



# Schedule Risk Analysis for Complex Projects

**Andy Abu-Bakar**

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## About the speaker

Andy Abu-Bakar CEng MIMechE

Risk Assurance Services Lead – Rhead Group

Eight years MoD various roles: Project Manager, Systems Engineer, Aircraft Trials and Certification

Three years PPM consulting: Defence and Aerospace roles

Key skills:

- Project Management
- Risk management & improvement
- Quantitative Risk Analysis & decision support

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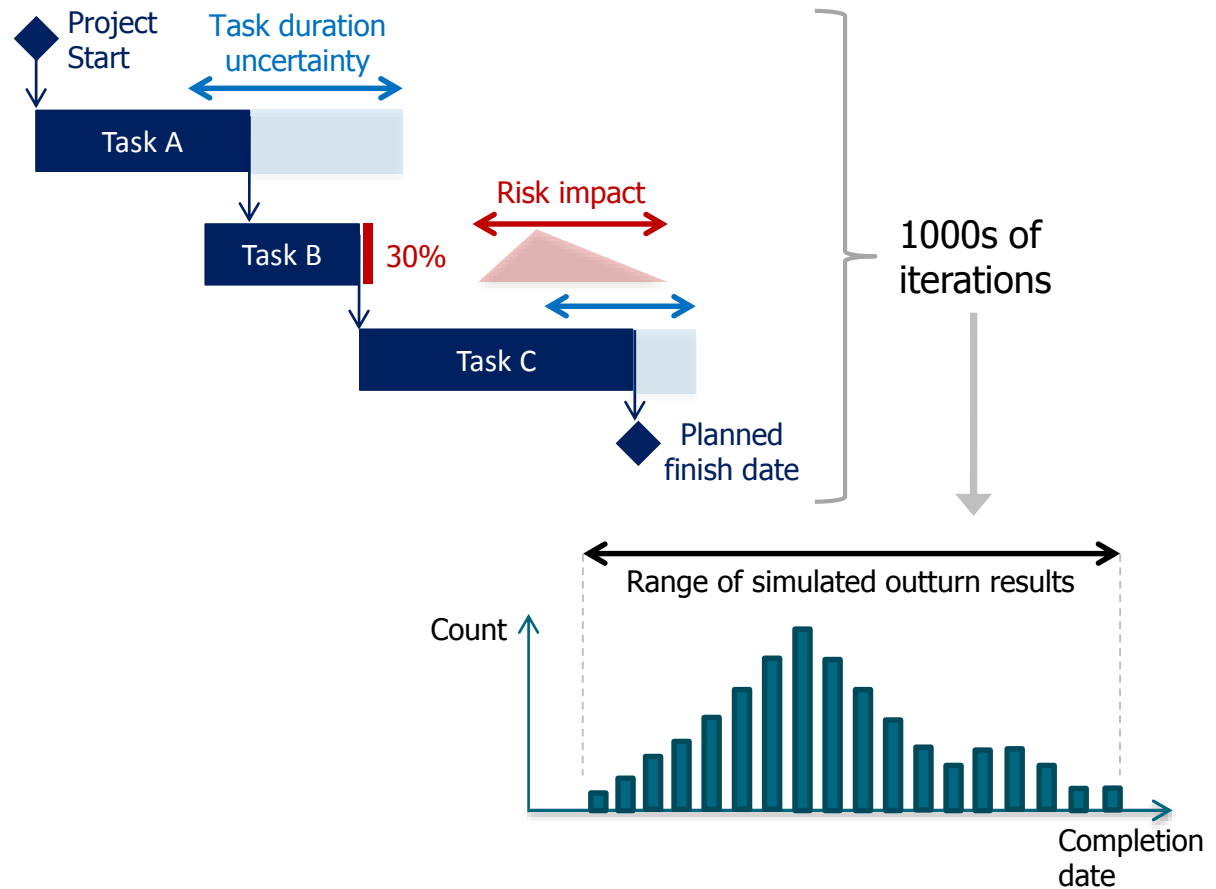
# Schedule Risk Analysis – what is it?

