Team Collaboration Experiment II (TCX2)

SwAF - SAF

LTC (Dr) Peter Thunholm
MAJ Sven-Åke Larsson

LTC Mervyn Cheah
Ms Gwenda Fong
Ms Cheryl Ann Teh
LTC Lock Pin Chew

Overview

- Sweden and Singapore have an ongoing C2 development research collaboration.
- The purpose of this second command and control team collaboration experiment (TCX 2) was to compare 3-level and 2-level integrated mission (frago) planning.
- Participants from Sweden and Singapore formed a Force HQ, an Army Brigade Staff and two Mechanized Battalion staffs and planned two different missions using two different applications of the new Swedish Armed Forces Integrated Planning Under Time-pressure (I-PUT) model, aided by new C2 technology.
- The scenario was a UN peace enforcement operation and TCX2 was part of a larger tri-service demonstration exercise held by the SwAF.

Disposition

- Background and Introduction
- Description of Experiment Methods
- Presentation of Results
- Discussion of Findings

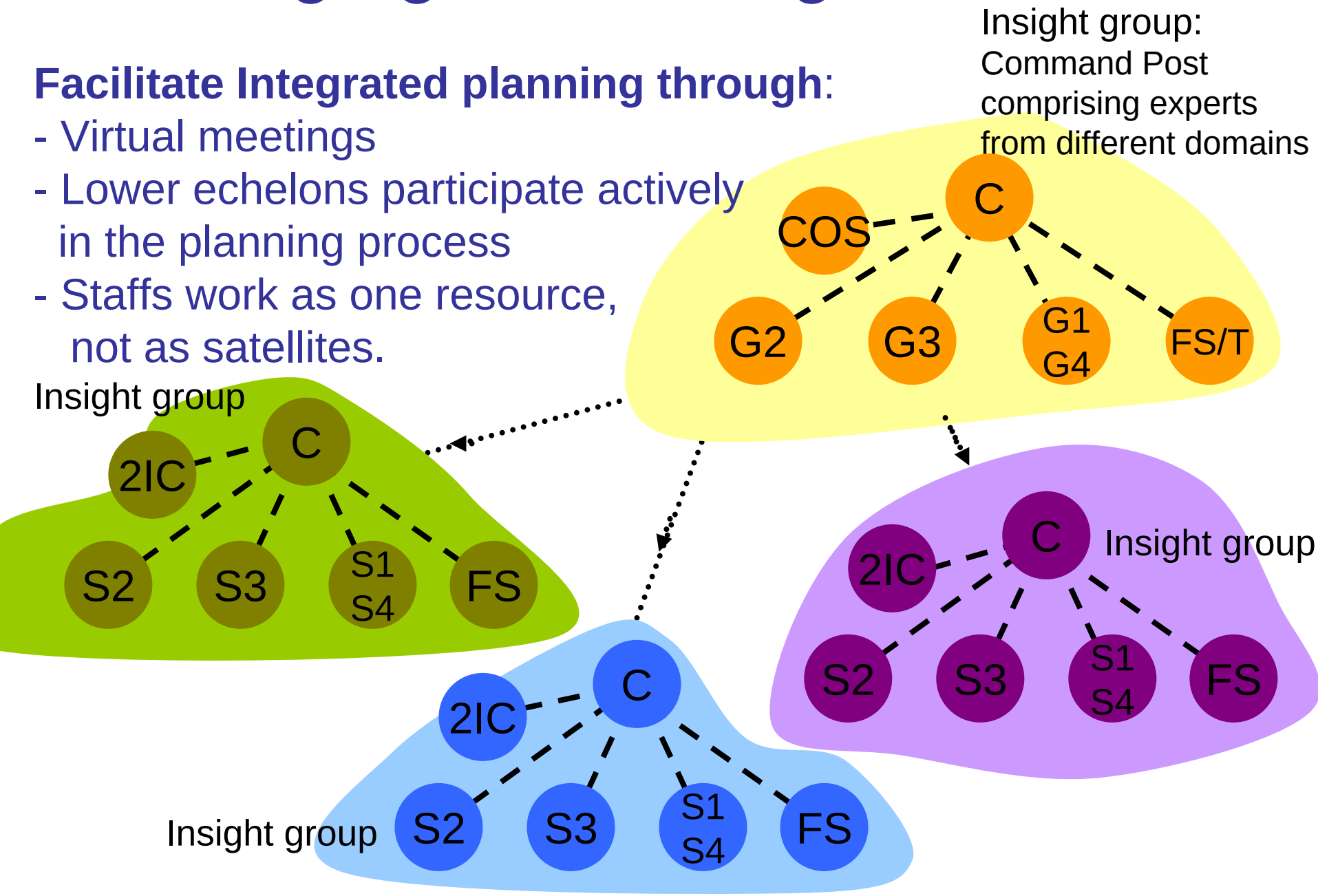
The Problem

- New C2 systems, utilizing the latest advancements in IT (such as high capacity networks), open up new possibilities regarding how to conduct mission planning, yet current staff procedures are not up to date with the new possibilities.
- Although modern army planning manuals prescribe parallel planning they still don’t take full advantage of the fact that distributed staffs can be constantly connected to each other, meet virtually and collaborate the same way as if they were all sitting in the same room.
- Our idea was that if we conceptualize hierarchical staff work in a new way, and integrate it more, we could win precious time for execution and increase the level of mutual understanding among different levels of command.

