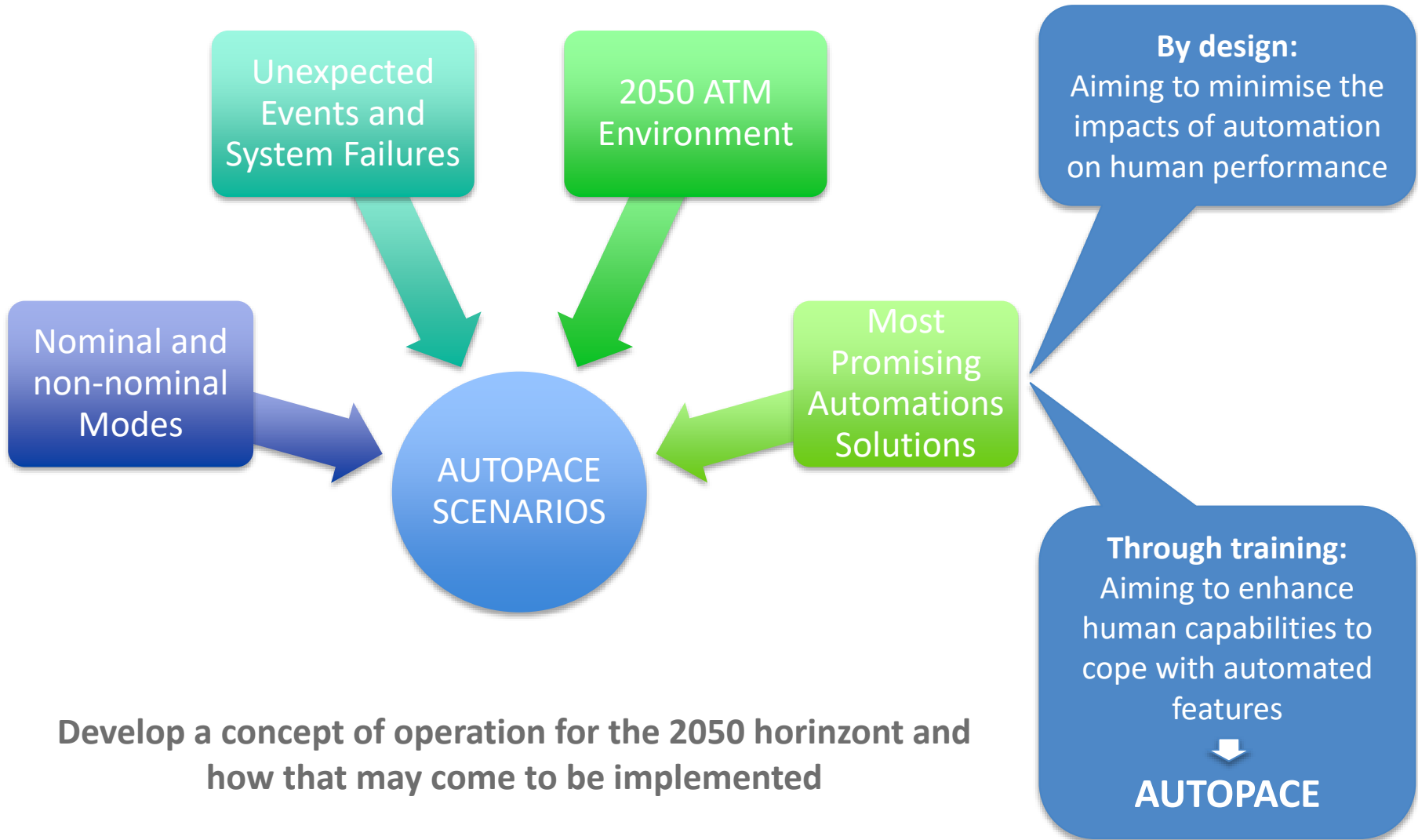
- **SESAR Joint Undertaking within H2020 research and innovation programme:** Fundamental research on psychological modelling to predict how future automation will impact on ATCo performance and to identify competences and training to cope with the effects of automation

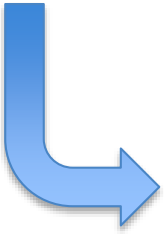


- Research on a **Psychological Model** to **quantitatively predict** how automation would impact on human performance
- Research on the required **competences and training** to **ensure the controller performance at high automated environments**

AUTOPACE project

Methodology





2 different automation scenarios:

- E1 - High automation: controller is limited to monitoring functions
- E2 - Medium automation: controller has monitoring, decision making and approval functions



3 non-nominal situations:

- Conflict Detection and Resolution fails
- Complexity management System fails
- System supported coordination fails

Support the design of training strategies for facing non-nominal situations under increased automation scenarios



