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# Goals, Claims & Graphical Argumentation

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# Introduction

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- Based on attempt to understand GSN/CAE logic
- Part a result of experience and part driven by work with OU on 'Problem Frames'
- GSN/CAE are currently seen as being essentially the same, however:
  - neither appears to exist in 'pure' form
  - hope to show they are different but complimentary
  - comments based on language, rather than intentions



# Graphical argumentation

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- ‘A picture is worth a thousand words’
- Neither graphic, nor text, sufficient on its own
- Graphical navigation with background text efficient and communicative
- However needs to be:
  - structured
  - logically plausible
  - **correct, complete, and consistent**



- Championed by the University of York
- Essentially a top-down process, although nearly always iterative in practice
- Used to disaggregate goals/problems
- More expressive than CAE



# Goal & Context

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- **Goal** initial starting point (may change)
- **Context** provides the background, limits & constraints for the goal
  - important for reuse
  - one, or many contexts, for a goal
- Together goal and context define **problem**:
  - “Difference between where you are and where you want to be”



# Strategies

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- **How** to satisfy the goal / solve the problem
- Defines the architecture of the solution
- May include: refinement, segmentation, process or delegation
- May reveal that the initial goal was stated at the wrong level (**why?**)
- Multiple strategies (alternate / parallel)
- May be decision-based



# Refinement & Segmentation

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- **Refinement** progressively refines view of the goal / problem to simplify and prioritise
  - Aim to transform the ‘soft’ or imprecise top goal to ‘harder’, more precise, sub-goal(s)
- **Segmentation often** splits context, e.g.
  - *Hardware / software / human factors*
  - *Sub-systems or life-cycle phases*
  - *Organisational – delegation*
  - *By standards*
- *Need to show new contexts*



- 'System engineering' view:
  - Define requirements
  - Produce the design to satisfy the requirements
  - Build to the design
  - Verify the build against the requirements
  - Validate the result against the need
  - Operate within suitable management system



# Delegation

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- Form of segmentation
- Important practical applications
- Can recognise customer-supplier relationship
- Almost always needs additional coordination / consistency goals
- Context becomes important part of delegation contract



# Sub-goals / Solutions

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- Sub goals - 'part-wholes' (Koestler's Holons)
- Solution is a sub-goal for which can be implemented with acceptable risk
- Sub-goals must inherit higher-level contexts
- Should trigger correctness / completeness / consistency verification



- Bottom-up 'aggregation' technique
- Should strictly be EAC
- Related to evaluation and reporting
- **May** mirror GSN (if used for planning)
- Need to carefully watch levels of confidence and envelopes
- Often involves negation of the null hypothesis



- “something that gives ground for a belief”
- “a testimony that establishes the facts”
- closely related to evident:
  - “something that can be seen”
  - “is obvious and clear to the mind”
- So evidence must be:
  - capable of being seen and challenged
  - authoritative in that it engenders belief
  - clear and unambiguous



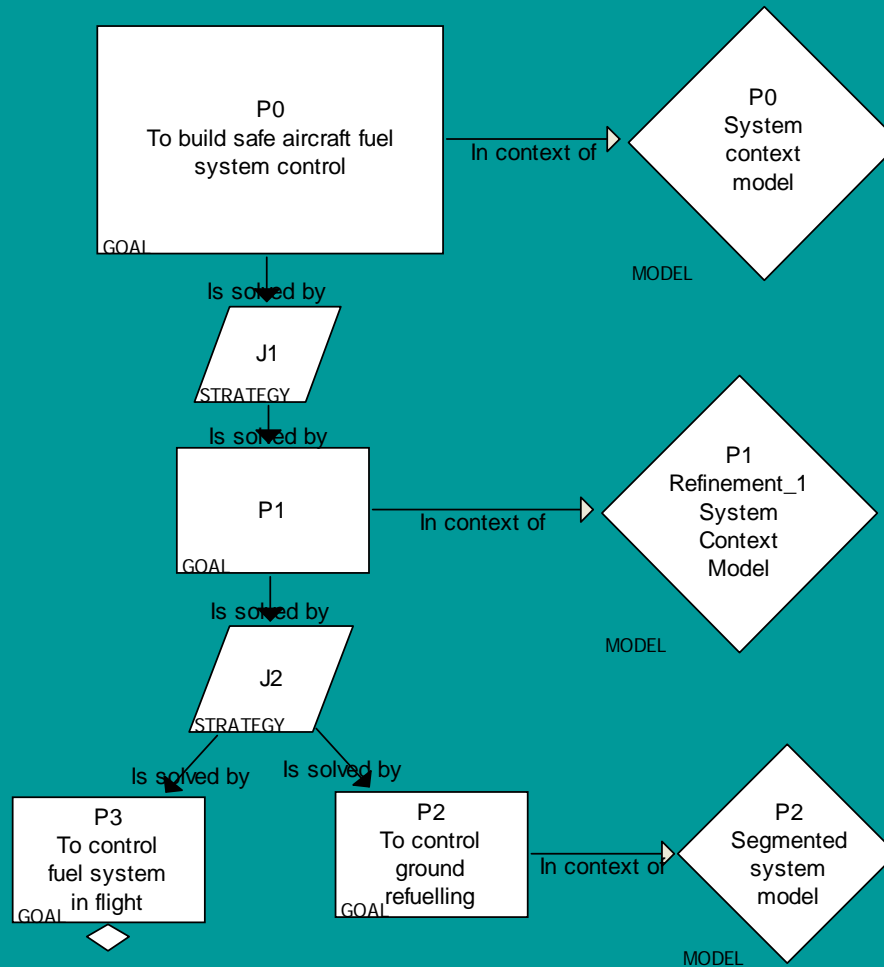
- Provide essential link, the ‘because’ to a claim that contains main logical steps
- Deductive (syntactic)
  - Boolean logic / formal methods
  - Unrelated to facts in the real world (evidence link)
- Inductive (semantic)
  - Based on past general observations
- May need to explicitly cover:
  - Confidence arguments
  - Envelope arguments: intersection or union



