The Emergence of Team Sector Management Strategies

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Overview

- Background on Shared Mental Models
- Research Question
- Experimental Platform
- Research Hypothesis
- Method
- Results
- Conclusion

Shared Mental Models

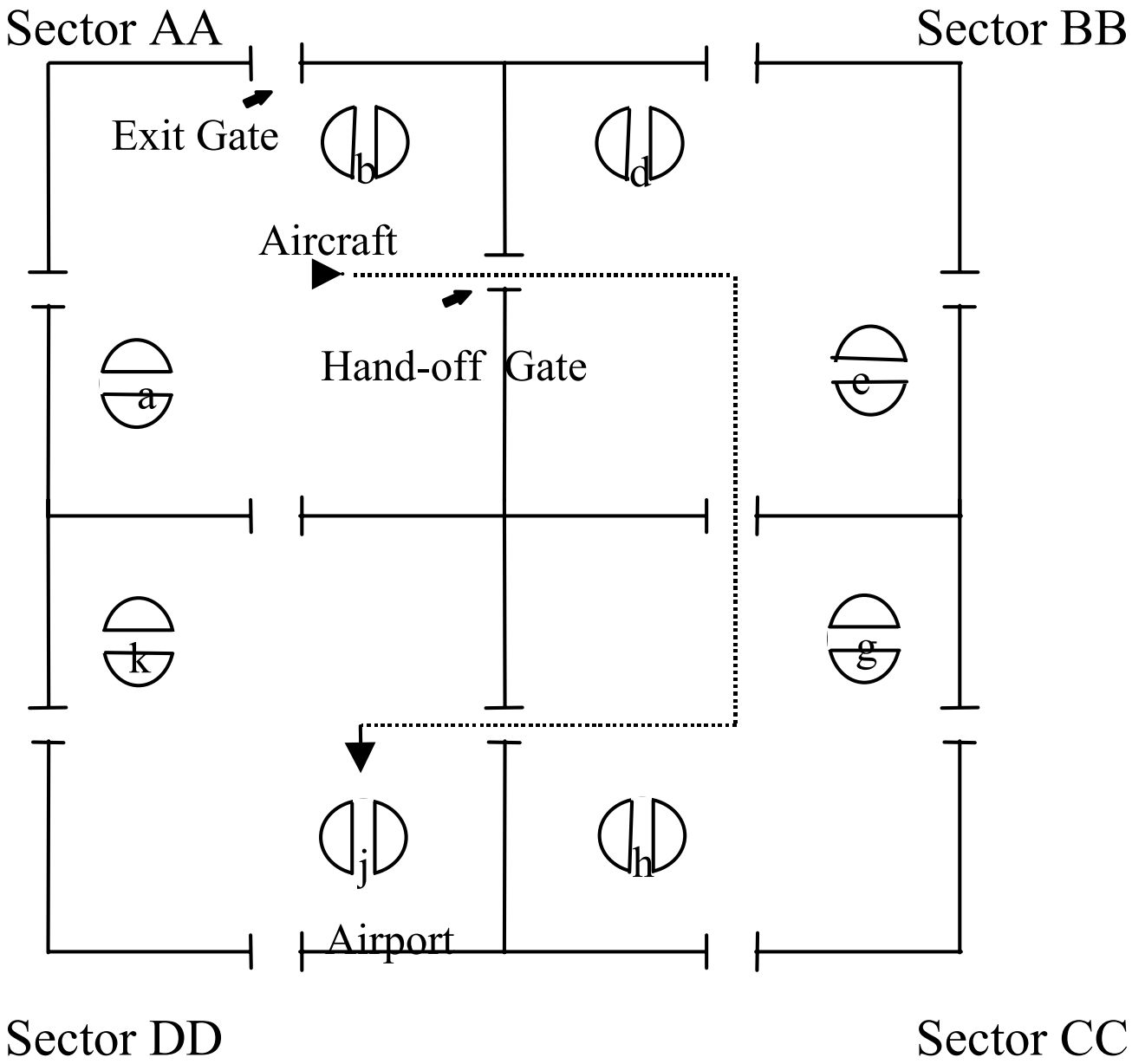
- Common set of set of expectations about what will happen in a mission
- Expectations include:
  - Time sequencing of events
  - Tasks to perform
  - Coordination of individual effort

Research Question

- Research suggests that shared mental models are necessary for effective team performance.
- Do teams with more complete shared mental models outperform teams with less complete shared mental models?

Experimental Platform

- Simulated multi- sector Air Traffic Control (AAT) radar environment
  - Extension of single sector air traffic scenario test
- Participants work as a 4-person team
  - Control traffic within their airspace and coordinate the transfer of aircraft among team members.

