Making an Impact with Your Analysis

And how to spot the opportunity to do so when it happens

Andrew Caldwell

Senior Principal, Defence Science & Technology Laboratory

About the author

- Andy Caldwell
  - 20 years experience in Operational Research
  - 3 of which were in industry, 17 of which in government
  - Worked in UK MOD and U.S. DOD
    - 3 major Defence Reviews
    - 3 major Programme and Budget Reviews or Annual Budgeting Cycles
    - 1 deployment as Scientific Advisor to UK Brigade in Afghanistan
    - Dozens of other studies covering policy, capability and systems issues
  - The examples in this presentation drawn from my own experiences
  - Please note, despite this, I still feel like a beginner…

- This presentation contains the personal views of the author and does not present the official position of the UK MOD

Making decisions, how we'd like it to be

- In an ideal world, designed by OR professionals, senior decision makers would:

- Ask clear unambiguous questions
- Provide sufficient time and resource to answer each question
- Ask questions on topics for which there is good data
- Make their decision after reading the final report in full
- Not be influenced by other factors outside the analysis
- Not have to consider the views of others who may be less well informed
- Provide clear feedback on how the analysis helped them

- BUT…

Making decisions, how it really is

- In the world that OR professionals have to operate in, senior decision makers:

- Ask iterative questions as new information emerges, none of which addresses the whole issue cleanly in one study
- Need the answers immediately
- If there is data that supports the question it is probably badly organised, incomplete and not immediately to hand
- Make their decision when they are ready, not when you are
- Have to consider evidence, deliverability and politics in each decision
- Have to account for other stakeholders' views, whether well informed or not, and are bombarded with data, opinions and ideas, all of which can be presented to them as 'evidence'

Author's Disclaimer

- Decision makers do not necessarily know, even after making the decision, how much the analysis influenced their decision relative to other factors
- In discussing the impact the analysis made I have to make assumptions and deductions about what I believe happened
- Consequently, the views expressed are my own and not intended to diminish in any way the contribution of other professions and advisors who would have also had an influence on the decisions discussed in this brief

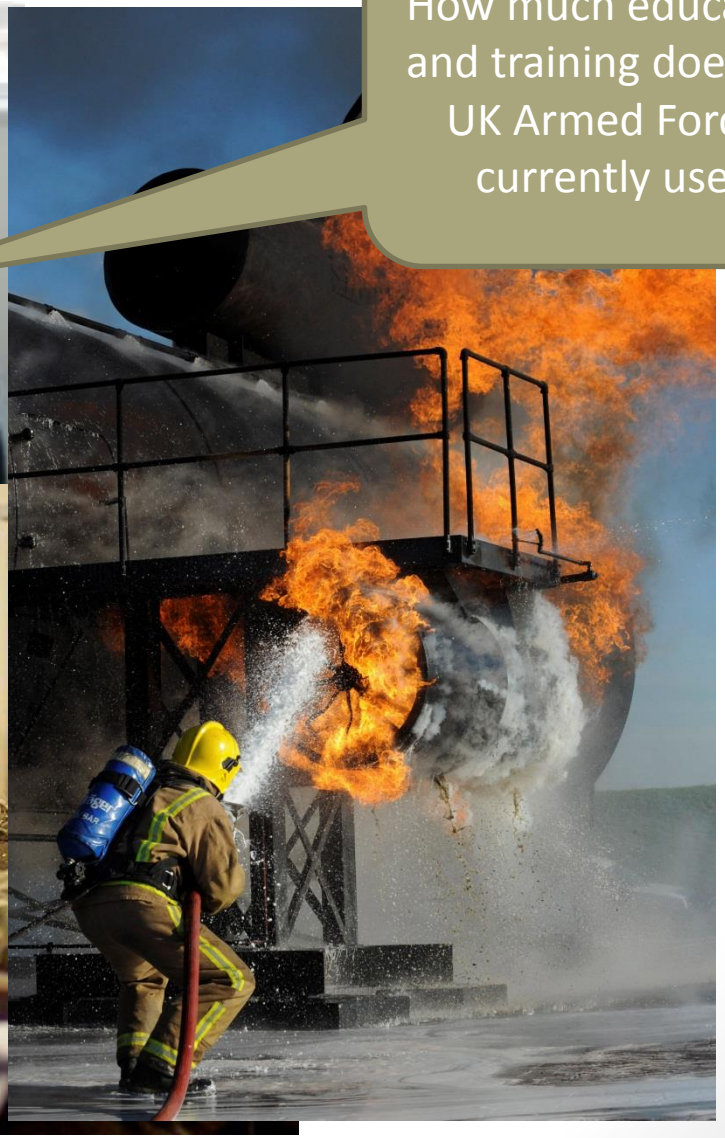
So, what can we do?

