



Australian Government

Department of Defence

Defence Science and  
Technology Organisation

# Revisiting “SCUDHunt” — the Human Dimension of NCW



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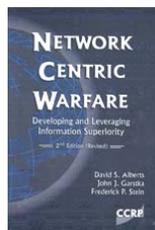
11<sup>TH</sup> ICCRTS — 2006

COALITION C2 IN THE NETWORKED ERA

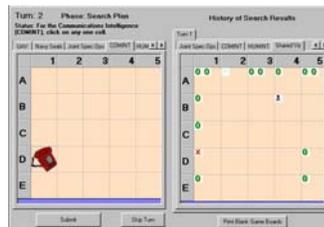


# Outline of the Talk

## 1. Tenets of NCW



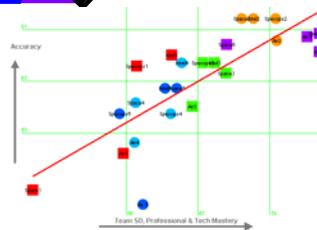
## 2. The "SCUDHunt" Game



## 3. Experiment 1 — Teams



## 4. Experiment 2 — Three Factors



## 5. Experiment 1 again — Shared Situational Awareness

## 6. Conclusions



# The NCW Tenet Chain



## Additional Australian NCW tenets:

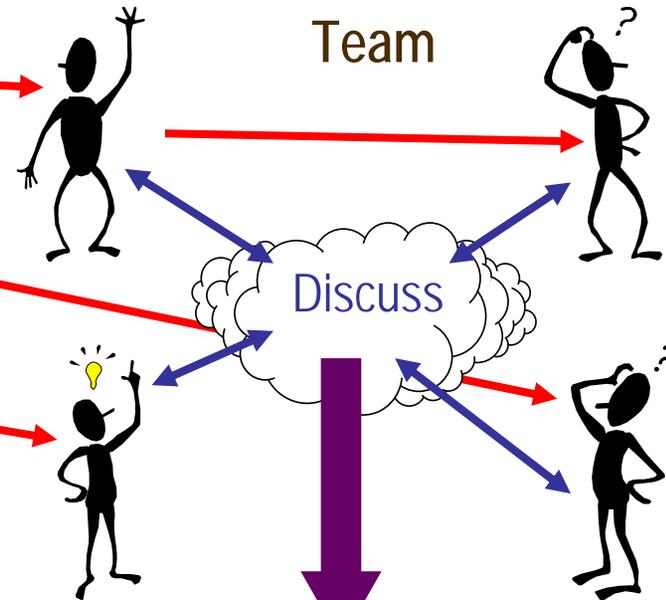
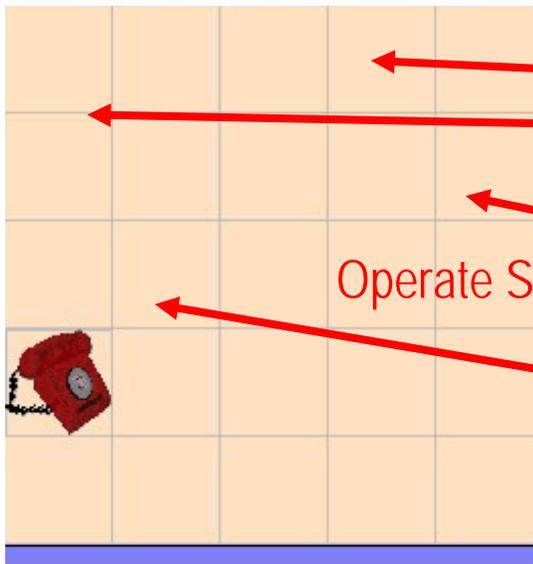
1. Also essential is **Professional mastery**: *"... an expression of how individuals apply their skills, knowledge and attitudes to the task at hand ... developed through training, education and experience."*
2. **Mission command** will remain an effective command philosophy into the future.

Are these tenets justified?