- Quantitative technique for simulating the project's outcome

**Schedule logic**

**Activity uncertainty**

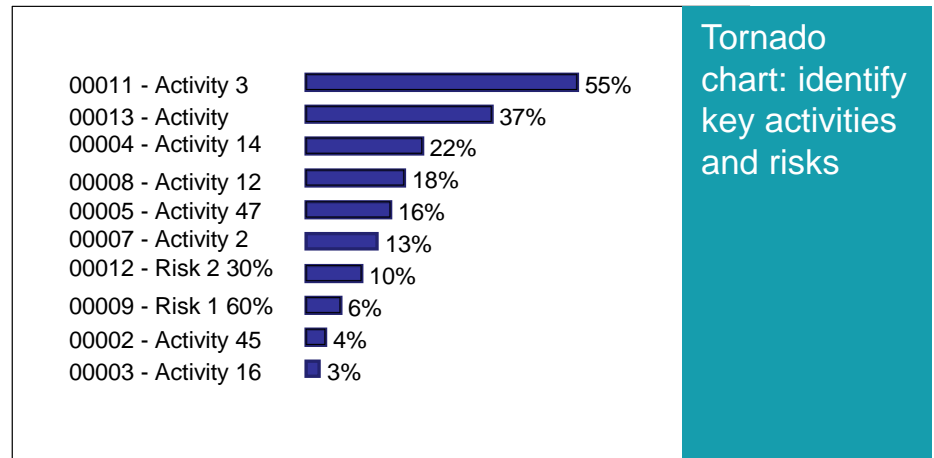
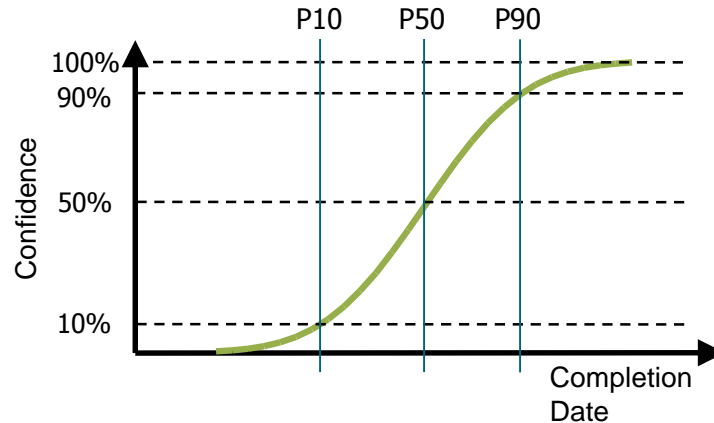
**Risk events (threats and opportunities)**



# Schedule Risk Analysis – why do it?

During concept and definition:

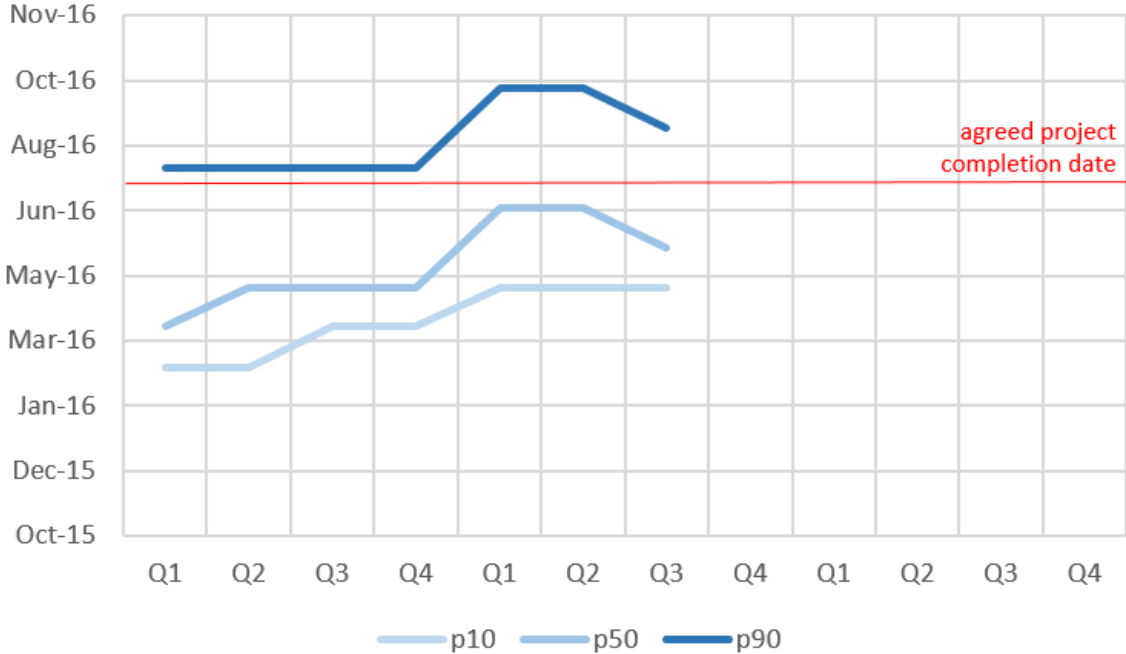
- Establish achievable delivery targets (or confidence in delivery)
- Understand range of possible project outcomes
- Forecast cost of project
  