- The key to making an impact with operational research is to accept that it can happen at any stage of the project lifecycle
  - You need to be able to recognise when it is happening
  - Be prepared to adapt your approach to make best use of that opportunity
  - Understand how your analysis is used by the decision maker

- Illustrated through three case studies
  - Background to the issue
  - Proposed study method
  - What actually happened and the “decision”
  - How the analysis created an impact

Defence Training Review

How much education and training does the UK Armed Forces currently use?



And how much will it require over the next 25 years?

Case Study 1: Defence Training Review

- Background: Major multi-billion pound project to provide training and education to the UK Armed Forces over 25 years

- Project was in an advanced stage, about 6 months away from the Invitation to Negotiate stage of the process

- Project team had an estimated baseline for current training demand but recognised the assumption that this was constant for the next 25 years was overly simplistic
  - Consensus view across Defence was that training demand would increase to match technology changes in the Armed Forces

- Operational Research team approached to refine the baseline and forecast future training demand

Study Method

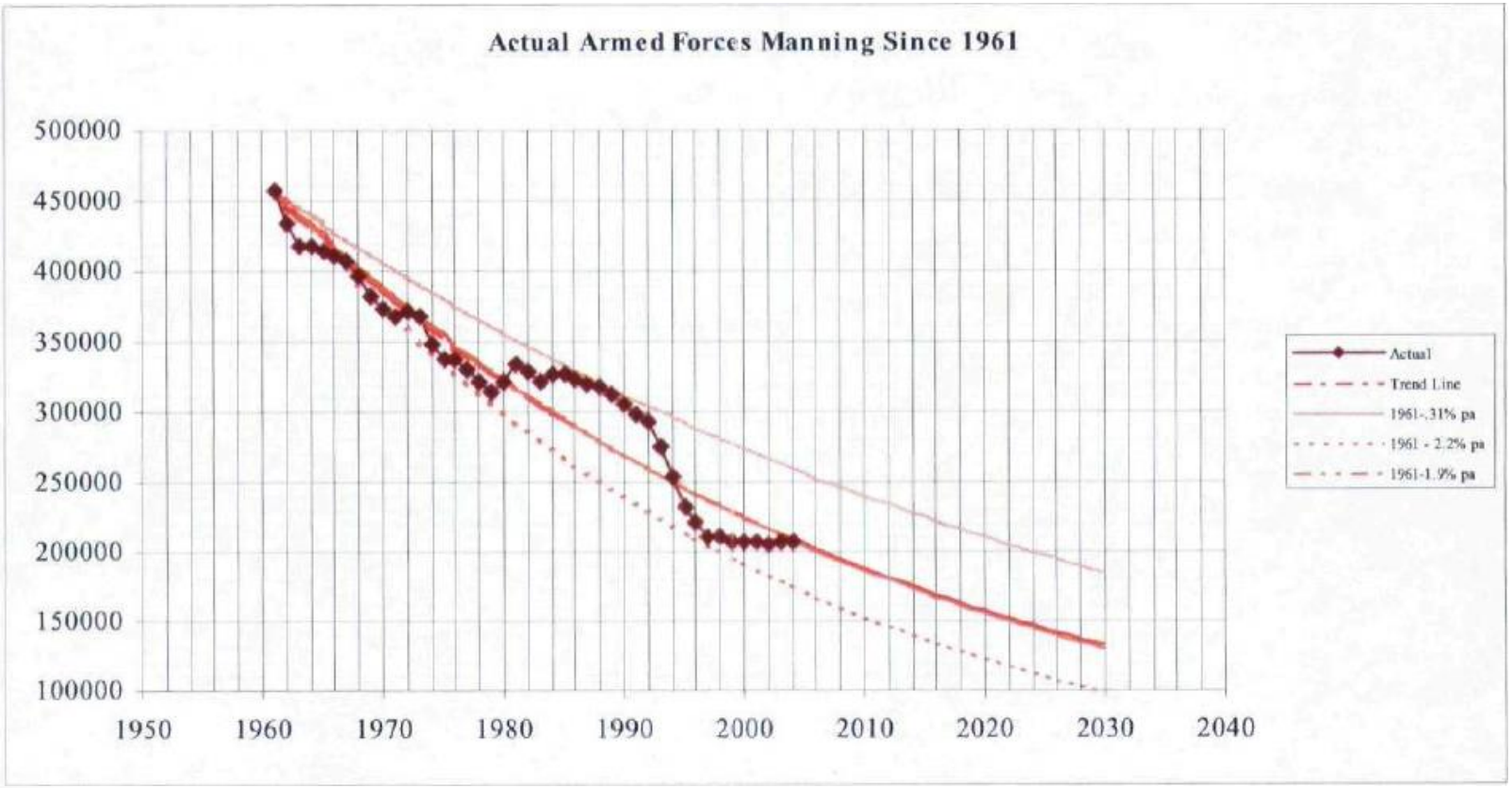
- Baseline training data was located in the six current Defence training colleges
  - Get the data, clean it up and rebaseline current training demand estimate
- Future forecast to use a range of analytical approaches
  - Based on fully manning the Future Force structure
  - Based on historical changes in time available for training
  - Survey of views across Defence that could affect future training demand
- All to be done in less than 6 months