Challenging Old Paradigms

Facilitate Integrated planning through:

- Virtual meetings
- Lower echelons participate actively in the planning process
- Staffs work as one resource, not as satellites.



Benefits of integrated planning

- Compression of planning cycle. Extra time resource invested in various ways:
  - More time for contingency planning
  - More time for preparations at lower echelons
  - Earlier start of execution
- Achieve higher degree of common ground between echelons in understanding commander's intent as well as developing situation and enemy intent.
  - Through increased opportunities for alignment of command intent via externalisation of implicit intent, and dialogue to share explicit intent (Pigeau and McCann, 2000)
- Reduction of higher echelon staff.

  - Through better integration with lower level staff

Stretching the bounds

- Current field manuals prescribe 2-level integration but we wanted to try integrated planning across 3 echelons (i.e. FHQ-Bde-Bn)
- Conditions under which 3-level integrated planning would work:
  1. Sub-units at the lowest level (Bn) are familiar with the ground situation.
  2. Not too many sub-units involved.
  3. Participants have a mandate to decide.

Hypotheses

- 3-level integration, as compared to 2-level at a time integrated planning, would result in:
  - Faster planning, i.e. shorter time to issue Bn Frago (H1)
  - Higher sense of plan confidence (H2)
  - Bn Cmd's would have better and earlier understanding of Force Commander's intent, and vice versa (H3)
  - Bn Cmd's would have higher commitment to the plan (H4)
  - More divergent views expressed during planning (H5)

  - We also expected that the process would be perceived as more effective (H6)

