



# Operational Analysis Support to the Development of the UK's Future C2 Concept

Alan Robinson

Dstl

# Background

- UK's High-level Operational Concept (HLOC) provides the conceptual foundation for UK Joint operations and the development of associated capabilities out to 20 years
- One component of this is the UK's Future Concept for Command and Control (C2)
- To help mature UK thinking on future C2 a senior-level workshop was run in Summer '06

# Structure

- This paper will cover:
- A broad overview and some lessons from the workshop...
- ... and from the subsequent exploitation phase
- A specific human-sciences element of the exploitation work

# C2 Workshop – what it was (1)

- A senior-level event held on 1<sup>st</sup> Jun 06
  - Led at 4\* level
- Designed to address key issues associated with future C2 in an era of Network Enabled Capability
- Attended by hand-picked audience of 1-3\*s
  - There by virtue of what they could personally contribute not due to the post they occupied
  - Attendees were from the Ministry of Defence and from Other Government Departments

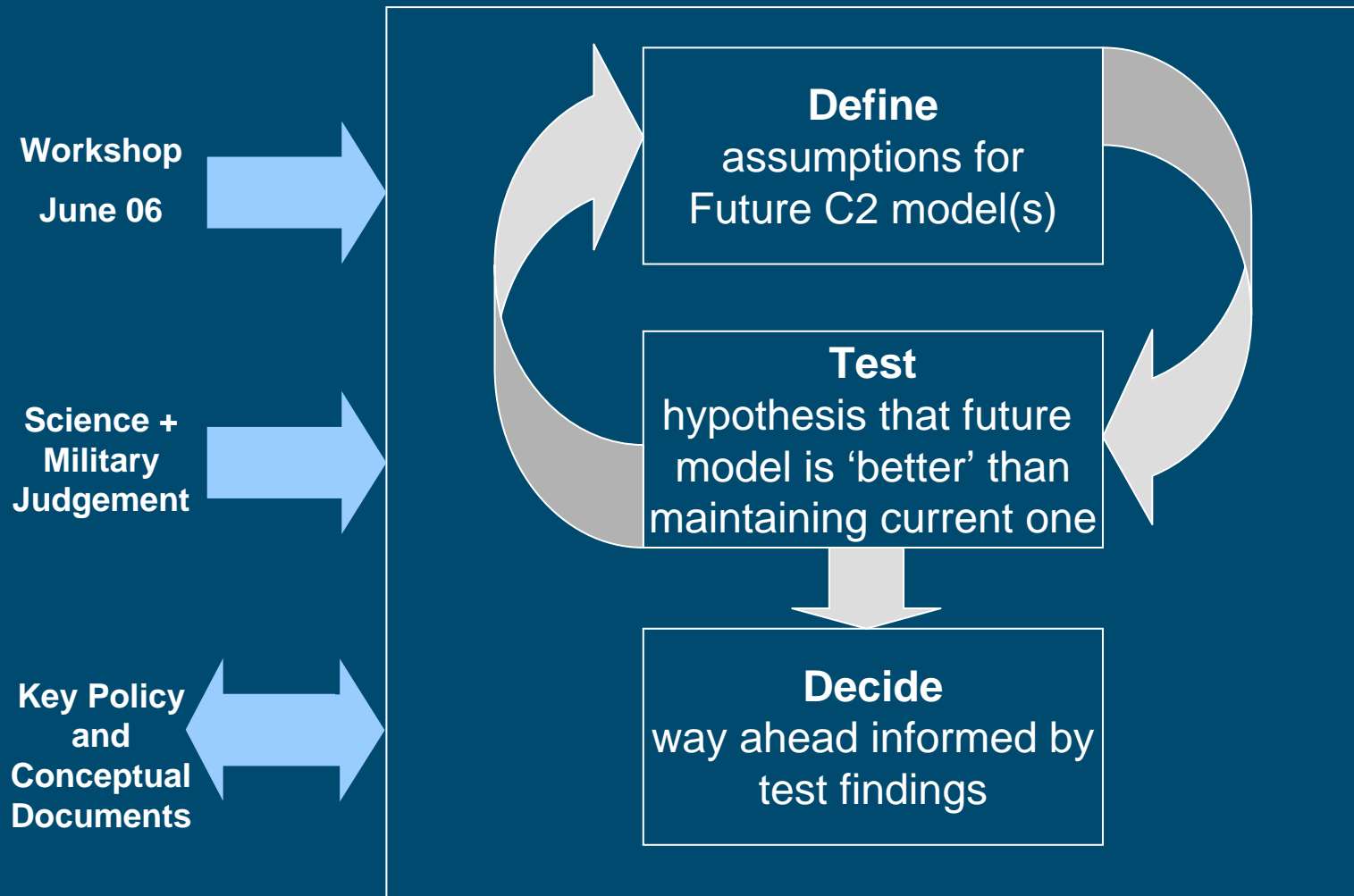
# C2 Workshop – what it was (2)