- Identify activities and risks which have most influence on project outcome
- Assess value of planned response (mitigation) activities



# Schedule Risk Analysis – why do it?

During project implementation:

- Evaluate effect of emerging risks
- Cost-benefit analysis for mitigation funding
- Monitor and control the project
- Identify best means of recovering forecast delay



# Case study: large public sector engineering project

Significant capital investment (£100Ms)

- Production and integration of a number of complex systems
- Development and proving of novel technology
- Planning, construction and commissioning of bespoke manufacturing facilities
- Trials and demonstration activities to support handover to user
- Training and support systems

Currently in definition phase approaching main investment decision

Collaboration between government body and number of industry suppliers

- Number of large engineering contractors
- Multiple sites UK and abroad



# Case study: analysis objectives

- SRA is central to government case for investment
  - Critical indicator used for investment decision
  - Helps to define project time and cost envelope
  - Must withstand detailed scrutiny
- Ongoing use of analysis throughout project life
  - Key project monitoring & control tool
  - Identify major schedule drivers
  - Develop and evaluate response strategies
  - Improve confidence in achieving delivery milestones



## Case study: project challenges

- Breadth of scope across multiple organisations with different cultures
- Number of interdependencies between parallel workstreams
- Complex, very detailed schedule (XX,000 line IMS)
- Volume, maturity and coverage of risk information (100s of risk events)
- Resistance to change and need for analysis



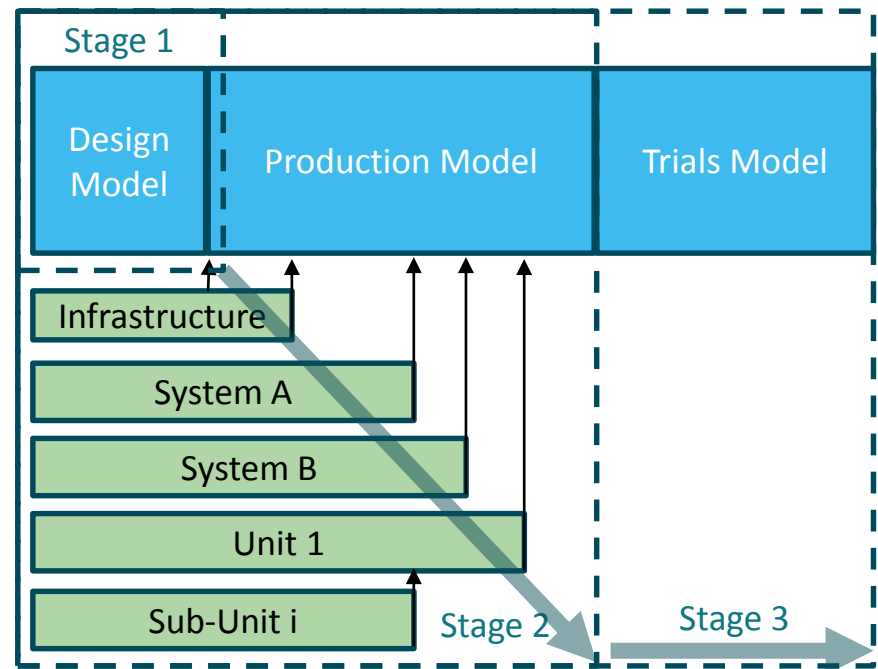
# Analysis approach: quality of evidence

Typical (bad practice) approach:

- Import schedule directly into SRA tool
- Apply anchored (+/-10%) uncertainty estimates
- Map contents of risk register to network
- Hope there are no questions!