What happened

- Recalculated the baseline, 2.4 million trainee days/annum
- Assessed future demand for training (assuming no strategic shocks)
  - Manning the Future Force structure indicated demand would be steady
  - Historical analysis identified future training demand would decrease
  - Interviews indicated that the consensus view across Defence was that training demand would increase

- Study team reported future training demand would decrease significantly over the course of the 25-year contract
  - Team leader summoned to explain to the six camp commandants about why we had chosen only one possible outcome of the three possible outcomes the study team had identified

This graph caused many discussions



The Decision

- Defence Training Review team accepted forecast that training demand would decline over the course of the 25-year contract
- Bidders responded with innovative proposals, such as selling off college accommodation into the private sector at regular intervals
- Estimated to have removed £1Bn in risk over the lifetime of the contract

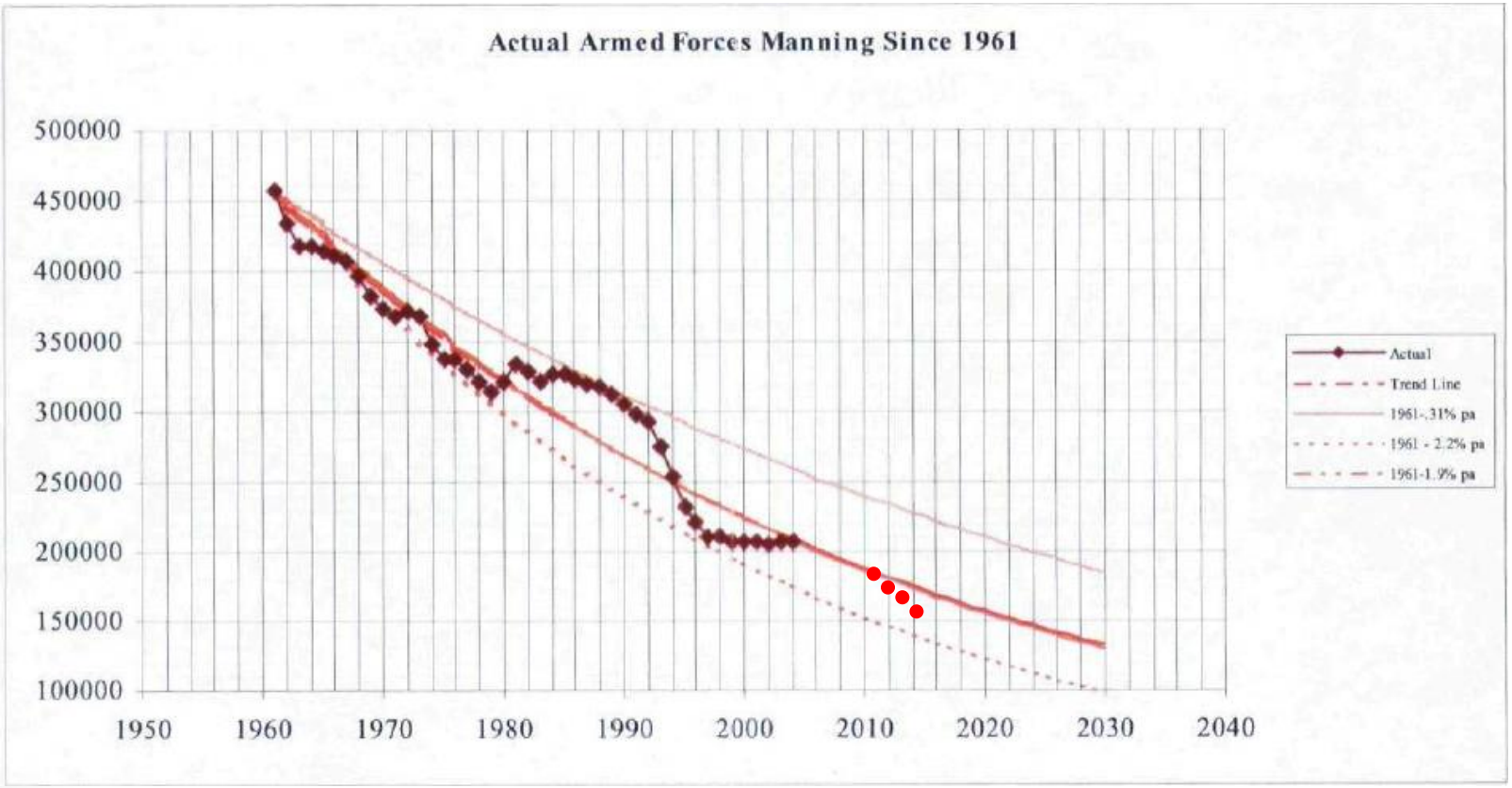
Why the work had an impact

- Investing effort in getting good data and presenting quantitative results based on that data carry significant weight in influencing the decision maker

- Recognising when you have discovered a ‘killer’ fact, chart or piece of information that renders all other arguments and views on the issue largely irrelevant

- Know your facts. The decision maker (and those who may find your analysis inconvenient) will test your credibility, not necessarily the study’s credibility, to determine if they should change their plans

And now 10 years later…



Helmet Camouflage

When did the British Armed Forces go from wearing this?

To this? And how was the decision made and did Operations Research help?

Case Study 2: Helmet camouflage

- Background: Each HQ staff member in Afghanistan involved in the OP HERRICK 14 rotation (summer 2011) challenged by the Commanding Officer to pick one thing to make a difference to for the incoming brigade

- One of the majors in the HQ had significant experience of camouflage and concealment and identified that customisation of helmets did not fit best practice
  - Colour, shape, shine etc.

- In-theatre Operational Research team approached to assess whether helmet modifications were increasing the vulnerability of UK forces

Study Method

- All fatalities and serious injuries are immediately investigated and recorded in the Operational Learning and After Action Reporting System (OLAARS)
  - Examine these for evidence of increased vulnerability
- All Significant Actions (SIGACTs) are recorded and include number of combatants, locations, outcomes etc.