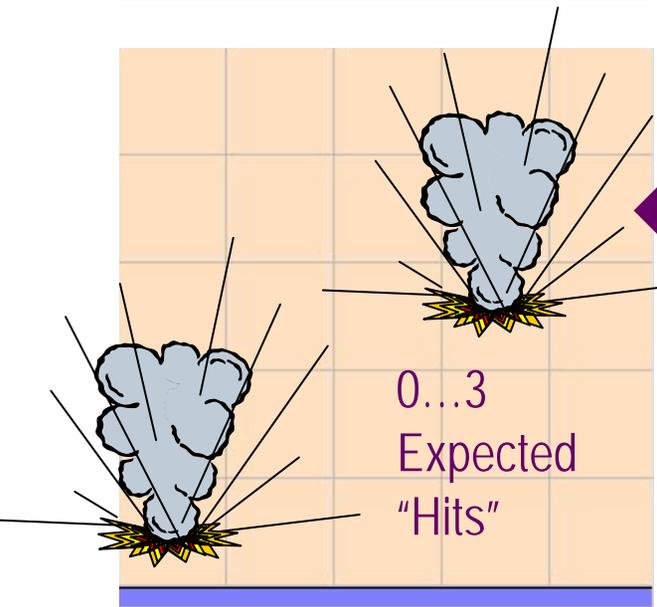
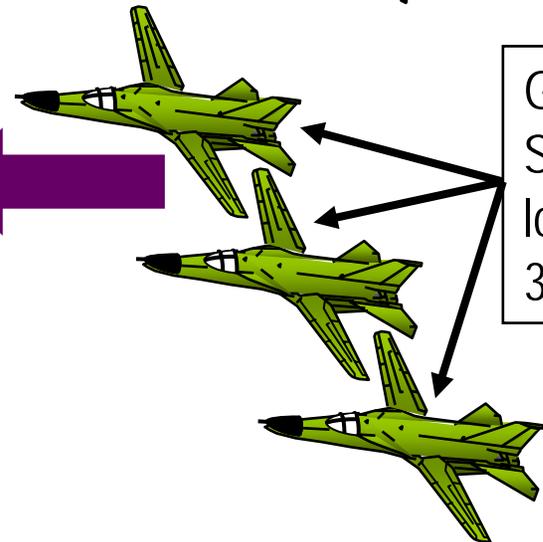


# The "SCUDHunt" Game

5x5 grid



Group decision on  
 SCUD launcher  
 locations, followed by  
 3 strikes





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# "SCUDHunt" Games Were Run in 2000-02



Turn: 2    Phase: Search Plan  
 Status: For the Communications Intelligence (COMINT), click on any one cell.

UAV   Navy Seals   Joint Spec Ops   **COMINT**   HUMINT

	1	2	3	4	5
A					
B					
C					
D					
E					

Submit    Skip Turn

---

History of Search Results

Turn 1

Joint Spec Ops   COMINT   HUMINT   Shared Viz

	1	2	3	4	5
A	00 		00	0	00
B	0				
C	0				
D	X				0
E	0				0

Print Blank Game Boards



# Sample "SCUDHunt" Team Conversation

**Space Player:** **SPACE** to col. 3.

**Spec Ops Player:** With your assets up to the ne, I can send the **seals** across to D2 and **joint spec ops** up to d5

**Spec Ops Player:** Both **spec ops** will be within search range of E3/E4

**Air Player:** Maybe **spec ops** can clear out row E. I'll take **manned air** over row A and the **uav** down col 4 so that next **space** pass will give us corroboration

**Spec Ops Player:** I could send the **seals** down to E2 vs D2 next, but both **air** and **space** had e2 clean

**Spec Ops Player:** **Air**, are you thinking **Joint Spec ops** to E4 this round vs D5



# Results from Experiment 1 (2000)



Team	Expected Number of SCUDs Destroyed (0...3)
T1	2.2
T2 (poor leader)	1.9
T3	2.1
T4	2.4
T5 (high school students)	1.4
T6 (junior students)	0.6
Average	1.8



