COMMUNICATION AND DECISION MAKING IN C4ISR SUSTAINED OPERATIONS: AN EXPERIMENTAL APPROACH

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Credits

- Dr. Donald Harville: Air Force Research Laboratory Warfighter Training Research Division
- Dr. James C. Miller: Air Force Research Laboratory Warfighter Fatigue Countermeasures R&D Program
- Dr. Linda Elliott: Veridian Engineering
- 21ST Century Systems, Inc., providing the Agent Enabled Decision Group Environment (AEDGE) software

People and Facilities
DoD Unique

- Staff – Government and Contractor Psychologists, Physiologists, Technicians, and Research Assistants
- Research conducted primarily in 10,000 sq ft Chronobiology and Sleep Lab (CASL) complex
  - Control, Prep, Testing, Medical Exam rooms, Biochemistry Lab, Bedrooms (5)
  - 2,100 sq ft of temporal-isolation living and testing space

- Fatigue in C4ISR Performance Lab

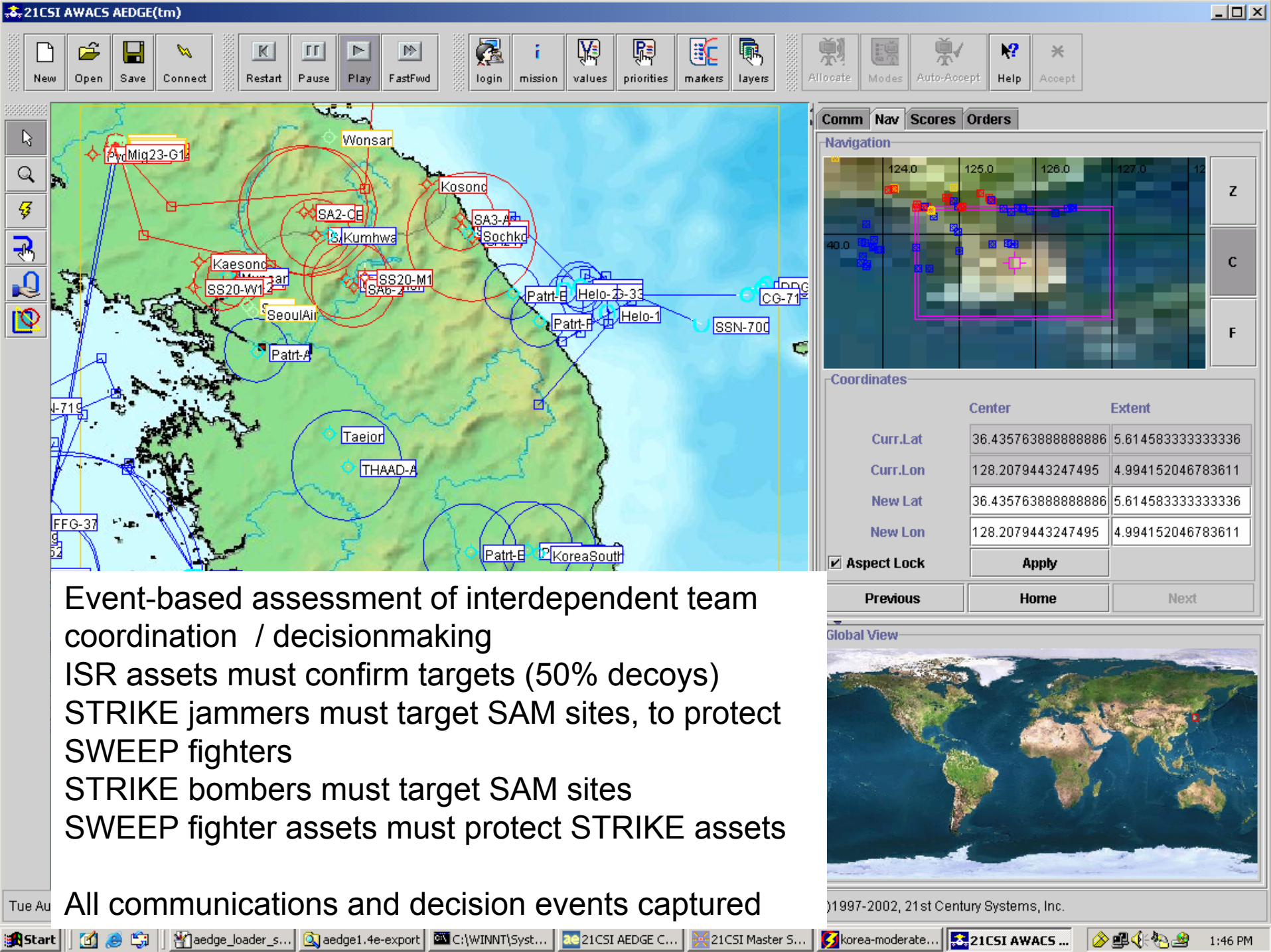
- 83-ft Rail Garrison habitat

Current Study

- Experiment
  - SS: Lts awaiting ABM training, Tyndall AFB
    - 10 3-person teams
    - TDY one week– 40 HOURS training
      - C4ISR roles / tactics
      - AEDGE interface
      - Cognitive tests (asymptote)
    - Experimental session : Friday 6pm to 10am Saturday
      - Taxied back to quarters
      - Return to Tyndall