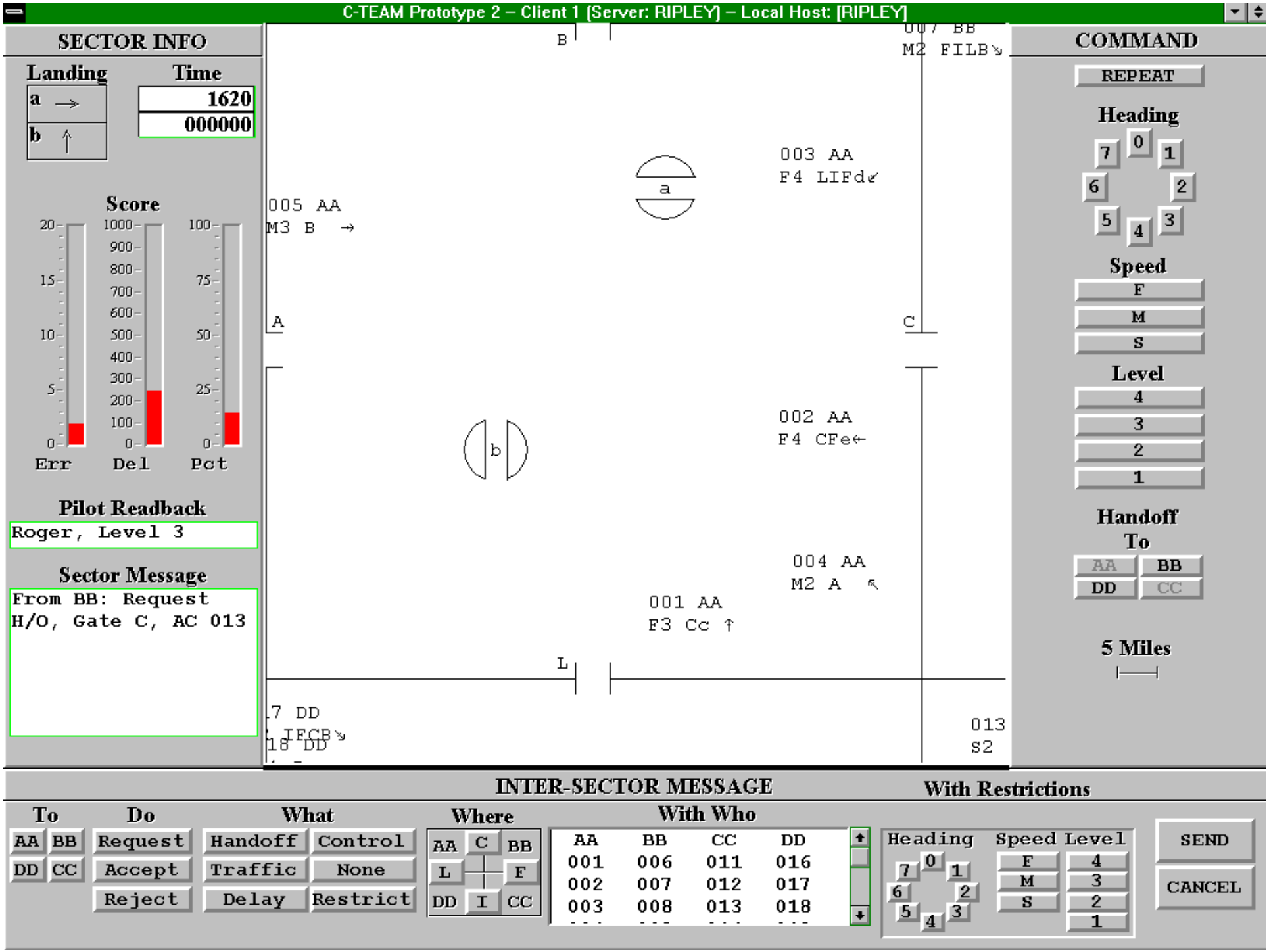

Sector AA
Sector BB
Exit Gate
b
d
Aircraft
Hand-off Gate
a
e
k
g
j
h
Airport
Sector DD
Sector CC

Research Hypothesis

- H_1: High performing teams will have well defined traffic flow patterns that will be more consistently followed by team members

Method: Particpants

- 125 paid volunteers (18-30 years old)
- Randomly assigned to one of 30 4-person teams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SECTOR INFO
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Roger, Level 3
Sector Message
From BB: Request
H/O, Gate C, AC 013
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007 BB
M2 FILB
003 AA
F4 LIFd
a
005 AA
M3 B
A
C
002 AA
F4 CFe
b
004 AA
M2 A
001 AA
F3 Cc
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18 DD
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INTER-SECTOR MESSAGE
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With Who
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003 008 013 018
Heading
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Level
SEND
CANCEL