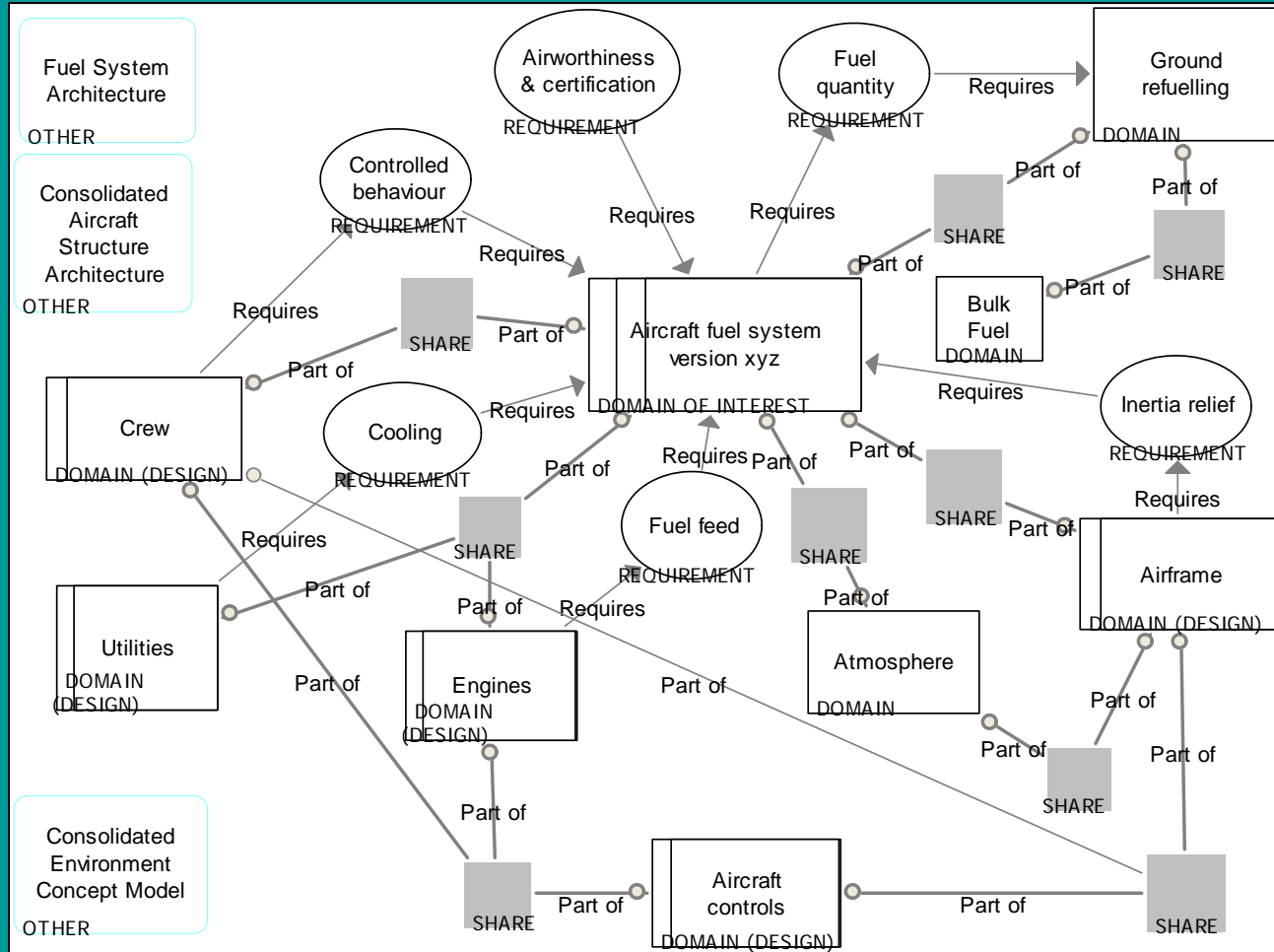
- “A plausible contention”
- Made plausible by the argument
- Like sub-goals may be ‘holonic’
- Should build towards the desired top claim
- Aggregation **may** be almost automatic based on GSN (if used for planning)
- Inherits the envelope of the evidence
- May need to specifically address ‘counter’ evidence, often by change of envelope