  - Examine these for evidence of increased vulnerability
- Field trials have previously been used to show increased value of different camouflage patterns
  - Draw on previous work
  - Repeat this work with a large scale UK based trial and conduct smaller environment specific assessments in Afghanistan

What happened?

- The was no clear evidence of increased injury risk associated with helmet camouflage patterns from OLAARS
  - Data was insufficient to draw anything more than anecdotal observations
- The same was true for SIGACTs. There was data but not enough detail to show a statistical link to helmet camouflage
- UK based trial could not be scheduled in the time available as higher priority trials could not be displaced
  - Previous trials did show a correlation between some colours and probability of detection (but not the colours we were looking at)
  - And we did get some photographs of the different helmet camouflage patterns in the Afghanistan specific environment

In the end we just had five photographs

Sniper Scarf & Sniper Tape (sunlight)

Sniper Tape (sunlight)

Cam Scrim Patch (sunlight)

Heavy Scrim (sunlight)

Heavy Scrim (shadow)

Decreasing Visibility

The Decision

- Incoming UK Commander for Task Force Helmand received a briefing which included the previous slide and an assessment of deliverability and cost of different options from Joint Force Support HQ's Logistics branch

- Commander decided to amend dress regulations to include use of 'heavy scrim' camouflage pattern. Incoming brigade received the additional materials in their kit bag before deployment

- Has remained UK standard dress regulation ever since

Why the work had an impact

- Admitting you cannot get good data or a clear answer can be as valuable as providing a low confidence numerical result
  - Decision maker now knows their decision needs to be based on other available evidence (and politics and deliverability) and they will confidently do so if you are honest with them

- But, you have to show you've considered all reasonable routes to get an answer through Operational Research
  - We get asked many difficult questions, we only lose credibility if we avoid trying to answer the difficult questions or present false certainty rather than admitting we have not succeeded

- Present your information in a format that helps the decision maker and be aware of how your work may be integrated with other information for briefing up the chain of command

Fuel Tanker Drivers' Strike

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What happened when the tanker driver unions threatened to strike?

And how did Operational Research assist the Armed Forces in preparing to prevent the country running out of fuel?

