

# TSAFE

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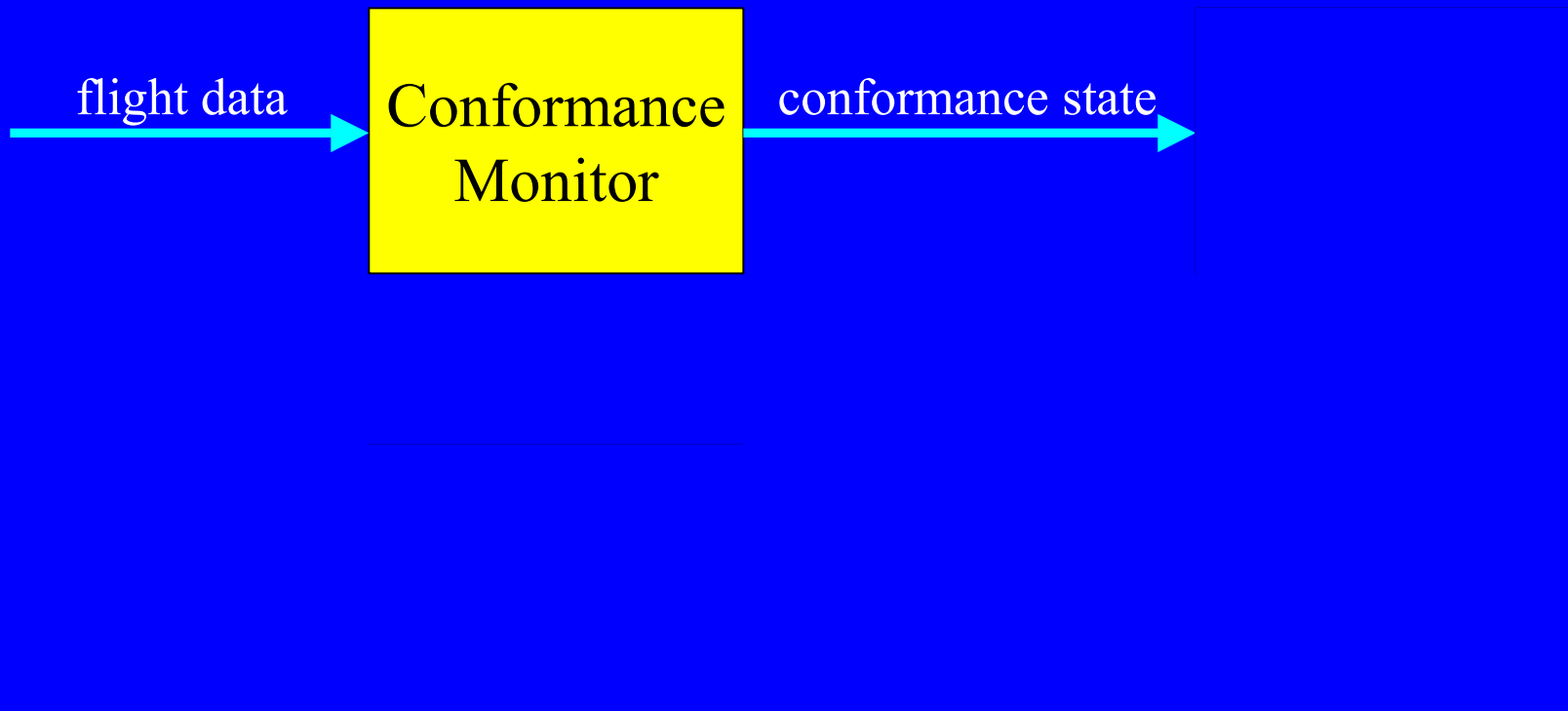
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# The Original Idea

- Short-term conflict detection and resolution tool for controllers
- Simple, “dumb” algorithms - not complex, ad hoc, CTAS-like heuristics
- Performs several functions:
  - Conformance Monitoring
  - Trajectory Synthesis
  - Conflict Detection
  - Conflict Avoidance