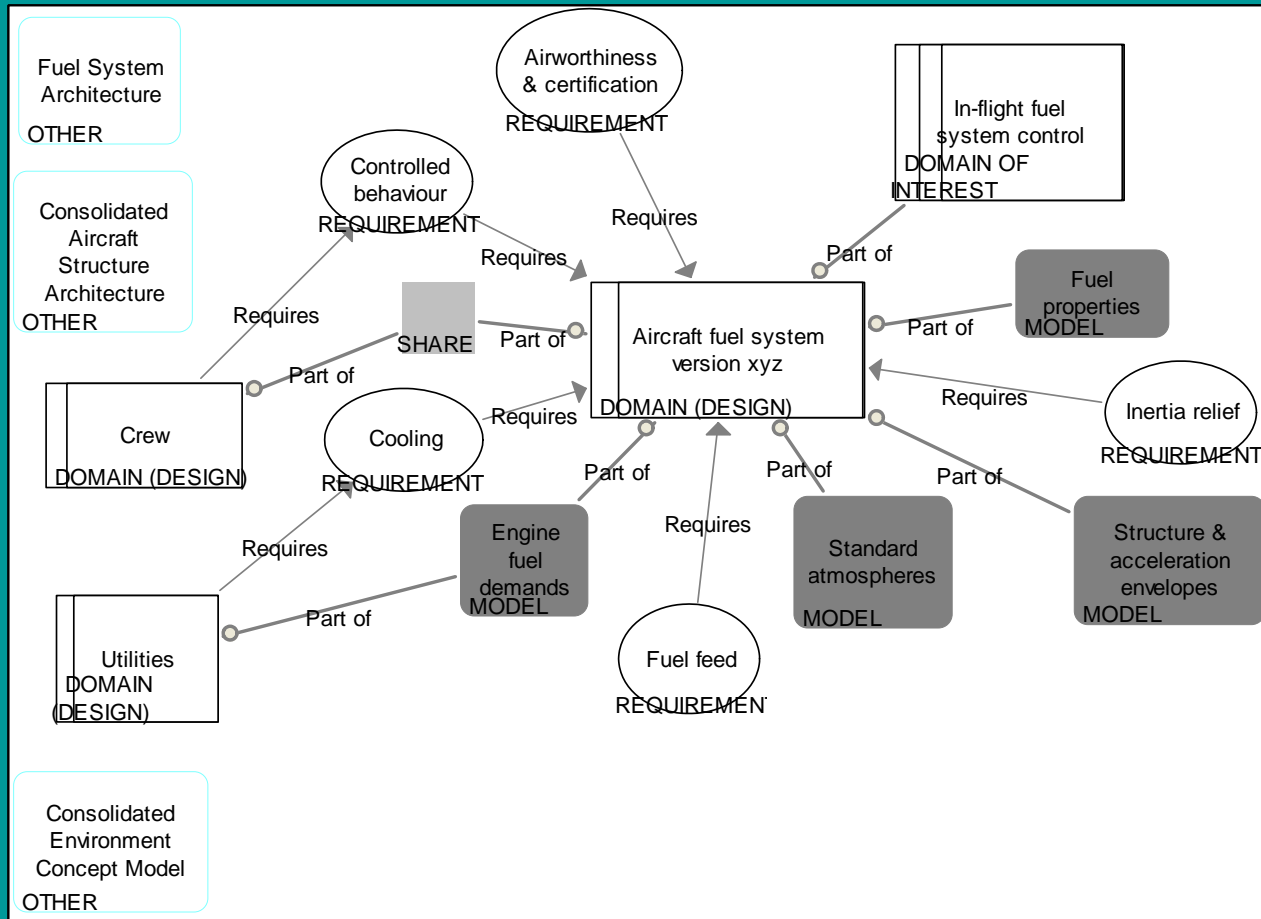
# GSN & Problem Frames



# Example Problem Frame



# Refined Problem Frame



Simplified PF for in-flight fuel control



# Conclusion

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- GSN & CAE fundamentally different
- Complimentary if GSN is used for problem solving & planning and CAE for reporting
  - Better support for document generation when node and link terminology is right
  - Separation of planning & reporting helps for milestone reports
  - Greater clarity in purpose
- Problem Frames fit well with GSN, particularly for managing the context



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Thanks for listening

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Any questions