- Combination of syndicate discussion based around scenarios...
- ... and plenary discussion including e-voting
- Supported by Dstl
  - Planning team led at Director level
  - Support to delivery including e-voting
  - Not facilitation
- Circa 8 months from inception to delivery

# C2 Workshop – why it was different

- High level of senior involvement during planning
  - 20+ hours of 4\* “face-time” !
- Strong desire to not get bogged down in normal staffing processes
- Attendees expected to work!
  - Pre-reading pack with 5 commissioned essays
  - Inclusive e-voting session
- Agreement up front that workshop would provide hypotheses to test
  - Not answers
  - Formal exploitation plan

# Exploitation of Future C2 workshop



# Exploitation Approach

- Identify key questions that needed addressing



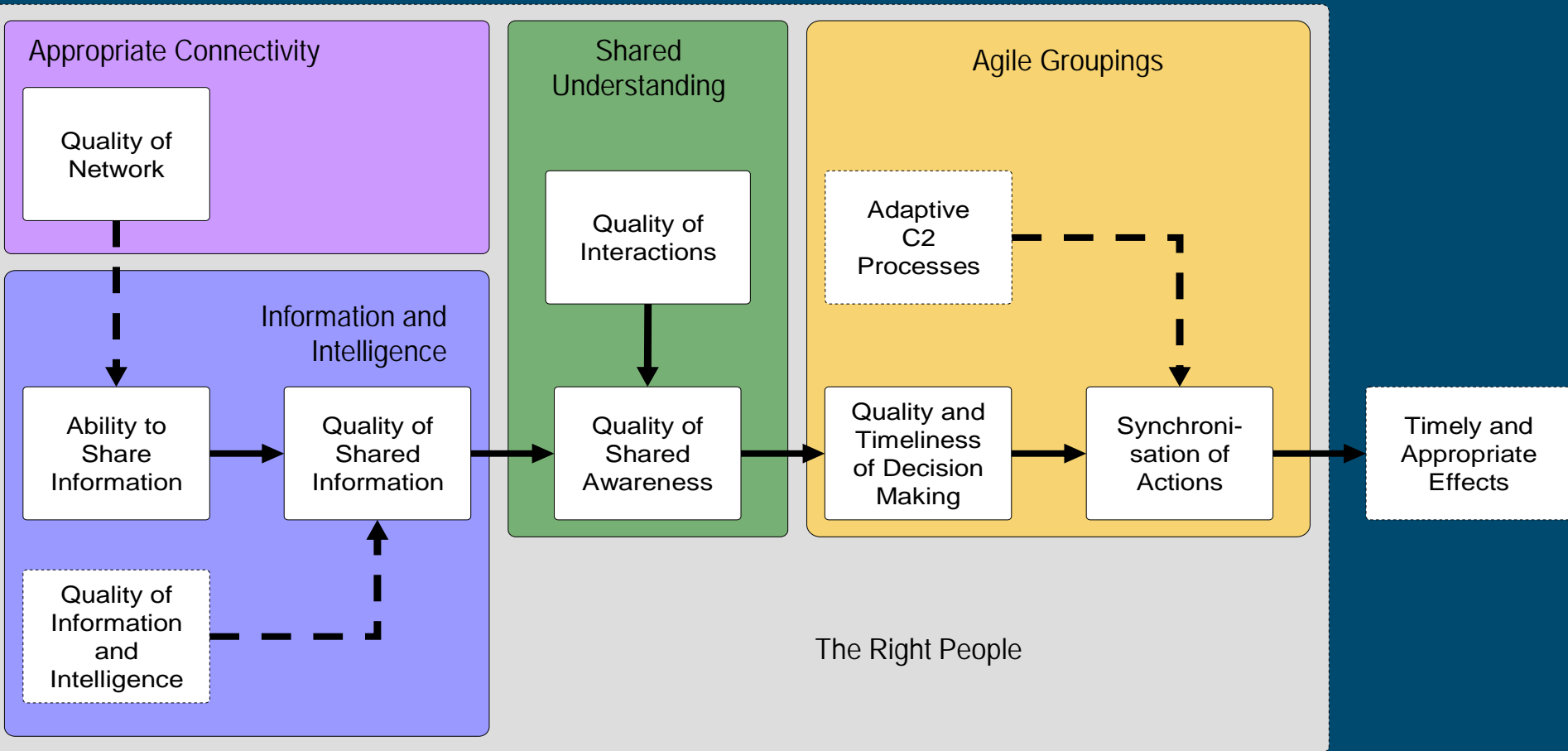
# Some of the key questions for testing

1. Is an alternative C2 approach better in realising military effect than maintaining the current one?
2. How will this impact on overall future force structures?
3. What is the impact on manpower and training requirements?
4. What is the impact on the shape, number and priority of future C4I equipment capabilities?