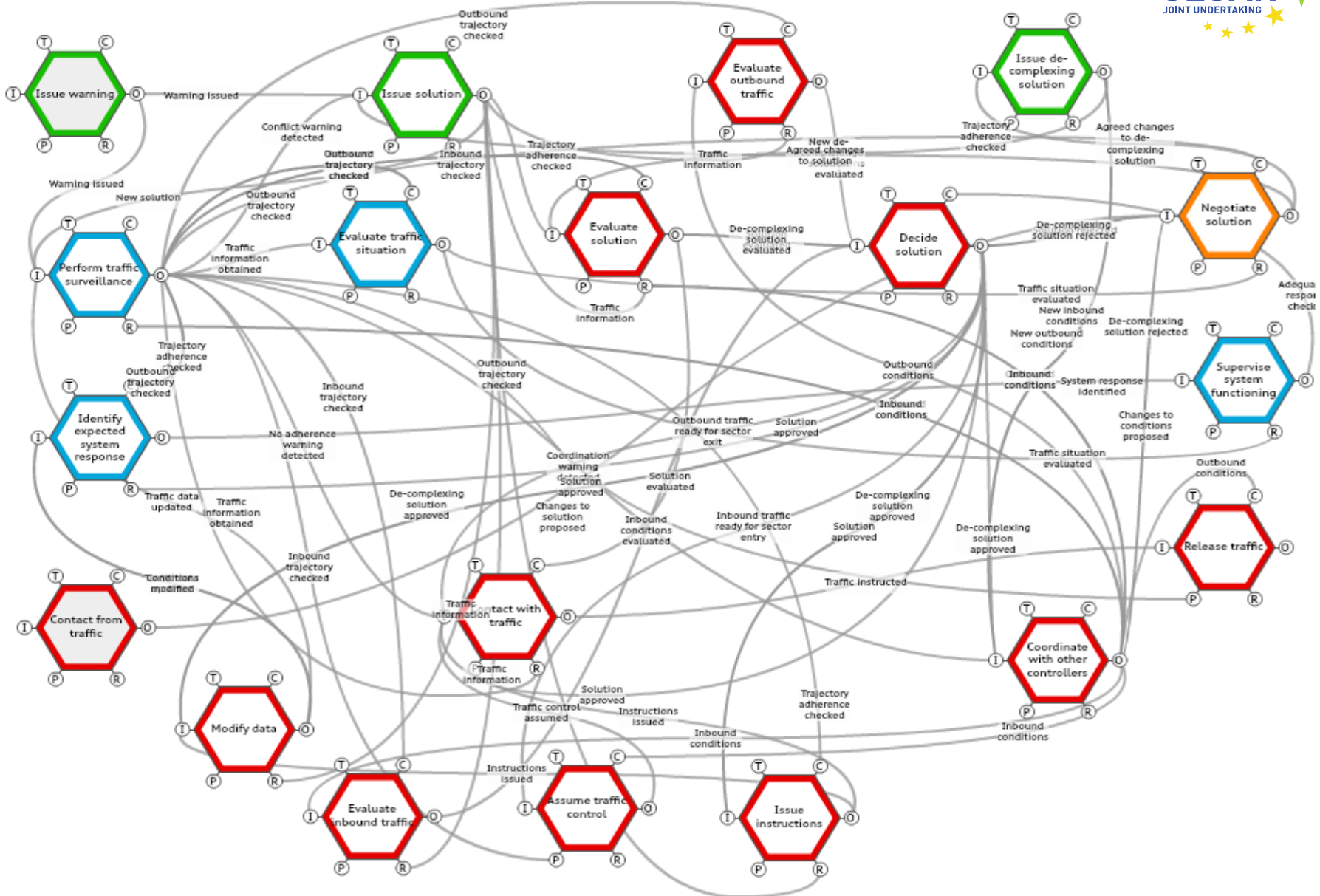
- Understanding the impacts of automation throughout the different sequences of actions and contexts in order to produce meaningful and precise guidance for the future of automation in ATC.
- Investigate the potential interdependencies between actions and processes
- Investigate the availability of information (as a critical resource) and process control
- Investigate coordination between automated decision-making and human monitoring requirements
- Support risk assessment activities (to be carried out in WP4)



Develop a model of ATC based on AUTOPACE medium (E2) and high (E1) automation scenarios, using FRAM

Preliminary results

The FRAM model developed



Preliminary results

Non nominal situations: the example of conflict detection and resolution failure

- Under nominal situation, traffic solutions are issued and merely its implementation has to be verified by the ATCo
- In this failure case, solutions are likely to have to be submitted to a considerably larger number of verifications and validations against critical safety and operation parameters



Iterative nature that may emerge within the solution decision making process

- The ability to acquire and process traffic information at the necessary pace, so as to produce timely traffic solution updates
- The ability to update traffic solutions in such a way that traffic information and situation remain coherent with parameters of proposed solution



Going forward for AUTOPACE

- Overview of potential operational changes based on a scenario comparative analysis
- Support the definition of hypothetical scenarios to be tested
- Inform risk assessment activities with more thorough understanding of potential changes to process and ATCo activities

For the FRAMily

- Spreadsheet based approach supports a fundamental system “learning process”
- The added value was not only in the “learning process” around model building activities, but most of all in the re-use of function descriptions
- Impact of new technologies: system changes versus instantiations
 - Where in the system may changes actually occur
 - Functions and aspects impacted
 - New aspects
 - “Inactive” aspects
 - Synchronisation (variability) issues between automated decision and human decision-making

For the FRAMily

The fundamental idea is additional plasticity: ability to reuse, change, transfer parts of models in and out...

I would propose a change in approach, which I think will reinforce FRAM principles:

- despite the added value that visualization has clearly brought in, to me, the best support for the analysis process (where FRAM is used as a tool) remains the excel-type listing and description of functions.
- The starting point of the FMV should be this list where functions are given that unique identifier, and possibly all their aspects as well.
- From this initiating point and also core “database”, functions can be selected/ unselected for visual representation.
- Changes to functions and aspects can be made based on the list and visualisations rebuilt. Lists can be imported/exported, stored...



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Thank you very much
for your attention!



This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No [699238]



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