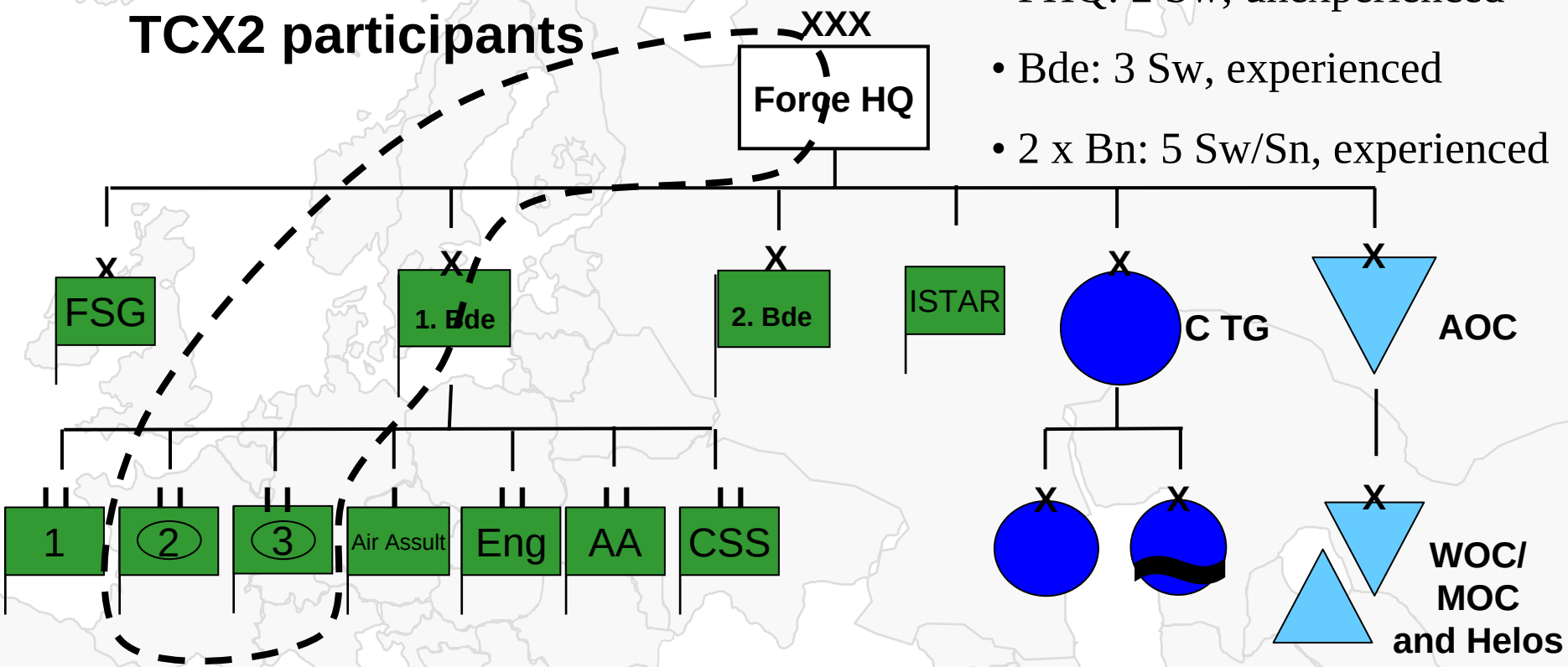
- We did not, however, expect any differences in plan quality (tactical content, clarity, and completeness of plan)

Method - Scenario

- We used the international PK/PE exercise, Viking 2005, scenario
- Post civil war
- Two ethnic groups divided by a ZOS
- Minority enclaves embedded in each territory
- The Multi-national force deployed mainly in the ZOS
- Scenario 1: Silence a large and defended artillery unit firing on a minority enclave.
- Scenario 2: Prohibit expected ethnic cleansing, supported by regular faction forces

Participants - Order of Battle (ORBAT)

- FHQ: 2 Sw, unexperienced
- Bde: 3 Sw, experienced
- 2 x Bn: 5 Sw/Sn, experienced



Plus a lot of Response Cells acting as companies and as OHQ

400 participants from all services of SwAF
A SG Bn staff invited to take part

Method - Task

- FHQ and Bde to develop CONOPS,
- Bn to develop FRAGO consisting of:
  - Situation (enemy forces, own forces)
  - Mission
  - Execution
    - CONOPS
      - Commander’s Intent
      - Endstate
      - Criteria for Success
      - Phases and timings
    - Tasks
    - Fire Support
    - Coordinating instructions
  - Combat Service Support
  - Command and Control

Method - Design

- **Experimental design**, **Independent variable** was the application of the I-PUT planning model:

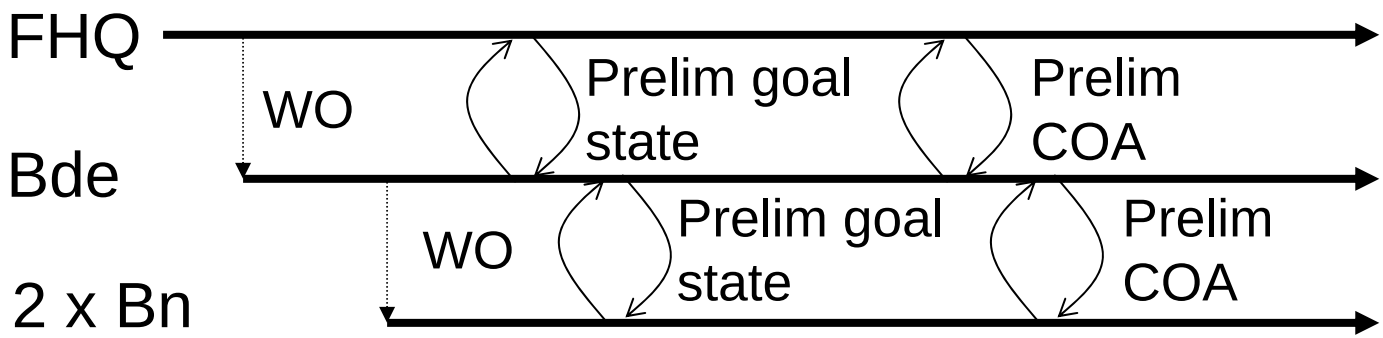
  Condition 1: **I-PUT model applied two levels at a time** (FHQ-Bde and Bde-Bn). Higher levels to “think ahead” and develop a draft for dialogue before interacting with subordinates.

  Condition 2: **I-PUT model applied with all three levels integrated** (FHQ-Bde-Bn). Focus is for the HHQ to support the Bn’s in their production of Bn orders.

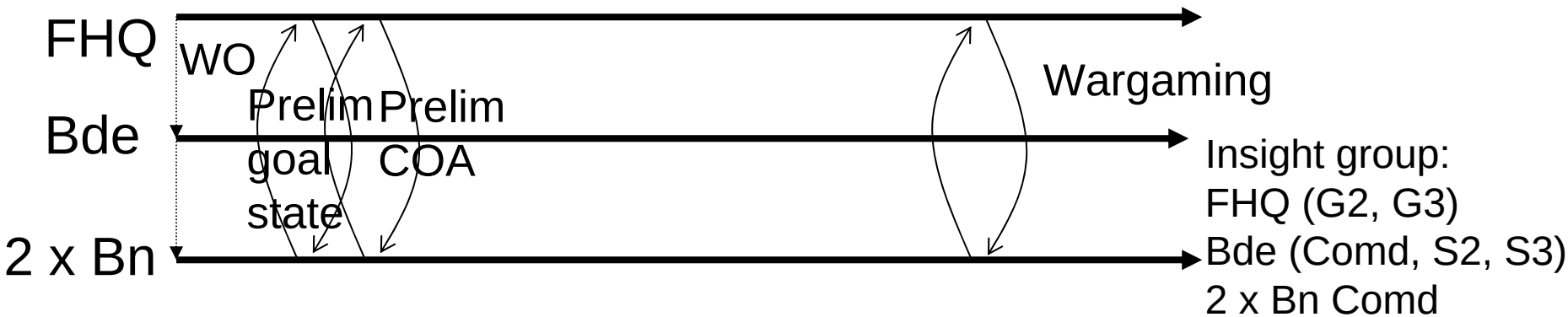
- Study design included:
  - Formal training (3 days) on I-PUT planning model and C2 system
  - 2 runs , each comprising planning and execution
- Possible learning effects between runs mitigated by:
  - Applied scenario-based training session (3.5 or 1.5 days) prior to Run 1
  - Familiarisation of survey questions prior to Run 1
  - Slight increase in complexity of scenario for Run 2

Method - I-PUT applications

Condition 1: I-PUT planning with 2 levels interacting at a time, each level to "think ahead" before interacting with subordinate level