5. Will the proposed C2 concept allow the military to operate more effectively in a coalition, multi-agency context?

# Exploitation Approach

- Identify key questions that needed addressing
- Construct a set of metrics and a framework of cases that would illuminate the key questions

# Marshalling the evidence: C2 Benefits Chain



# A framework for testing hypotheses

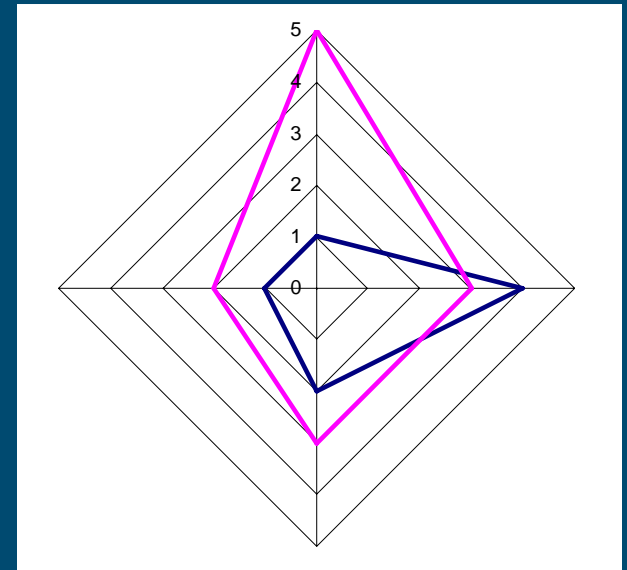
- Four key cases were identified that allowed a broad range of future C2 options to be examined
- Considered the military instrument of power within the context of the overall strategic campaign
- Three core scenarios set in 2020 timeframe and covering the likely spectrum of future conflict

	Commanders & staff co-located (in Joint Operating Area)	Commanders & majority of their staff separated (but in JOA)
Current Model	Case A	Case B
Task-based Model	Case C	Case D

Initial Cases

# Comparing the cases

- Each case assessed in terms of its effect on key measures, including
  - Resources
  - Effectiveness
  - Connectivity demands
  - Situational Awareness of Environment
  - Situational Awareness of Command Intent
- Typically, reporting is relative to the reference case – “Which-report” format
- Pictorial as well as tabular formats used as ways of presenting results