Current Study: C4ISR Context

- **Effects of Sleep Deprivation on C4ISR team communication, coordination, decision making, and problem solving**
  - **AEDGE Platform: Capture Generic Functions**
  - **3 human roles & agent-based role**
    - **ISR (Predator UAVs, Global Hawk, JSTARS)**
    - **Strike (Bombers, Jammers, Fighters)**
    - **Sweep (Fighters, AWACS)**
    - **HVAA (RJ, Tankers, SAMS, Carrier)**



Event-based assessment of interdependent team coordination / decisionmaking

ISR assets must confirm targets (50% decoys)

STRIKE jammers must target SAM sites, to protect SWEEP fighters

STRIKE bombers must target SAM sites

SWEEP fighter assets must protect STRIKE assets

All communications and decision events captured

Assessment of Teamwork

- Coordination/Sequencing of Events
- Dynamic Problemsolving

Immediate Indicators

- Handovers (asset re-allocation)
- Communication
    - Email
    - Audio

Audio Capture of Communications

- Digitally recorded communications are a critical source of assessment
  - Sequencing
  - Assets
  - Other
    - Encouragement
    - Fatigue

Communications: Initial Coding

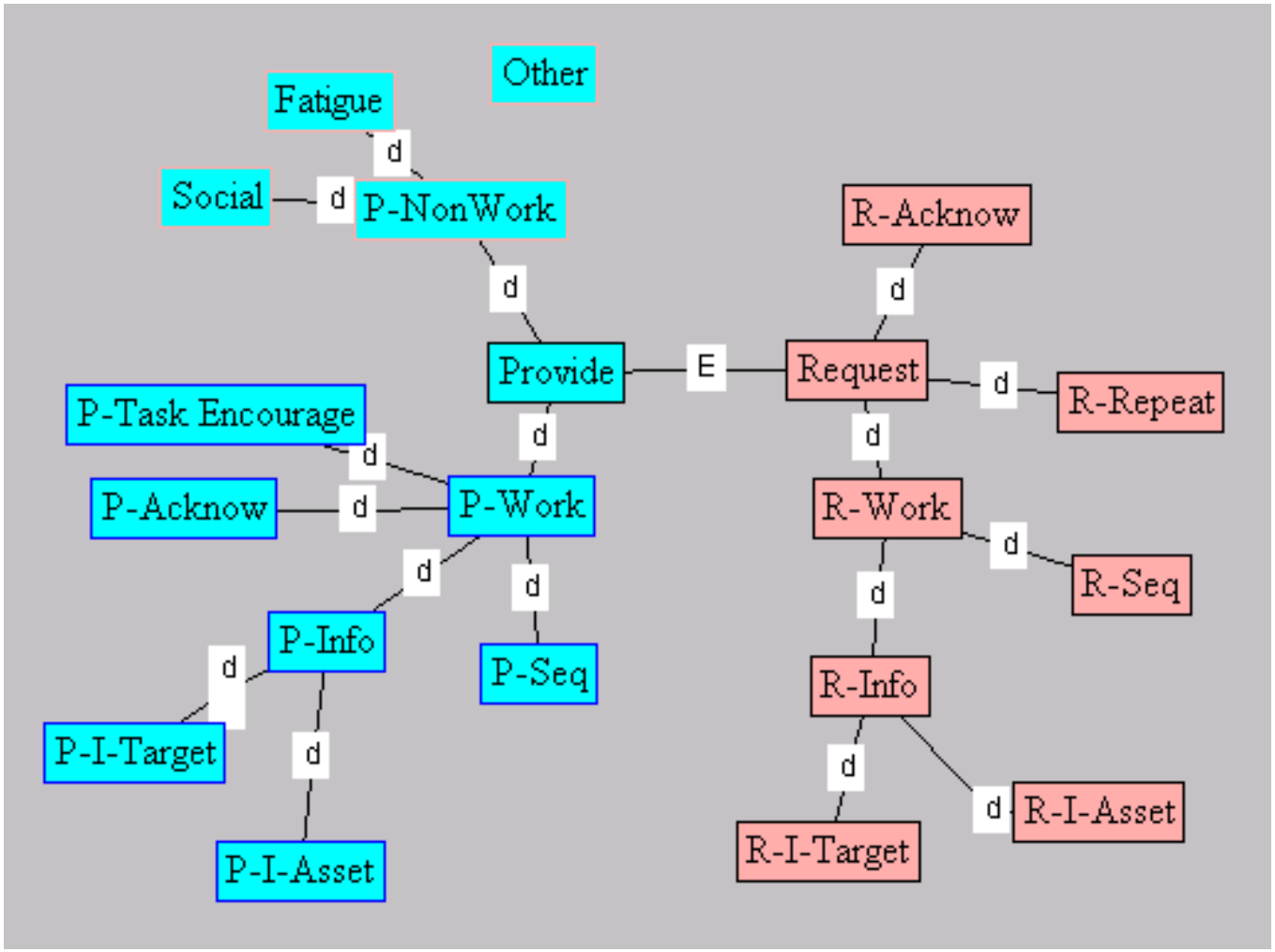
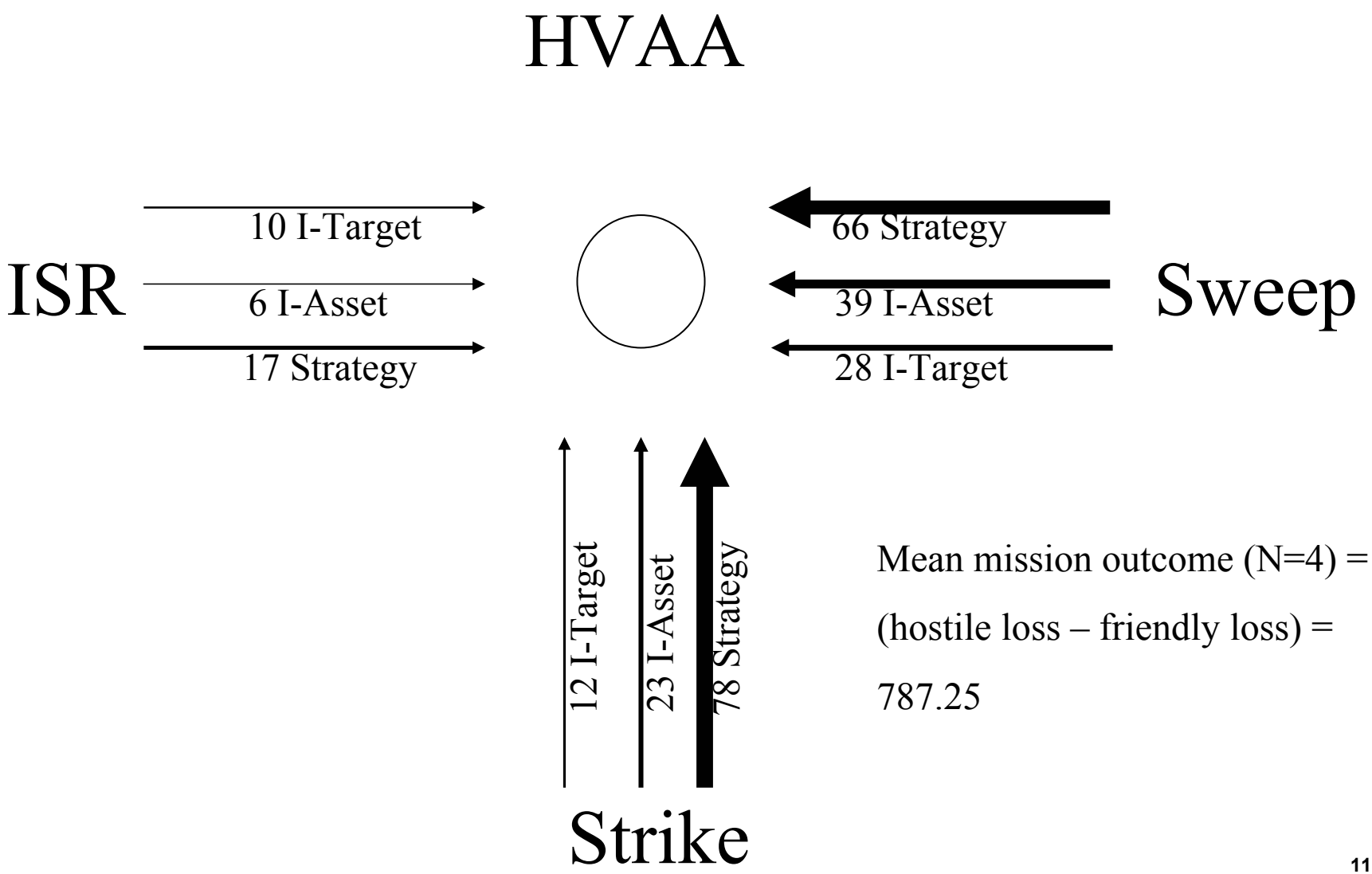