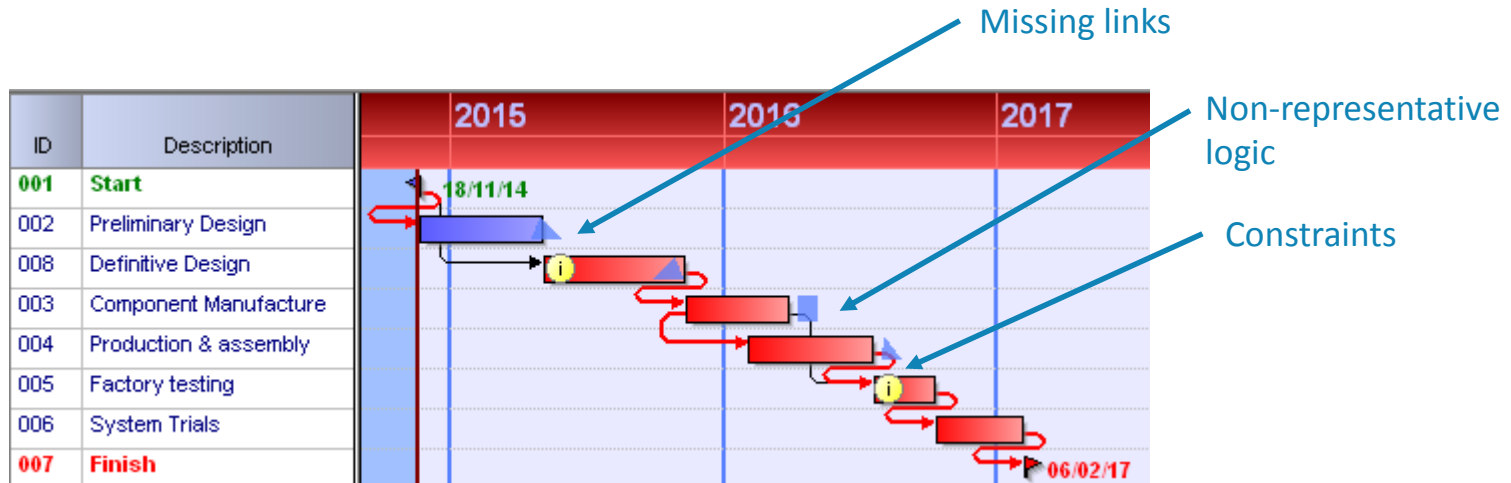
Focus on maintaining quality of evidence:

- Scope split across number of high-level models
- Consistent development method
- Rigorous estimating practice
- Maturity (quality) check applied before use



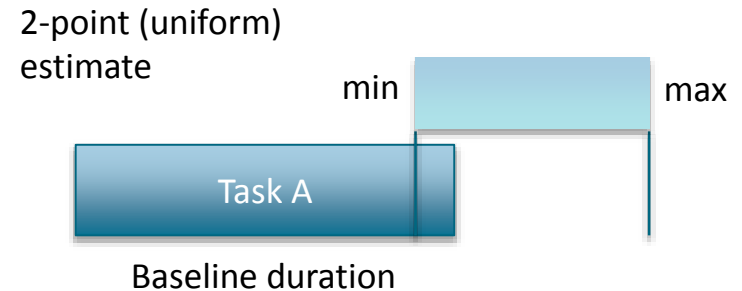
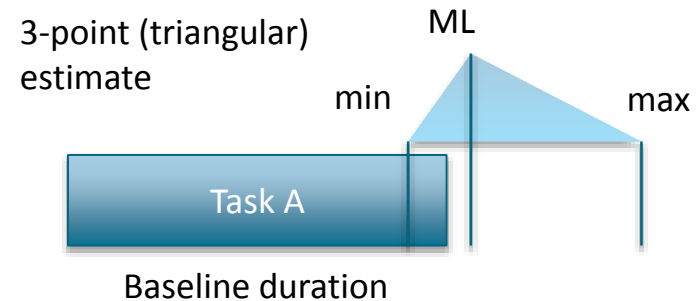
# Building the models: summary schedules

- Simple high-level networks required to maintain quality of analysis
  - Summarising IMS detail into small number of activities
  - Differentiating between critical scope and non-driving activities
  - Target of <200 lines per network
  
- Clarity of logic required to produce rational risk networks
  - Ensure logic relationships allow effect of uncertainty and risk to be modelled accurately
  - Remove schedule constraints which inhibit simulation