# Comments on Experiment 1

- Experiment was originally designed to test different collaboration technologies, but no significant difference between voice, text, or visual
- **Significant effect if team can't communicate at all** (average 0.5 vs 2.0) — **so interaction is important**
- Our re-analysis concentrated on **human aspects**.
- Differences between teams statistically very significant —  $p < 0.0002$
- **What makes a good team?** ... Experiment 2



# Experiment 2 (2002) — Technology Skills

Rated by average of Subjects' answers to 2 questions:

- Please rate your level of expertise with text chat on a 1...7 scale
- Please rate your level of computer skill on a 1...7 scale

Team	Ave. Age	Ave. Tech Skill	Ave. Score
T1 (officers)	45	4.2	57%
T2 (NCOs)	42	4.4	83%
T3 (officers)	39	3.3	68%
T4 (NCOs)	27	5.2	60%
T5 (NCOs)	44	4.4	55%
T6 (officers)	48	5.4	78%
Average	41	4.4	67%





# Expt 2 — Estimating Professional Mastery

Professional Mastery Level	NCOs	Officers
4	 E4 (2)	No Degree (0)
5	 E5 (1)	
6	 E6 (1)	Bachelors Degree (3)
7	 E7 (5)	
8		Masters Degree (8)
9	 E9 (3)	
10		PhD (1)
<b>Total Personnel</b>	<b>12</b>	<b>12</b>