Case Study 3: Tanker Drivers' Strike

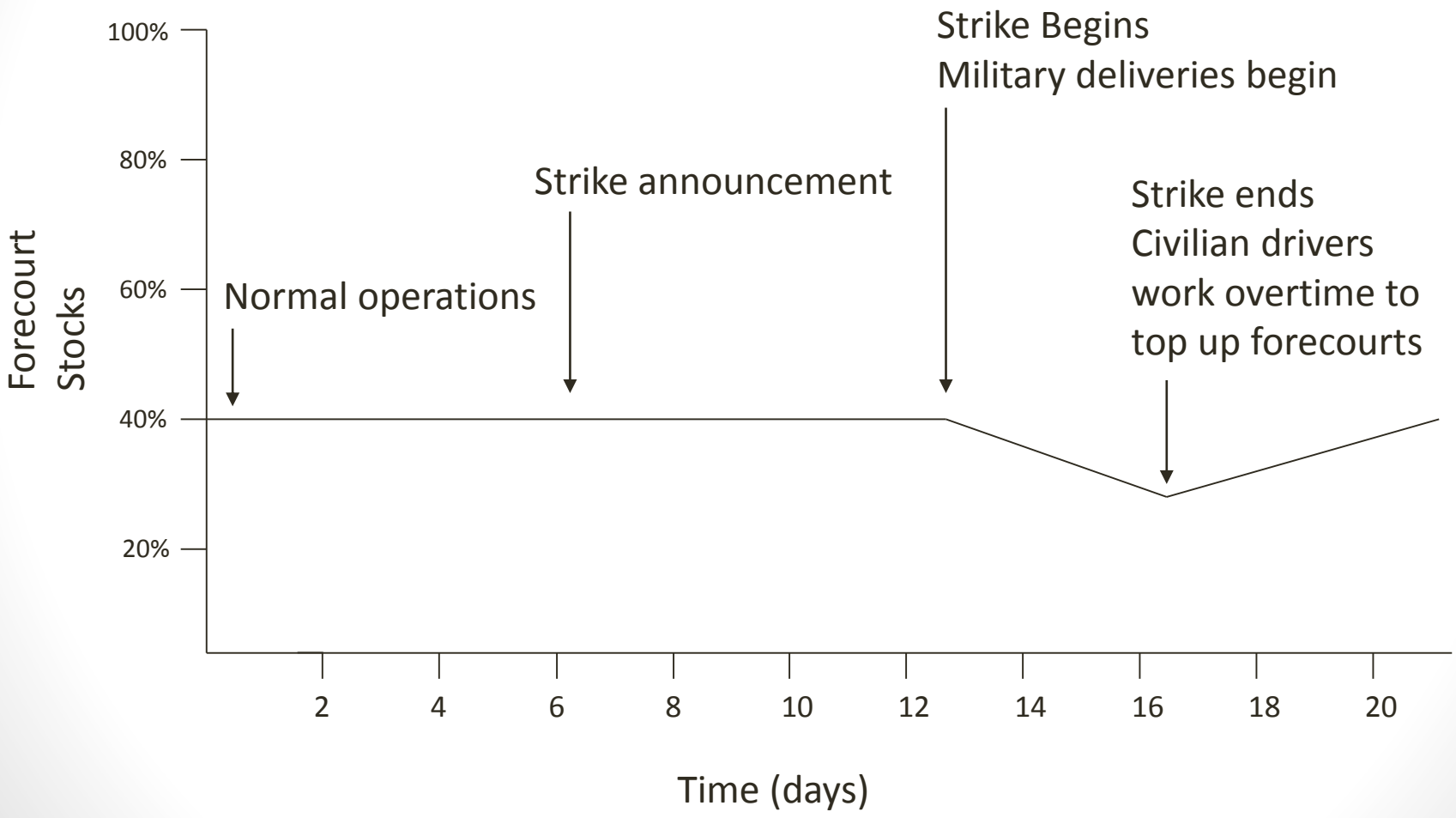
- Background: Tanker Driver unions threaten strike action. Ballot of members a few weeks away and unions have stated that they plan to strike once the ballot is completed
- Significant potential to affect the country
- Contingency planning ordered for military support to deliver fuel in the event of a strike
- Operational Research support requested to optimise military deliveries of fuel
  - Point to Point or Hub to Spoke