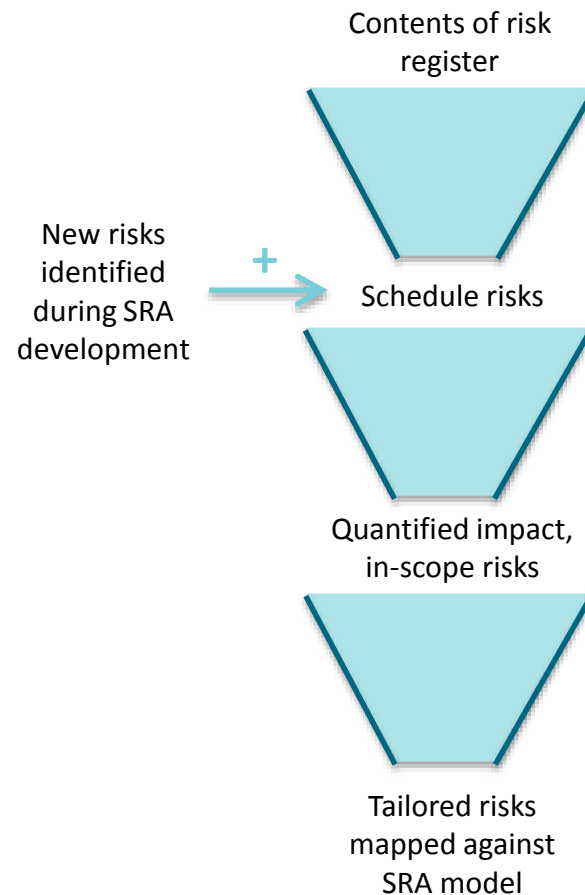
## Building the models: uncertainty estimates

- Developed bottom-up estimates
- Avoid anchoring bias
- Defined approach to developing estimates:
  1. Capture activity context
  2. Identify Sources of Uncertainty
  3. Select an appropriate form of distribution
  4. Define scenarios for each estimate
  5. Record estimate values and supporting rationale



## Building the models: risk sentencing & tailoring

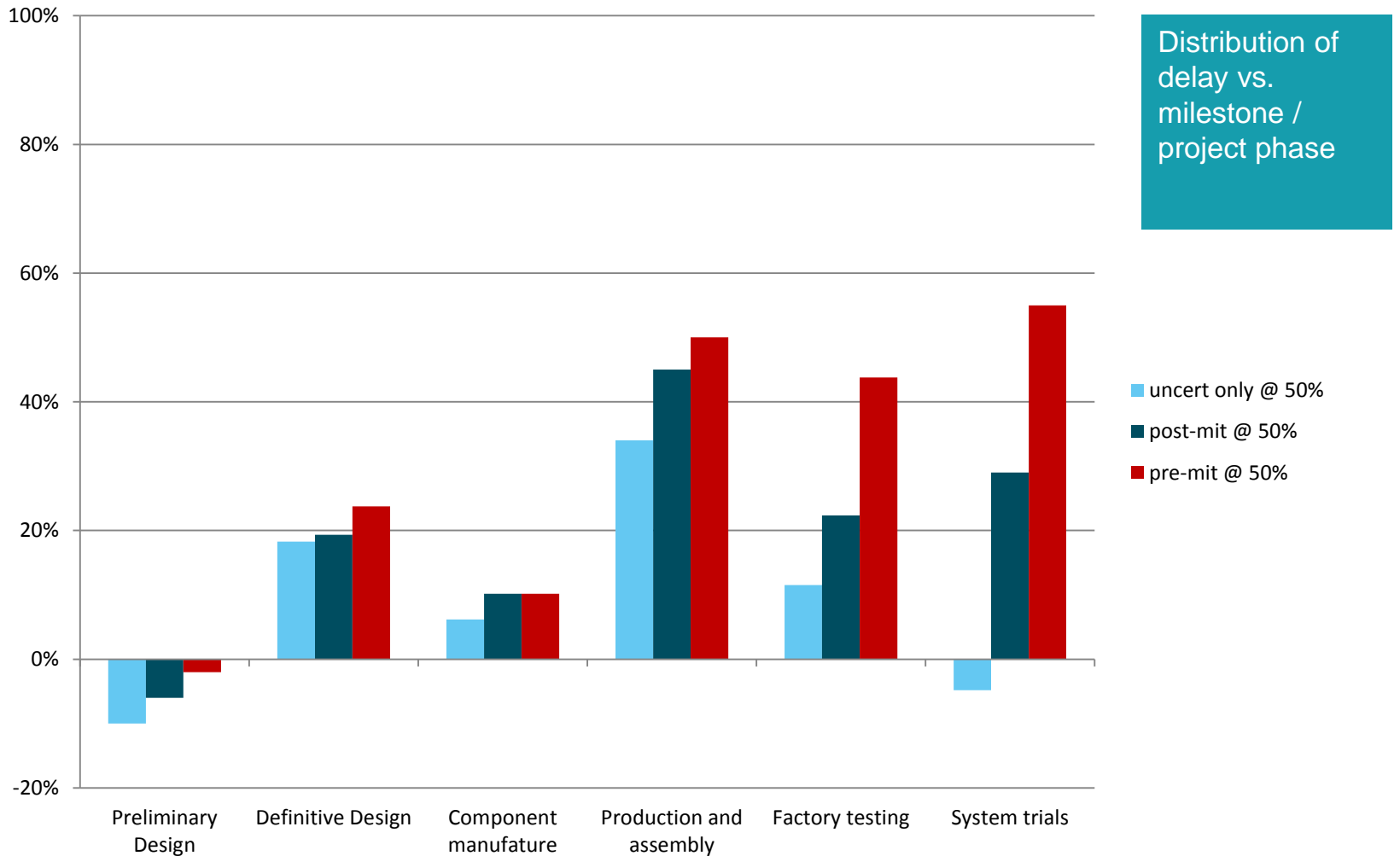
- Reviewing individual risk events to test validity
  - Remove issues, BAU events and undefined worry beads
  - Test (or develop) basis of estimates
  - Verify value of risk mitigation
  