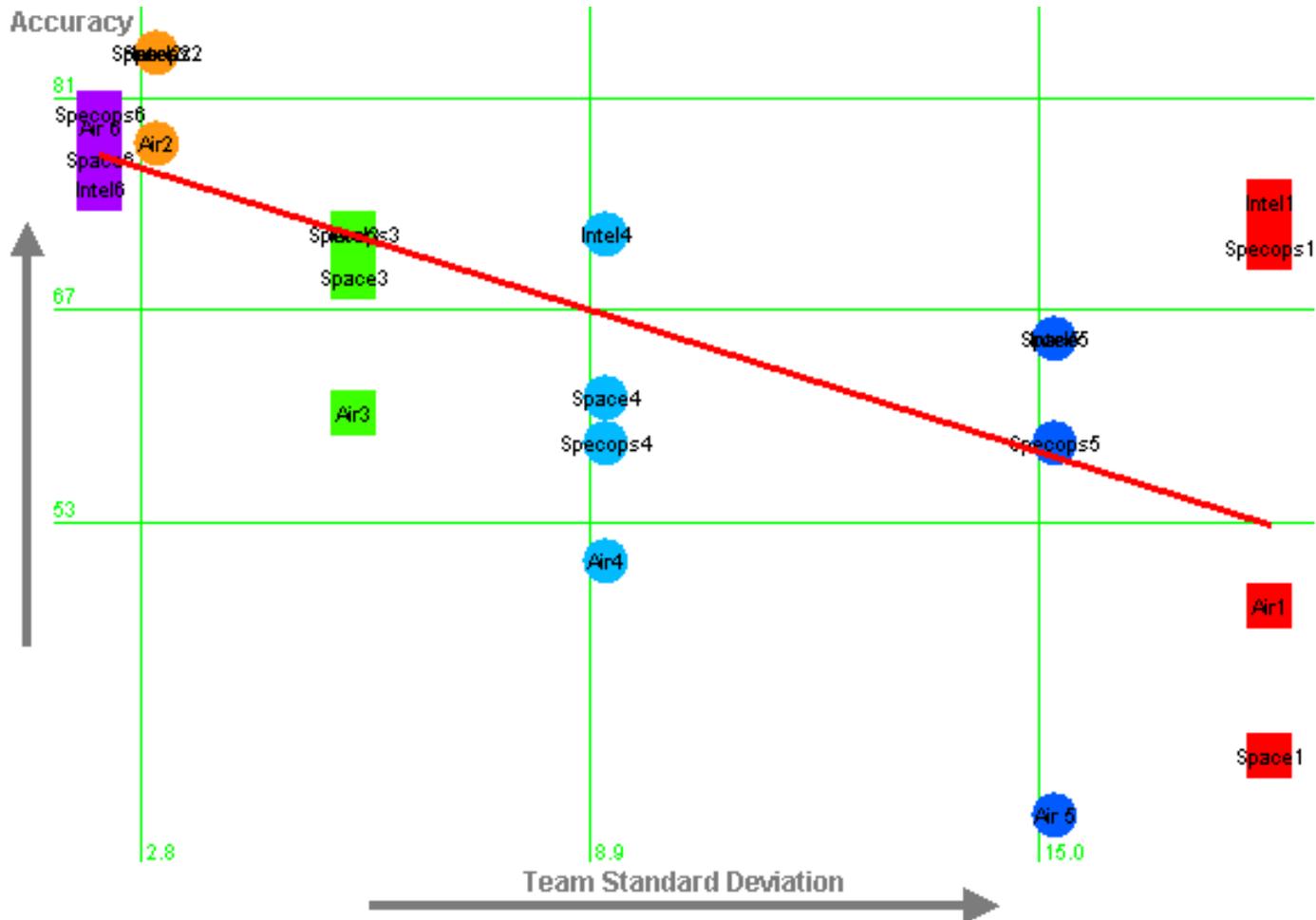
# Experiment 2 — Teamwork

- No direct measurement of “teamwork quality” made
- Not clear what such a measure would be, anyway
- Used standard deviation of individual player scores as a proxy

Team	Average Player Accuracy Score	Std. Dev.
T1 (officers)	57%	18%
T2 (NCOs)	83%	3%
T3 (officers)	68%	6%
T4 (NCOs)	60%	9%
T5 (NCOs)	55%	15%
T6 (officers)	78%	2%
Average	67%	