Study Method

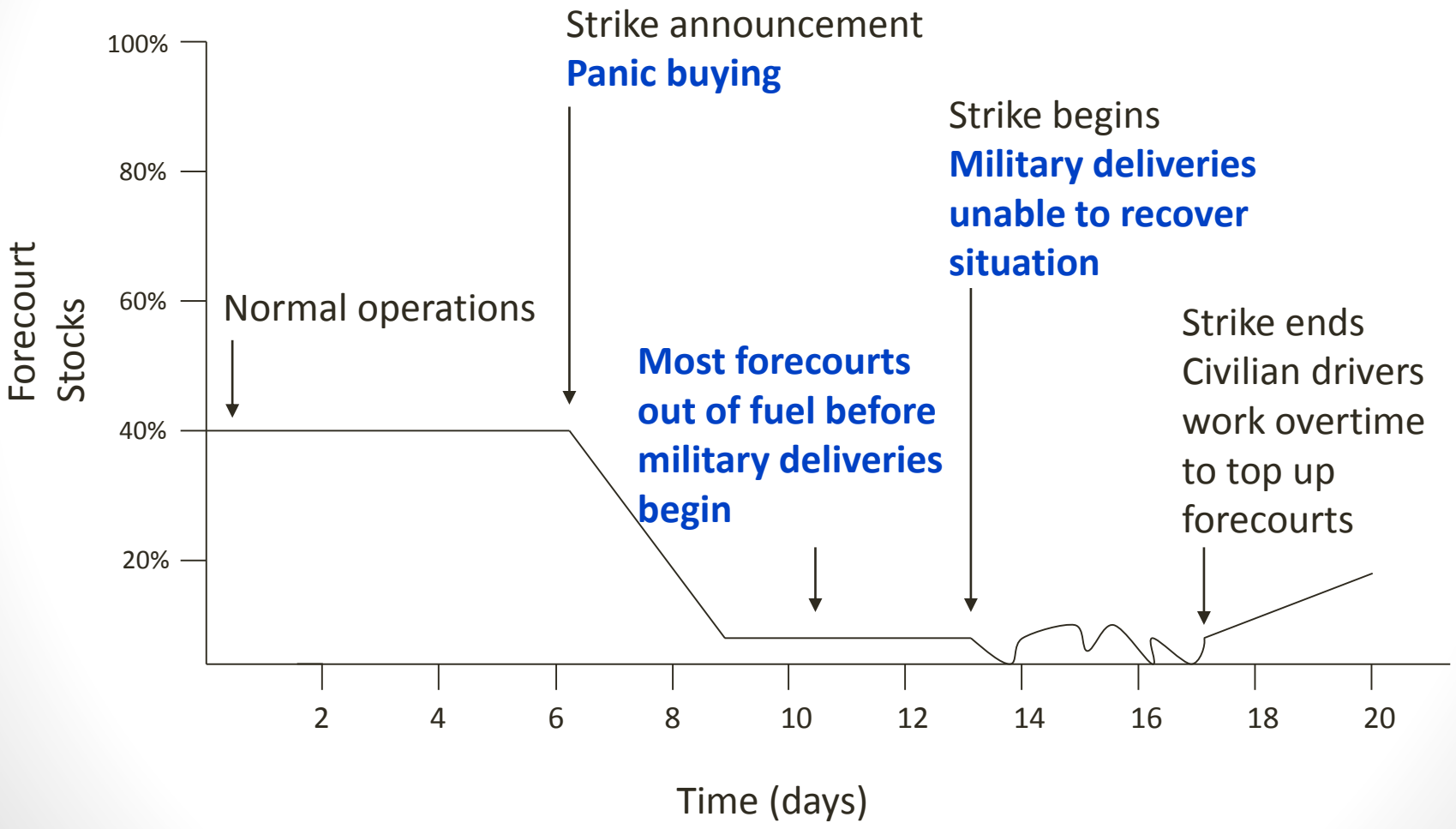
- Build Logistics model to examine efficiency of two proposed delivery plans. Start by collecting data and assumptions to populate the model
- DATA & ASSUMPTIONS:
  - 8,700 fuel stations most of which maintain their tanks at 40% capacity
    - UK forecourt stocks operate just in time with a few days reserve
  - The average car, motorbike and truck has a fuel tank that is 50% full. So if you know how many cars, truc [illegible] out there you can work out the maximum c
  - MOD to maintain supplies during strike period. Cannot achieve 100% of civilian delivered capacity but can get close to that figure
  - Strike assumed to last 7 days
  - Strike action legally requires 7 days notice before it can begin

Killer fact!

Assumed Situation



Possible Situation



What happened?