# TSAFE Model

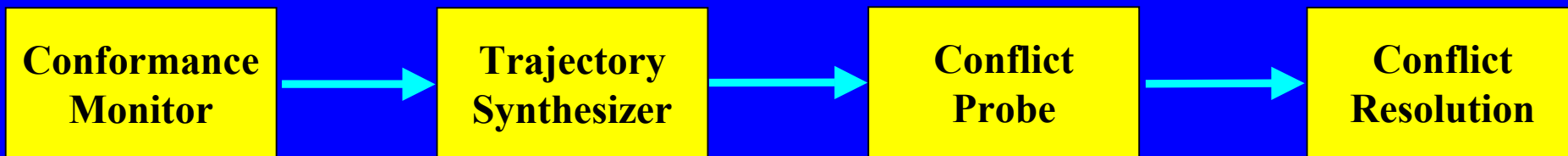
- Basic TSAFE model



- Our focus is on Conformance Monitoring

# Focus on Conformance Monitoring

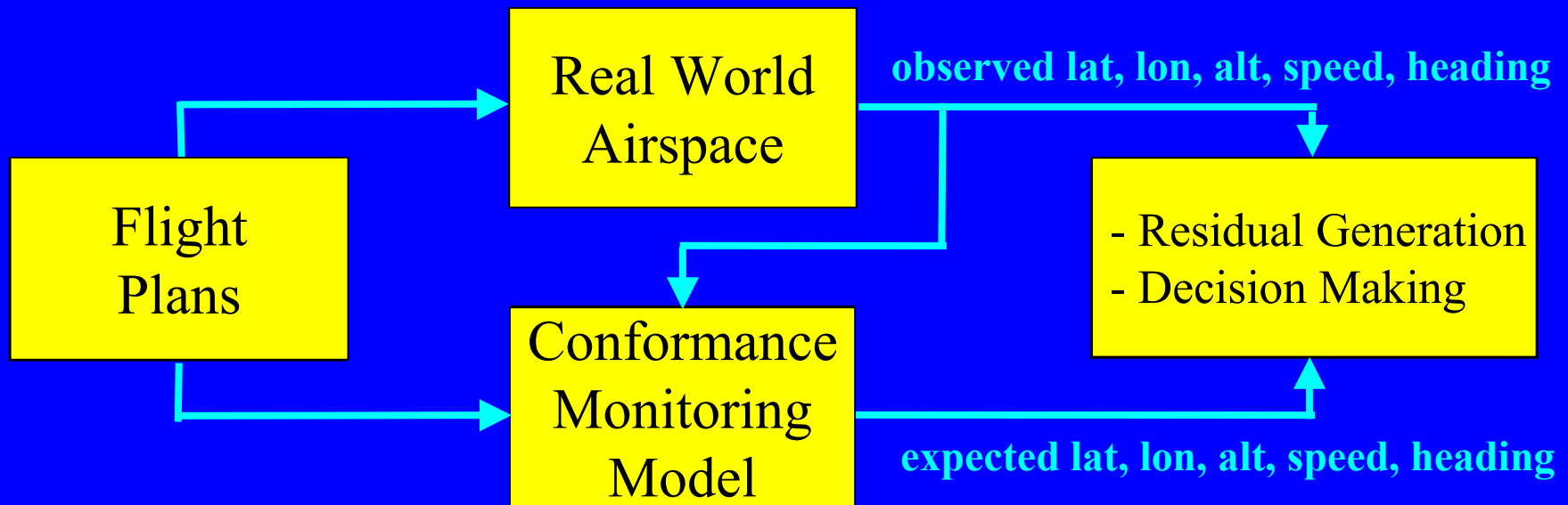
- Needed a smaller problem to tackle first
- First step in conflict detection & resolution



- Area of Tom Reynolds' research
- Potential integration of machine learning techniques (help from Leslie Kaelbling)

# Reynolds' Rap

- Conformance monitoring as a model-based fault detection problem



- CMM “snaps” flight back to flight plan

# Conformance Monitoring Functions

- Residual generation formula

$$\sum \frac{WF_i |x_{obs} - x_{exp}|}{n} = CR$$

- Decision-making function

CR < 1 => conforming

CR > 1 => blundering

CR = 1 => containment limit

- TSAFE GUI allows configuration of weighting factors and residual threshold

# Future Work

- Equip TSAFE and FIG to handle various feeds
- Run experiments
- Use machine learning
  - Learn the best weighting factors
  - Learn how a flight flies its flight plan
- Integrate into CTAS