Condition 2: I-PUT planning with 3 levels interacting at a time, no "think ahead" => engage in discussion without preconceived mental commitment



Method - C2 System

- Swedish Demo System Generation 2 (DSG2) applications used to facilitate experiment

- Collaboration was facilitated by:
  - Communicator (chat and video/audio conferencing)
  - X-lite (telephone conference, operational net)
  - Portal (file management)
  - Ground map and tactical drawings

Method - Measures

- Background variables
- Confounding variables
  - realism of scenario
  - system failure
- Dependent variables
  - planning and execution tempo (observer protocol)
  - plan confidence (survey at end of each run)
  - mutual understanding (survey given twice during each run)
  - commitment (survey given twice during each run)
  - dissent (survey given twice during each run)
  - planning model application and evaluation (observer protocol + survey at the end of each run)
  - plan quality (survey at end of each run and independent raters)

Results - Manipulation check

- The manipulation worked! The scenario was considered sufficiently realistic regarding:
  - the story
  - amount of information provided
  - amount of time provided for planning
  - level of uncertainty in the scenario
- No difference between runs, except for realism of story (higher for Run 2). This was probably due to our effort to make Scenario 2 more complex (to counteract maturation effects from Run 1).
- A few minor system failures were reported during the runs, but these did not impact the team's ability to plan. No confounding effect on the results.

Results - Planning & Execution tempo

- Substantial differences between the two runs:

	Interaction on End-State	Interaction on CONOPS	Issue of FRAGO
Run 1 (2-level)	1 hr 45 min after game start (Bde-Bn)	3 hr 45 min after game start (Bde-Bn)	Average of 6.67 hr
Run 2 (3-level)	45 min after game start	Prelim: 1 hr 45 min after start Update: 3 hr after game start	Average of 3.87 hr

- Execution tempo also affected (readiness to march, send out reconnaissance):
  - Run 1: execution commenced 4 hours after game start
  - Run 2: execution commenced 1 hour after game start
- ✓ Hypothesis H1 on less time needed for Bn to produce FRAGO in 3-level planning

Results - Plan Confidence

- Participants rated their plan based on 6 factors:
  - tactical solution
  - feasibility
  - thoroughness
  - necessity of accomplishing mission as the team intended it
  - ease of convincing a subordinate commander
  - ease of convincing a superior commander
- Participants were on average quite confident:
  - Run 1 Mean between 3.07 - 4.86
  - Run 2 Mean between 3.50 - 4.86
  - No statistical difference!
- ✗ Hypothesis H2 on 3-level planning resulting in higher plan confidence
  - Perhaps should have taken measurement directly after plan was finalised and not after execution...

Results - Common Ground

- Free text responses used to compute indices:
  - Understanding of plans developed one/two echelons up/down
  - Confidence level regarding understanding of plans one/two echelons up/down
- No difference between 1st and 2nd probes in each run, perhaps because:
  - coarse resolution of scoring based on 3-4 main points, &
  - intent and CONOPS did not change much during planning
- 3-level planning resulted in higher understanding of plans one & two echelons up/down during 1st probe, as well as higher confidence levels associated with understanding the plans two levels up/down
- No difference in final degree of understanding
- Hypothesis H3 partly supported (*faster*, but not *better*)

Results - Commitment

- State of plan development:
  - Significant differences across 1st probe of both runs (M_{Run1}=2.47, M_{Run2}=3.93, p=0.002)
  - No significant difference between 2nd probes
- Commitment to plans:
  - Significant differences across 1st probe of both runs (M_{Run1}=1.87, M_{Run2}=3.33, p=0.005)
  - No significant difference between 2nd probes
- ✓ Hypothesis H4 on higher commitment to plan at an earlier stage
- Caveat: flipside of commitment is a potential lack of flexibility to adapt to sudden changes
- Probe on feasibility of changing plans given time pressure did not indicate any more/less willingness to change their plans in either experiment condition