# Exploitation Approach

- Identify key questions that needed addressing
- Construct a set of metrics and a framework of cases that would illuminate the key questions
- Marshal extant evidence
- Undertake new work to fill gaps in the evidence base
  - Bespoke studies
  - Capitalising on other ongoing studies

# Overview of progress to date

- Insights from existing science base of the risks and benefits of the four cases was published in Sept 06
- This was supplemented in March 07 with initial evidence from the testing programme
- Further work currently in hand to continue to provide supporting evidence
- Coordination forum exists to help align associated studies
  - “Studies flying in loose formation”
  - Eg use of coherent products across studies and study roadmaps

	Commanders & staff co-located (in JOA)	Commanders & majority of their staff separated (but in JOA)
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# A Human Factors Component

- One element of the overall programme was a specific piece of work undertaken by the Human Factors Integration Defence Technology Centre (HFI DTC)
  - Led by researchers at Brunel University
  - Used students to play the various roles
- Used a chess-game structure to explore the impact of distributed planning
  - Outline of experimental approach
  - Some illustrative results



# Experimental Design – Players

Commander

Friendly – responsible for “own side”, ie G3

Enemy – responsible for looking at opposition options, ie G2



Not an attempt to work out who were the best chess-players...

... rather an analogue for elements of the military planning process that could be played by students

# Experimental Design - Structure

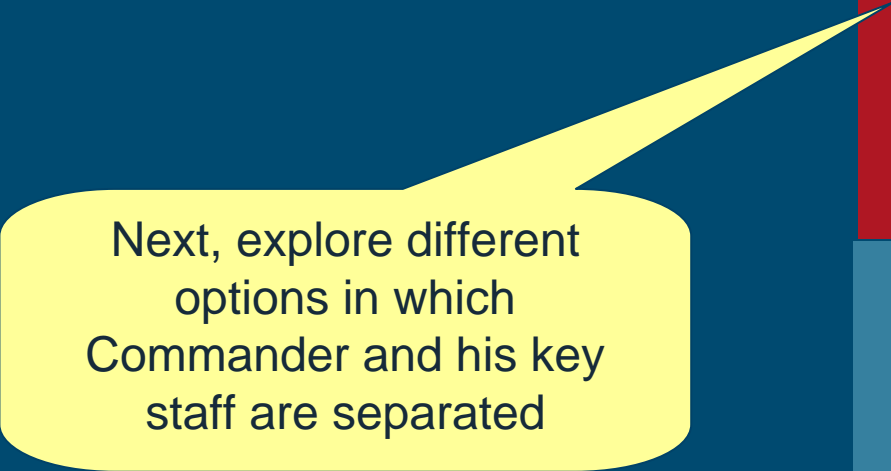
Co-located  
Planning

First play games with the 3-person  
team located together and able to  
interact freely

# Experimental Design - Structure



Commander Remote from...



Next, explore different options in which Commander and his key staff are separated