- Secondary benefits:
  - Identify gaps in risk coverage
  - Improve quality of risk definitions and validity of estimates



# Monitoring progress and updates

| Network Name                  | Date of last maturity assessment | Schedule | Uncertainty Estimates | Risk Events | Correlation | Model Behaviour | RBD | Delivery confidence (v.s. RBD) | Owner | Status Notes   |
|-------------------------------|----------------------------------|----------|-----------------------|-------------|-------------|-----------------|-----|--------------------------------|-------|--|
| Design & development          | Jul-14                           | G        | G                     | G           | R           | G               | Sep | High                           | PSO   | Existing model structure and results produced in July can be used for initial end-to-end results. No correlation applied, but 'green' across other maturity categories.  |
| Platform production & Test    | Sep-14                           | G        | A                     | A           | G           | A               | Nov | High                           | PSO   | Network structure and uncertainty estimates largely complete: remaining areas outstanding for late testing activities. Schedule risk scrub work ongoing to sentence, validate and tailor risk events: approx 90% complete. Correlation assessed and now incorporated into model. Model behaviour assessed through simulation run to confirm functioning logic.         |
| Trials & Acceptance           | Jul-14                           | G        | A                     | R           | R           | R               | Nov | Low                            | PSO   | Schedule logic defined and agreed with stakeholders. Capture of uncertainty estimates ongoing (40% complete). Risk identification workshops to be arranged in combination with existing risk register coverage. Forecast completion end Jan.   |
| Mechanical Systems            | Jul-14                           | G        | A                     | A           | A           | A               | Dec | Med                            | IP    | Network structure and logic sound. Uncertainty estimates 95% complete. Risk (threat and opportunity) data sentenced and correlation information captured: both to be incorporated into model. Model simulation run to confirm behaviour. Completion date subject to other activities and priorities.   |
| Electrical Systems & Software | Sep-14                           | G        | G                     | A           | R           | A               | Nov | High                           | PSO   | Logic amendments made to clarify path through network. Uncertainty estimates supported by detailed rationale statements. Additional rationale information being gathered to support risk estimates. Correlation information to be captured and applied in model. Model has been run to establish behaviour. Plan to add control unit to model in next update (Feb 15). |

# Analysis outputs & interpretation: other views



## Summary and LFE

- SRA forecast data supported by auditable evidence
- Identified main areas of uncertainty, threats to delivery and what lay behind them
- Developed and helped implement actions to mitigate risk
- Initiated re-planning of design phase to improve confidence
  
- Focusing on quality of supporting data ensures results can be explained and acted upon
- Actionable recommendations help temper 'bad news'
- Communication process
  - Taking time to review process used helps to establish buy-in
  - Make sure contributors see results first
  - Make sure briefings are limited to those who have a stake in the analysis
  - Identify and develop response recommendations





**QUESTIONS?**