Results - Dissent

- Participants did not report any differing views of the team's plans at each survey across both runs
- As a surrogate measure, the survey also asked them to assume a hypothetical divergent view, to assess their willingness to influence the team:
  - Willingness to raise differing views decrease over time for both experiment conditions
  - No significant difference across experiment conditions
- ✗ Hypothesis H5 on more divergent views:
  - no difference in terms of amount of dissent raised
  - no difference in the willingness to influence the team to adopt divergent views

Results - I-PUT evaluation

- Command teams applied the quick I-PUT model
  - COA identified very early in the process, after prelim end-state was developed
- Condition 1 (2-level at a time):
  - interaction was rather one-way because higher HQ directed to “think ahead” before engaging with lower HQ
- Condition 2 (3-levels at a time):
  - seldom a really free discussion. FHQ/Bde presented ideas, with Bn providing some comments
  - the command team at each echelon formed a stronger team than did the integrated team across echelons
  - the integrated team did, however, interact during a formal wargaming conducted based on the Bde CONOPS
  - rated as more efficient and effective under realistic field conditions

Results - I-PUT evaluation

- ✓ Hypothesis H6 on 3-level application of I-PUT more effective for a scenario with:
  - not many units involved in planning
  - overall situation that is well-understood
  - experienced commanders and staff participating in planning
  - urgency to issue orders
- Advantages of integrated planning vs traditional planning:
  - saves time for earlier start of execution
  - better understanding at the LHQ of the HHQ commander's intent; better mutual understanding
- Disadvantages highlighted:
  - interaction with HHQ may hinder LHQ CO from executing an ongoing task
  - demands experienced commanders for useful integration
  - pressure on Bde Comd to come up with COA so Bn can start planning

Results - Plan quality

- No statistical difference between runs regarding plan quality, which is in line with expectations
- Bn staff were quite satisfied with their FRAGO's as rated along the dimensions of tactical content, clarity, completeness (Mean between 3.55 - 4.67)
- SME rated the plans in a similar manner
- Overall, participants found their plans to work well during execution, except
  - 2-level planning was deemed to have insufficient amount of discussions on what might go wrong as compared to 3-level planning
  - This was also supported by observer protocols

Discussion

- Main findings:
  - Crucial for Bde and Bn to develop intent and end-states of FHQ earliest possible to enable quick start of execution. 3-level integrated planning achieves earlier alignment of mutual understanding and higher confidence about that understanding, thus allowing quicker completion of plan by Bn HQ, as well as commitment to plan early on in the process.
  - Command teams had little trouble applying the I-PUT planning model which is a simplification over traditional planning models, and in fact, further simplified the model and still produced orders of good quality. This is in line with previous studies on military planning (Cheah et al 2005; Schmitt & Klein, 1998; Ross et al 2004; Sirret et al 2004)

Discussion

- Comments on anticipated results that did not materialise:
  - Level of mutual understanding was expected to be higher given 3-level planning because of increased communication, but this was not so. Perhaps it is good enough that it was attained more quickly. Oral communication perhaps doesn't contribute to a higher level of mutual understanding as compared to a formal written CONOPS. Similar findings by Thunholm (2005). Perhaps oral communication would add value when the task/CONOPS is really complicated and not easily understood in written form.
  - Plan confidence was expected to be higher in 3-level planning, but this was also not the case. The team did not engage in a lot of free discussion, perhaps bounded by matters of training, habit, and unfamiliarity with the other team members?

Discussion

- We believe that our findings should be able to be generalised to other FRAGO development situations
- Implications for future military planning situations:
  - 3-level integrated planning can work in the right context and conditions
  - Perhaps there will not be a need for written orders above the Bn level. The ability to interact across hierarchy and space will enable LHQ staff to be viewed as an extension of HHQ.
  - 3-level interactions will also increase the ability to exercise mission command, given better mutual understanding two echelons up the command chain early on in the planning process.
- Future studies to evaluate:
  - Conditions that suit 2-level vs 3-level integrated planning
  - Can 3-level planning be applied to initial mission planning as well, if the Bn HQ took on staff functions within the Bde HQ?

Questions?