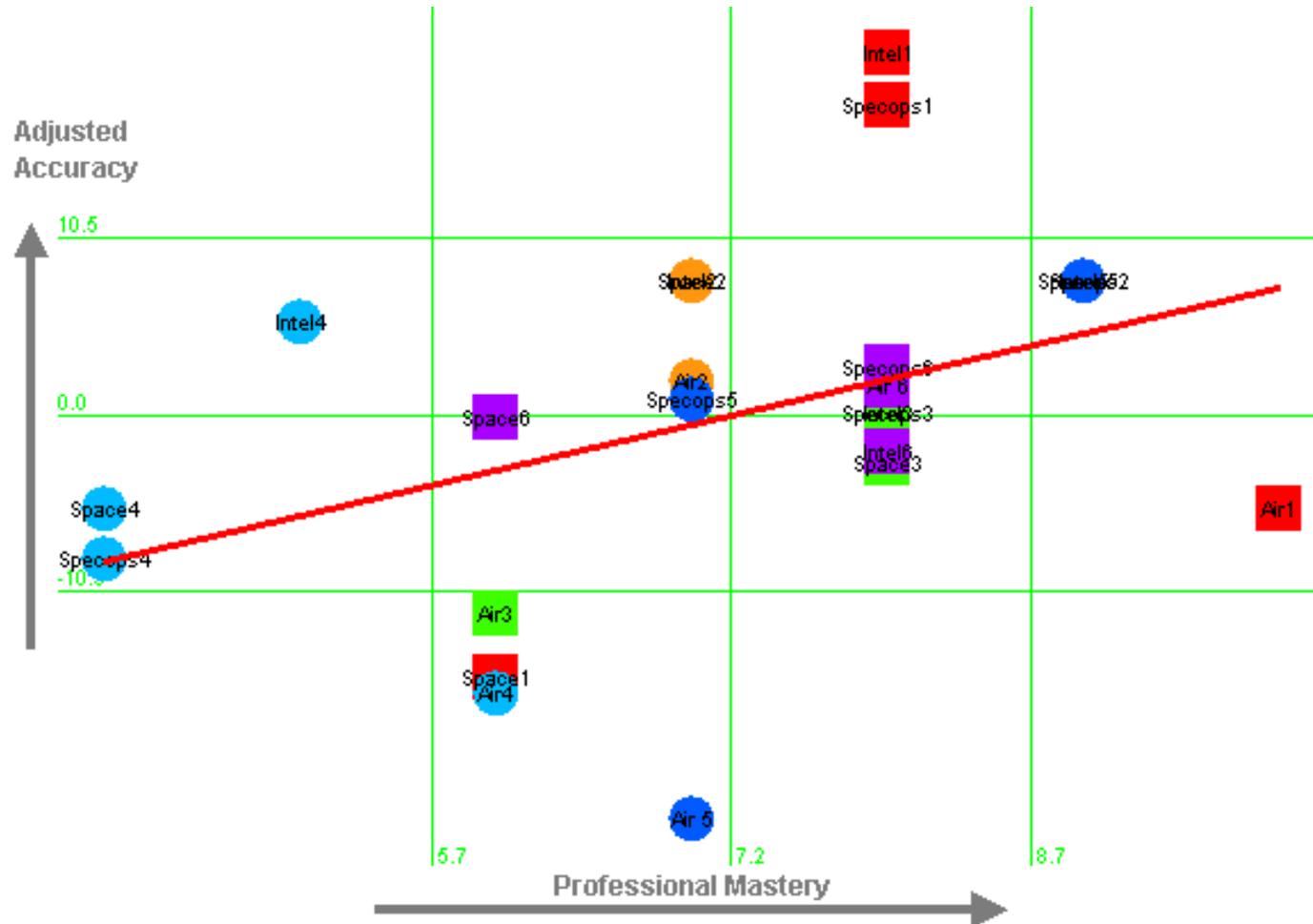
# Experiment 2 — Effect of Teamwork



- Predicts 45% of the variation in individual accuracy scores
- Statistically very significant ( $p < 0.0004$ )