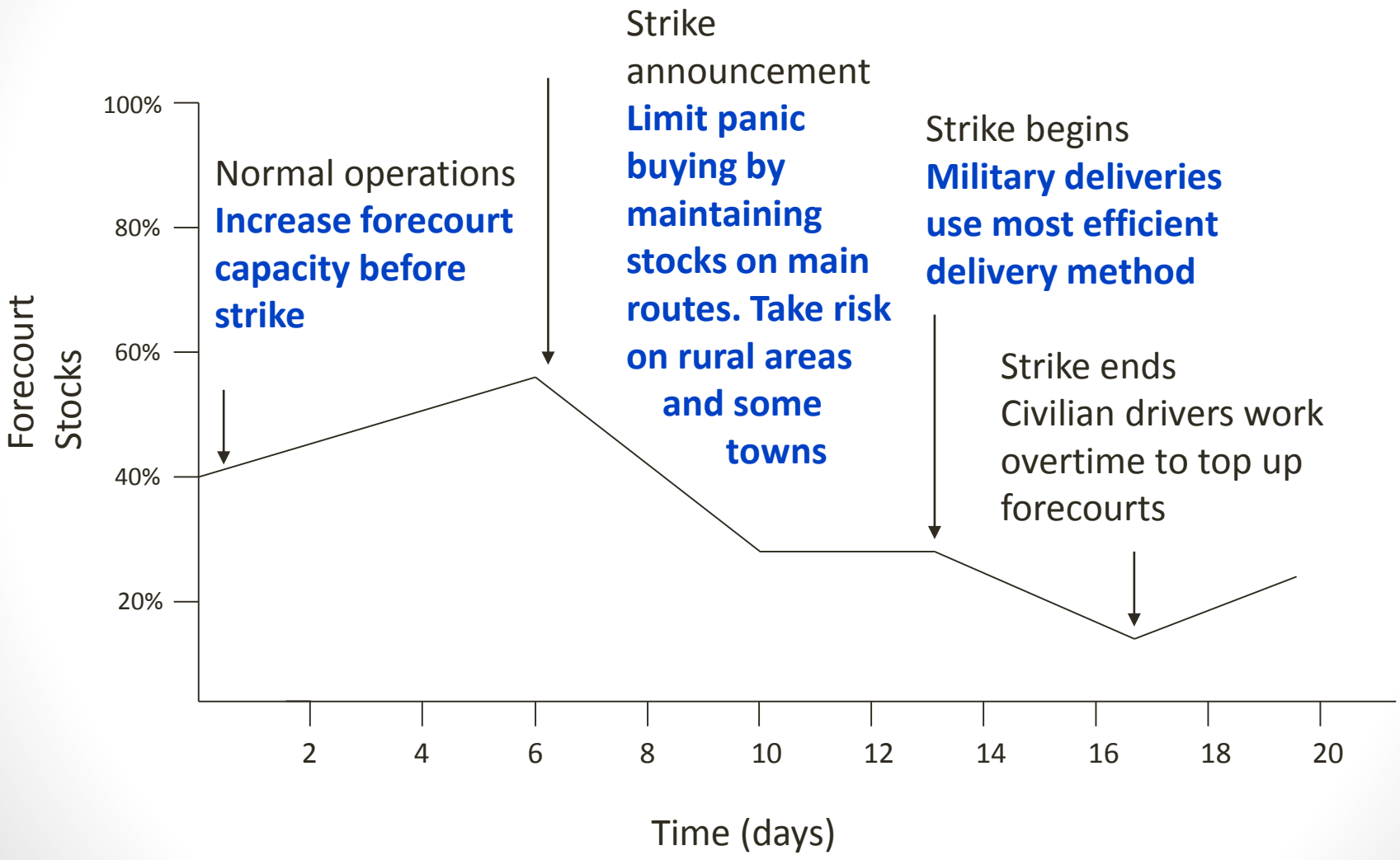
- The observation that the country would be in a crisis before the military contingency plan could be activated changed where the planning effort was focused
  - Everyone intuitively knew this was a problem but it fell in the gaps between different Government departments

- Options were developed to maintain stocks during strike notice period to buy time for the military contingency plan to be activated