Method: Procedures

- Training
  - 4 hours of part task training to develop proficiency of controlling traffic and communicating with adjacent sectors
- Experiment
  - Three 28-minute scenarios consisting of 3 levels of workload based on aircraft density

Method: Data Collection

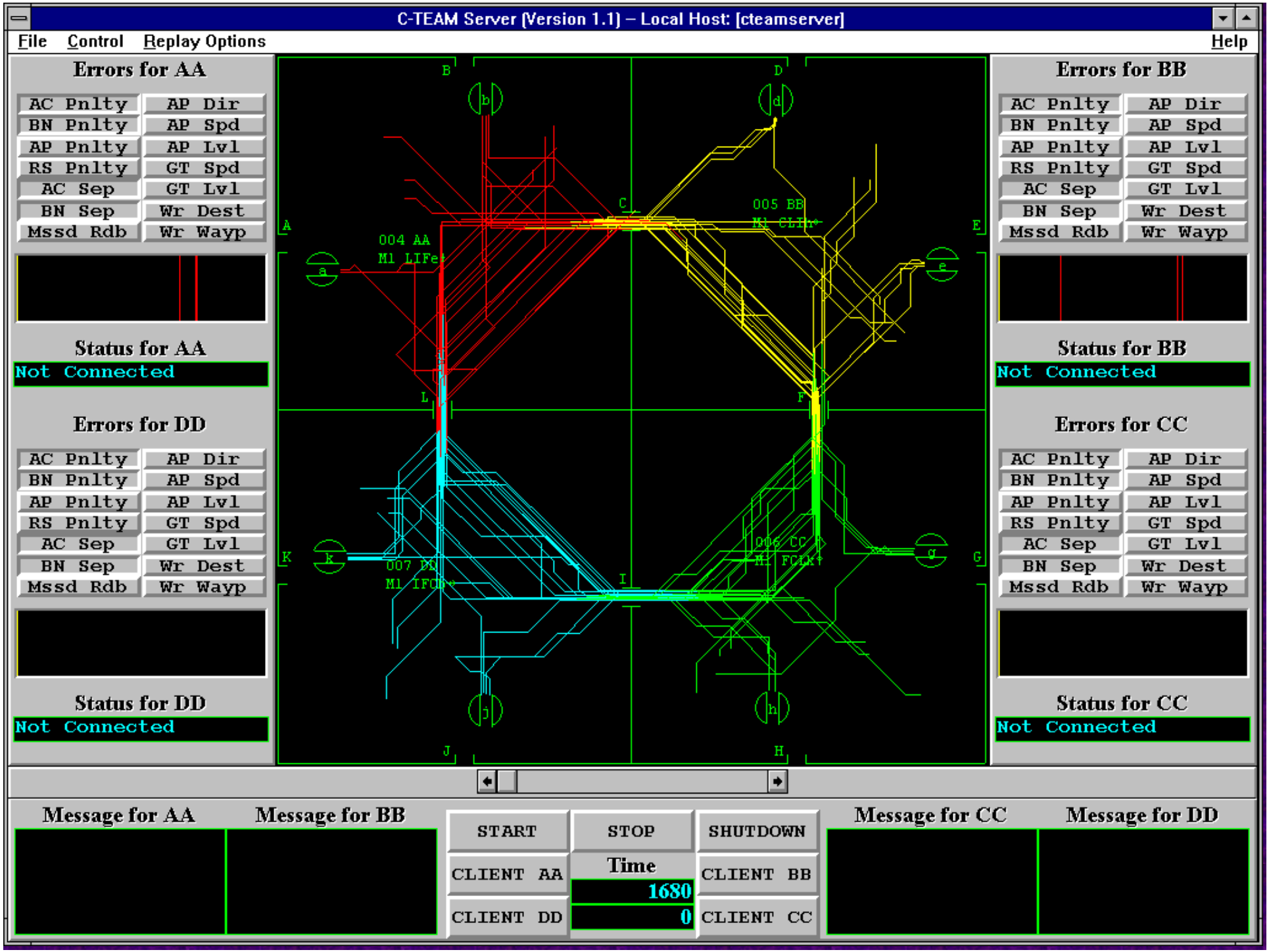
- Recorded :
  - Aircraft trajectories
  - System outcome measures
    - Number of team safety errors
    - Amount of team aircraft delay time
    - % aircraft reaching their destination.

