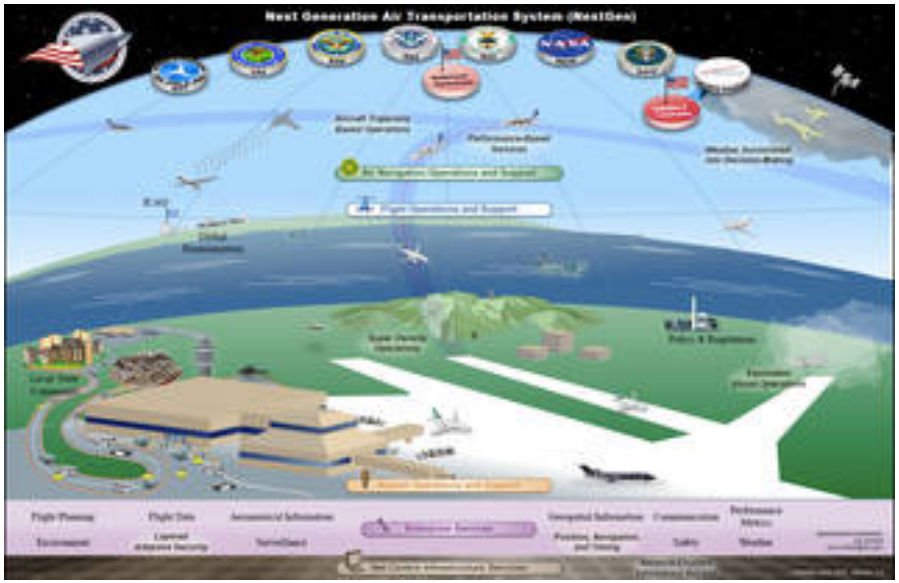
NASA INNOVATIVE ADVANCED CONCEPTS (NIAC): NNH15ZOA0001N. PHASE I

Verifying Safety of NextGen Models: A Rational Approach



WHY

- Air spaces gets more crowded
- Safety concerns become more critical.
- Need better reasoning about how pilots navigate crowded skies.
- Principle of rationality: experts know that only a few actions are most relevant
- Our hypothesis:
  (1) these few choices mark out a small space;
  (2) in that small space, formal verification tools can thoroughly explore a model

WHAT

JPF= Java Pathfinder = model exploration tool.
GALE= optimizers=like a smart pilot controlling a craft.

- Step1: Run GALE to find rational decisions.
- Step2: Run JPF for a few steps, constrained to regions found by GALE.
- Step3: Unleash JPF on regions accepted by Step2.

If JPF finds problems, ask GALE for mitigations:

- Step 4: run GALE with the constraint that it should strive to avoid JPF's counter-example states.

HOW

Case studies using recent work at NASA Ames models: modeling of pilots in the Brahms multi-agent framework for NAS and the NextGen Air Transportation Systems

WHO

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Menzies = co-author of the GALE heuristic optimizer.
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