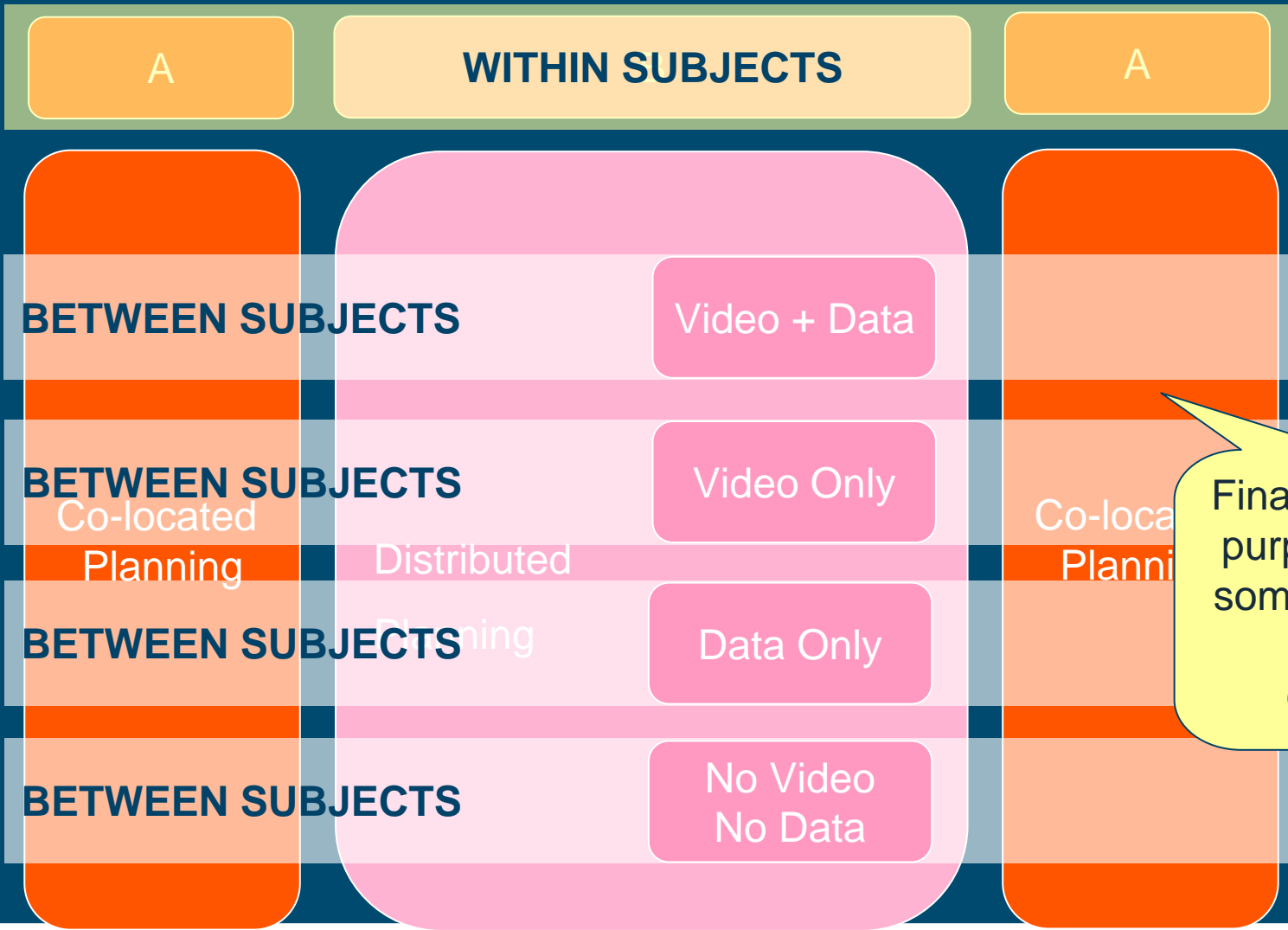
...Planning Staff

# Experimental Design – Separated

- Voice (telephone)
- Data (shared workspace)
- Video (Webcam)