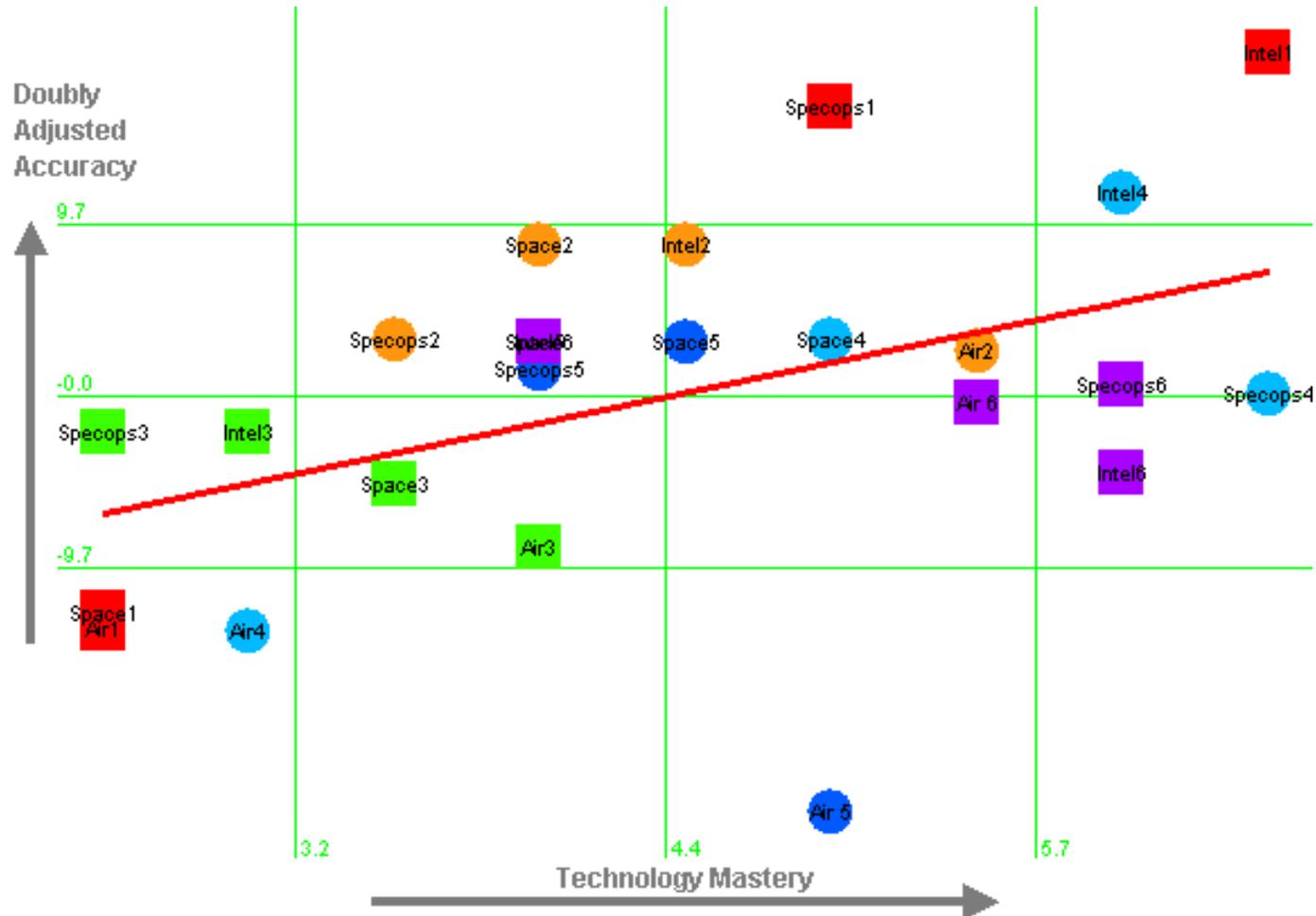
# Expt 2 — Effect of Professional Mastery



- Predicts extra 9% of the variation in individual accuracy scores
- Statistically moderately significant ( $p < 0.06$ )