Analytical Results

- Factor scores were used to create linear composite of system outcomes.
- Cluster analyses performed on linear composite of system outcomes
  - Six cluster solution obtained
    - One cluster (6 teams) represented high performing teams
    - One cluster (4 teams) represented low performing teams
    - Remaining clusters were not used

Pictorial Results

- Traffic flow patterns were visually examined for high and low performing teams.
  - High performing teams
    - All had well-defined and symmetric traffic flow patterns
  - Low performing teams
    - All had disorganized asymmetric traffic flow patterns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File
Control
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Help
Errors for AA
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Status for AA
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Message for AA
Message for BB
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Time
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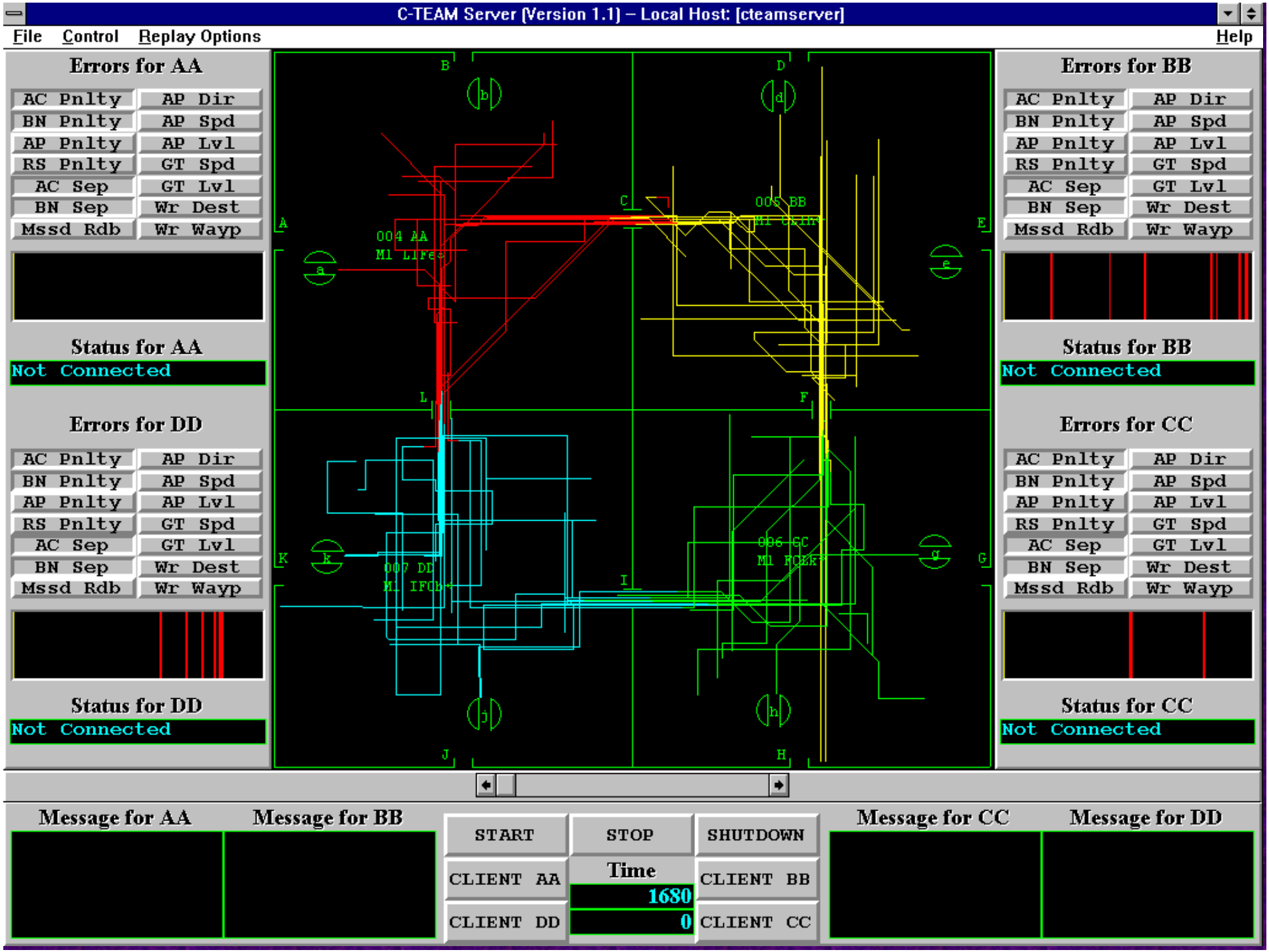
CLIENT CC
Message for CC
Message for DD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Message for AA
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CLIENT AA
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CLIENT CC
Message for CC
Message for DD

Conclusions

- High performing teams had more well-defined traffic flow patterns that were consistently used among team members.
- The development of a shared mental model of traffic management appears to enable team members to better coordinate their individual efforts.

Recommendations

- Test the generalizability of these results to ATC population.
- Develop expert systems to simulate team member performance for use in ATC selection battery.