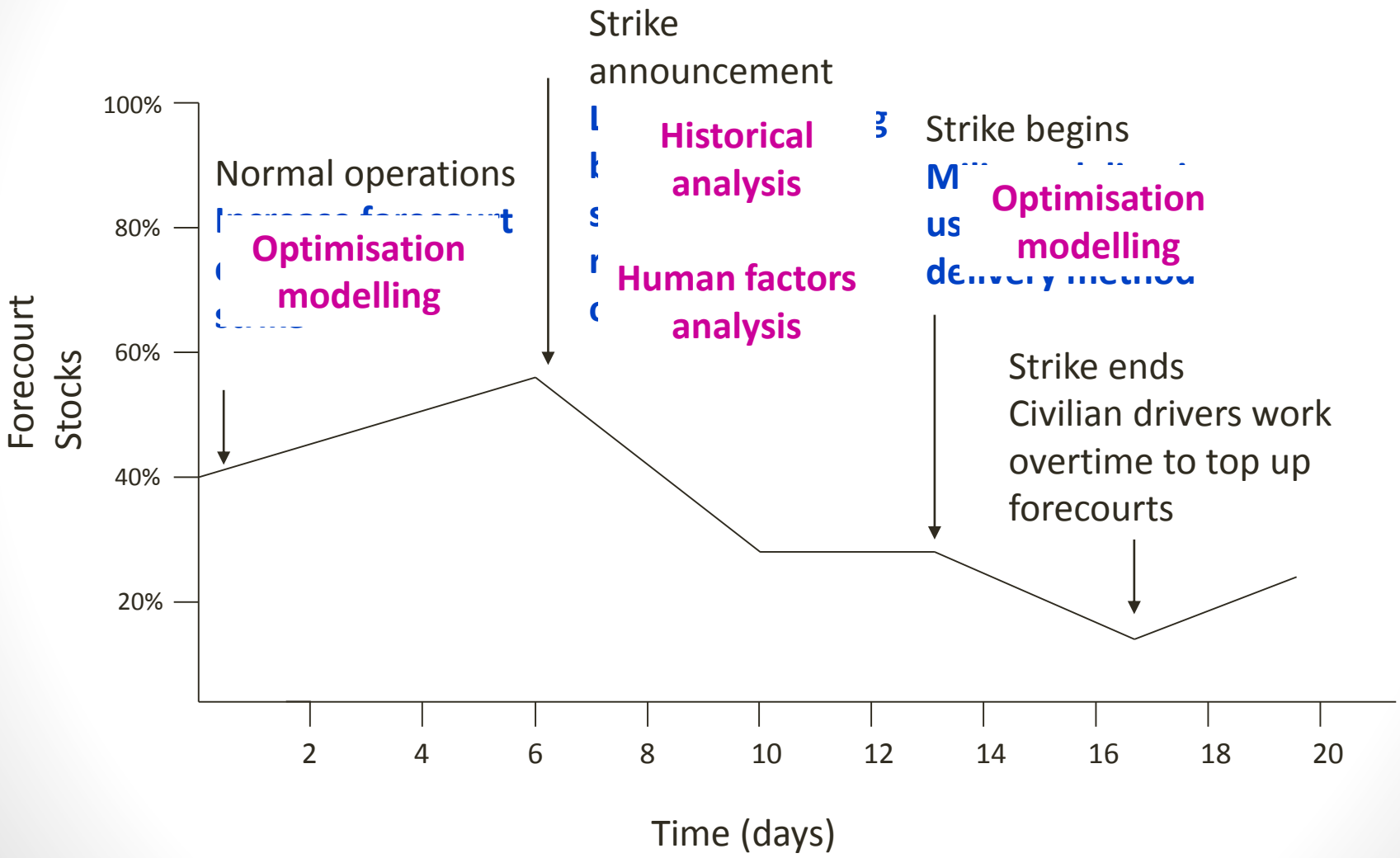
The Decision

- In the end one union voted against the strike, so the plan was never tested but had it been it might have looked like this…

Possible planning adjustments



Possible planning adjustments



Why the work had an impact

- The Operational Research team were not afraid to point out that the starting conditions assumed in the plan were unlikely to occur
  - Were the team being asked the most important question by the decision makers?
- The Operational Research team were able to bring a multi-disciplinary approach to examining the problem
  - Human factors
  - Historical analysis
  - Optimisation modelling
- Independent critical analysis reassured the decision makers as the team was trusted and seen as impartial

Summary – Creating Impact

- Invest time in getting good data and building quantitative results based on that data
- Keep a look out for that the ‘killer’ chart, fact or piece of information that changes everything. Don’t assume others will spot the significance unless you point it out
- That failure to come to a clear answer through OR does not necessarily fail the decision maker if you can explain why
- Multi-disciplinary approach increases confidence in the results
- Don’t assume the question as asked is the right question

Summary – Making the Most of Impact

- Impact can occur on day one of a study (e.g. fuel strike), midway through (e.g. Defence Training Review) or at the end (e.g. helmet camouflage). Be ready at all times!

- Know your facts. The decision maker (and those who may find your analysis inconvenient) are testing your credibility, not necessarily the study's credibility

- Think about how best to deliver the message and make it easy to incorporate your information with other information the decision maker might need to see

- Independent critical analysis reassures decision makers, so ensuring the team is trusted and seen as impartial is important to deliver impact. You build this credibility throughout your career so every study you do will help you achieve impact when it matters most…

Questions?