# Experimental Design - Structure



Finally, for control purposes, replay some games with the team colocated

# Participants



108 Participants  
(Total Cohort)



36 Teams  
(Within Subjects Factor  
A-B-A)

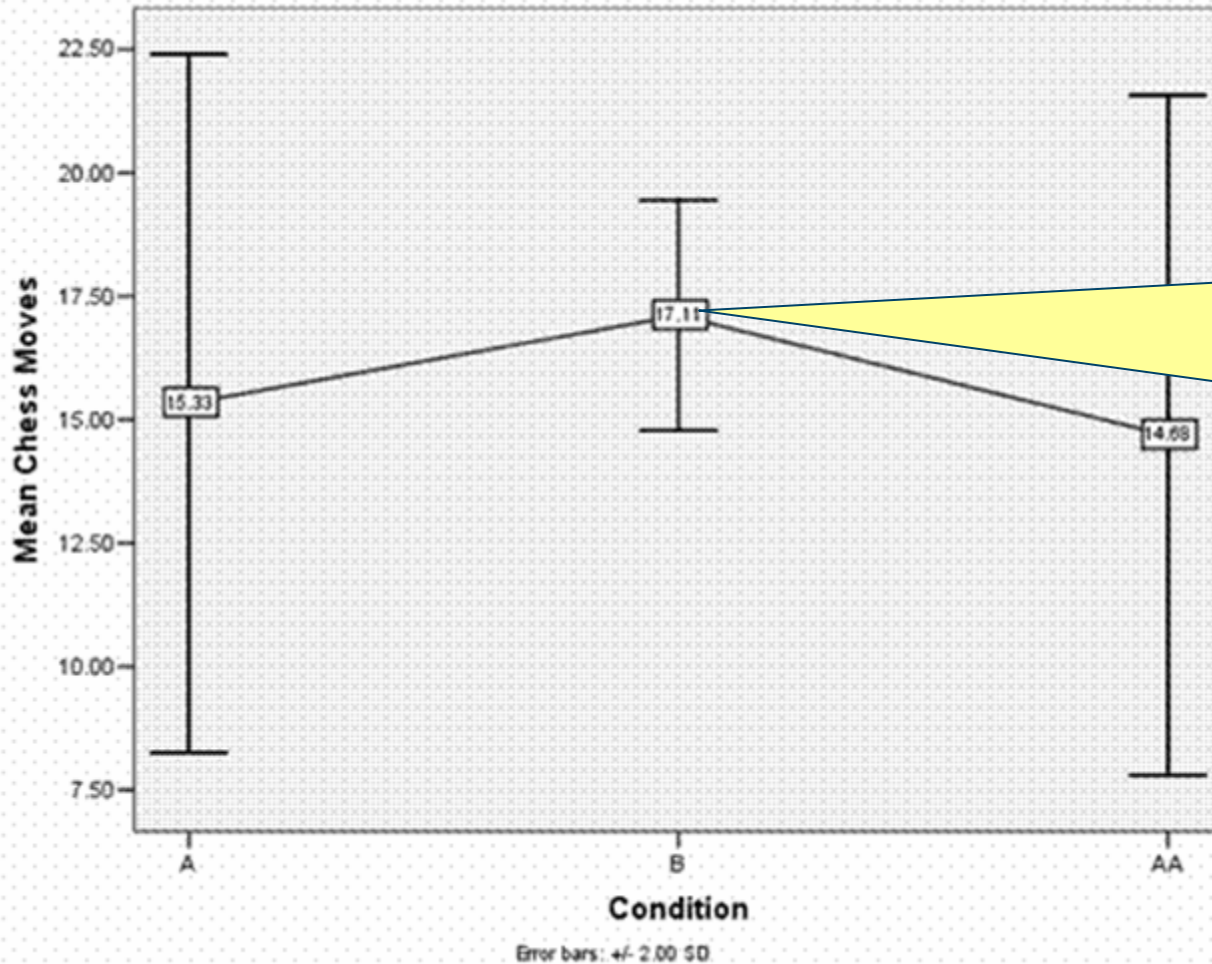


9 Teams  
(Between Subjects Factor  
Technology)

**[dst1]**

**Some Example Results**

# Mean number of Chess Moves



More chess moves made in the distributed planning condition...

...but considerably less variance

Speaks to “efficiency” of the distributed process



# Other Findings

Evidence that comms – quality and content - most affected by availability of lower quality comms

Some evidence that improved transmission of “command intent” and “situational awareness was achieved when players had to be most explicit in their communications

and  
itions

ad was

erent

# Final Comment

- The chess-game was just one piece in the overall programme of work
- Provided an interesting perspective on military C2 issues from a non-standard viewpoint
- Is being followed up via further work

# Questions



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