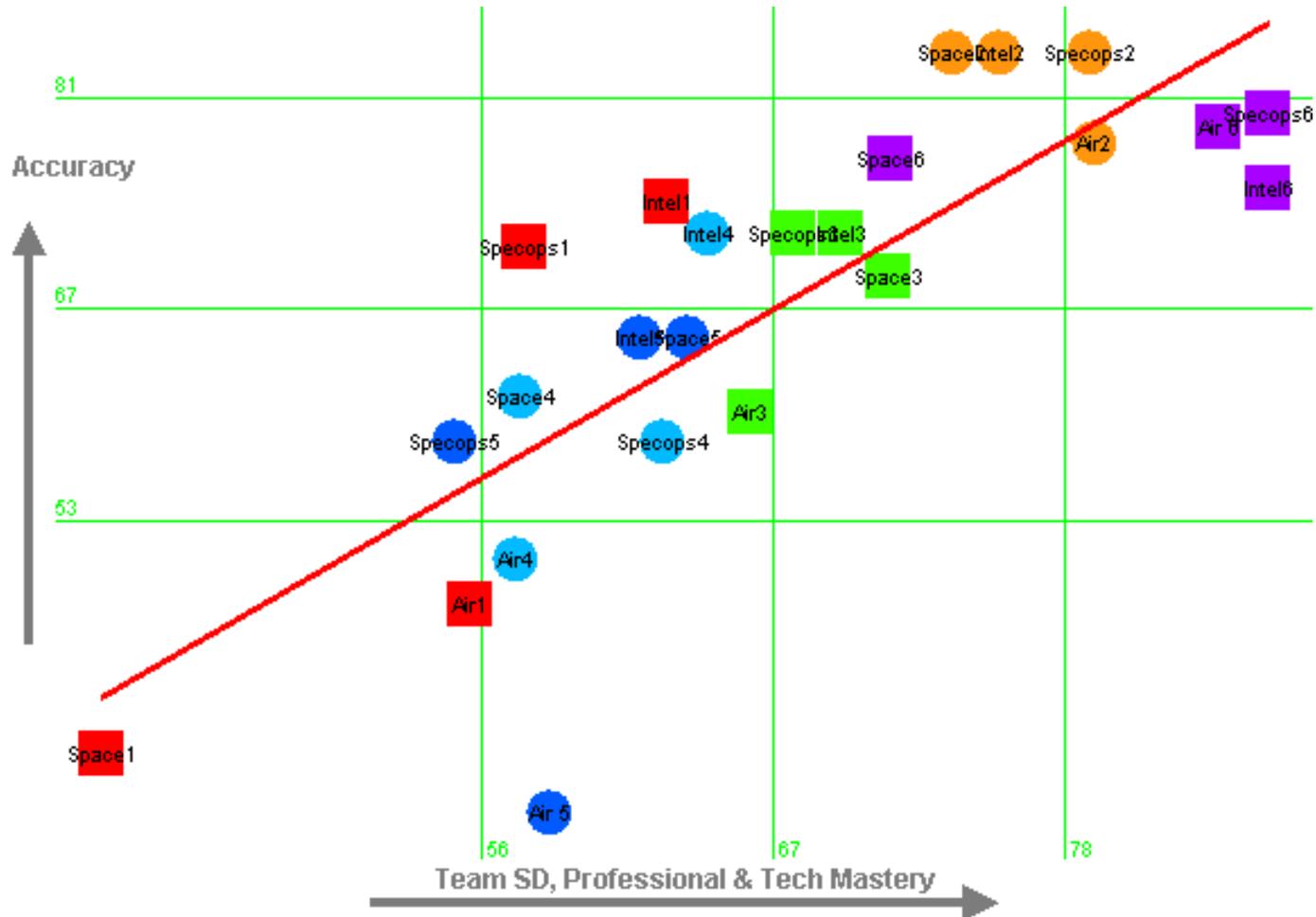
# Expt 2 — Effect of Technology Skills



- Predicts extra 9% of the variation in individual accuracy scores
- Statistically moderately significant ( $p < 0.03$ )



# Expt 2 — Effect of All 3 Factors



- Predicts 63% of the variation in individual accuracy scores
- 37% random or unknown



# Experiment 2 — Comments

Our re-analysis supports a three-factor model:



Professional Mastery



Technology Skills

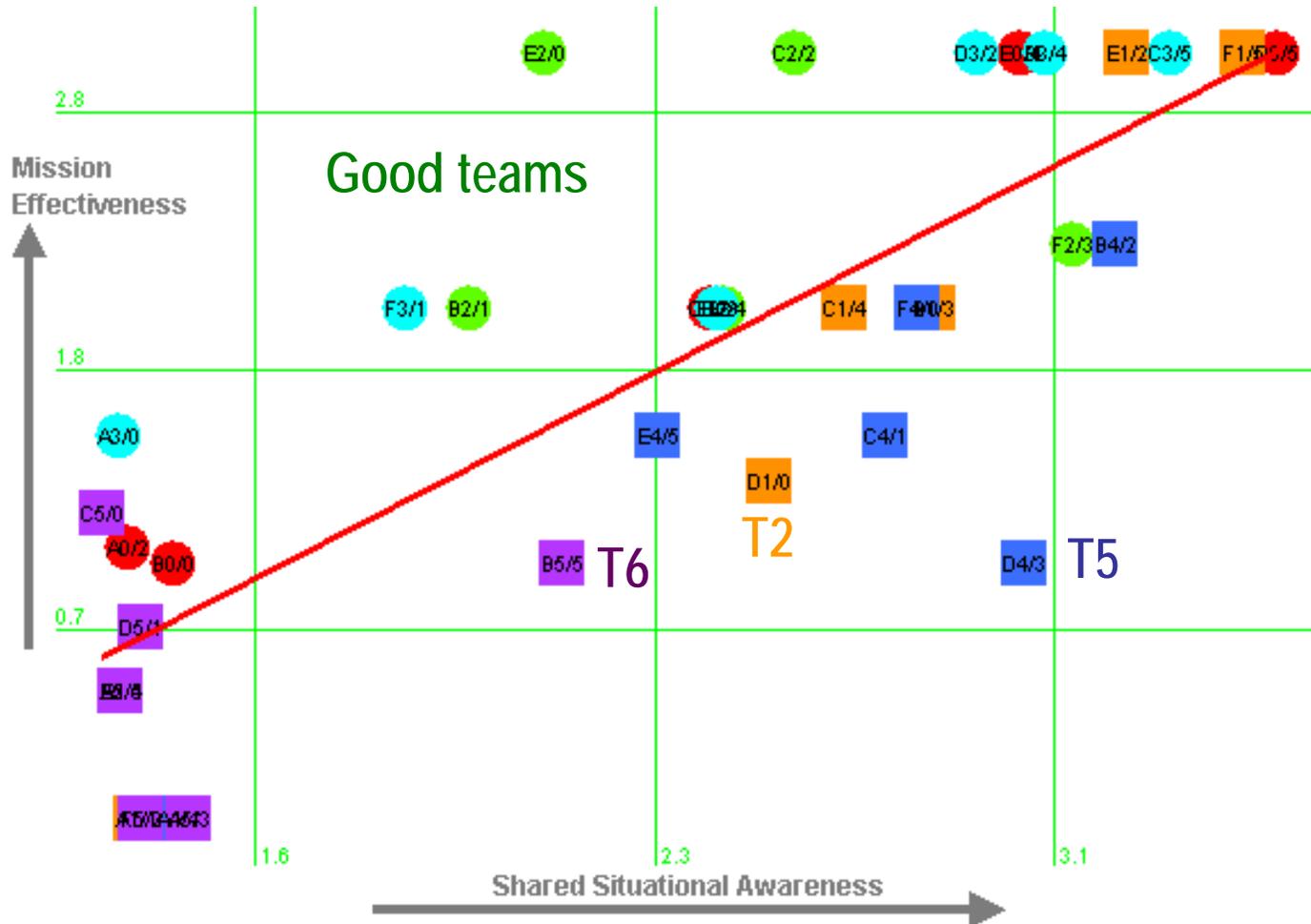


**TEAMWORK** (most important)

Do we need a greater focus on the human dimension?



# Expt 1 again — Shared Situational Awareness



- Three poor teams (boxes) performed worse than SSA predicts
- Statistically very significant ( $p < 0.00001$ )



# Experiment 1 — Comments

**Shared Situational Awareness is not an end in itself:**

— Teams can fail by agreeing and being **WRONG!**

**This can happen with:**

— Poor teamwork (not exploring all options, ignoring some points of view)

— Insufficient professional mastery

**Do our militaries have adequate training for NCW?**



# Some Final Remarks

- We re-analysed 2000–02 “SCUDHunt” experiments
- **Concentrating on the human dimension:** individual and team factors
- Differences between “good” and “bad” teams had more impact on performance than technology did
- **Bad teams failed by not agreeing**, giving wide variation in scores ...
- ... **or by incorrect agreement**
- “Professional mastery” and technology skills were also important



# Two Quotes — Still True!

*“It is not technology, systems or platforms that generate the real capabilities for our Defence Force, it is the strength of our people.”* — Australian Department of Defence, *Force 2020*

*“How teams work is a subject that has received some attention, but little of it has been focused in military domains with the pressures inherent in these situations. ... We need to know far more than we currently do about this behavior”* — David Alberts, *Information Age Transformation: Getting to a 21st Century Military*