Figure 3. Representation of communication concepts

Predictions and Analyses

- Ascertain fatigue effects on Communication and Coordination processes
  - Mission Planning
  - Mission Execution
    - Communications
    - Sequencing of events
    - Allocation of Assets among teammembers
  - After-action Reviews

Provide Information and Strategy
Scenario 1 Preliminary Data



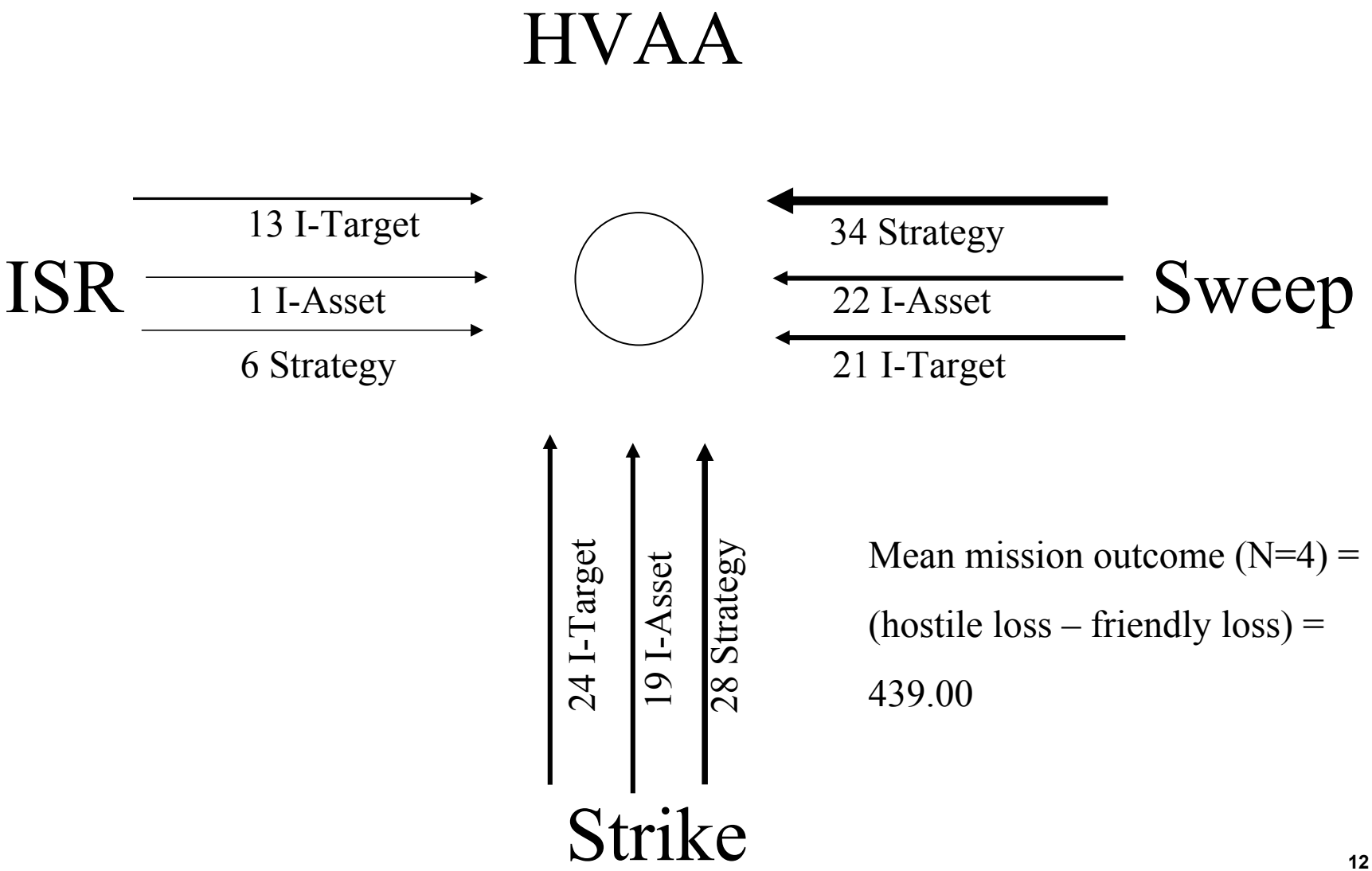
Mean mission outcome (N=4) =

(hostile loss – friendly loss) =

787.25

Provide Information and Strategy

Scenario 6 Preliminary Data



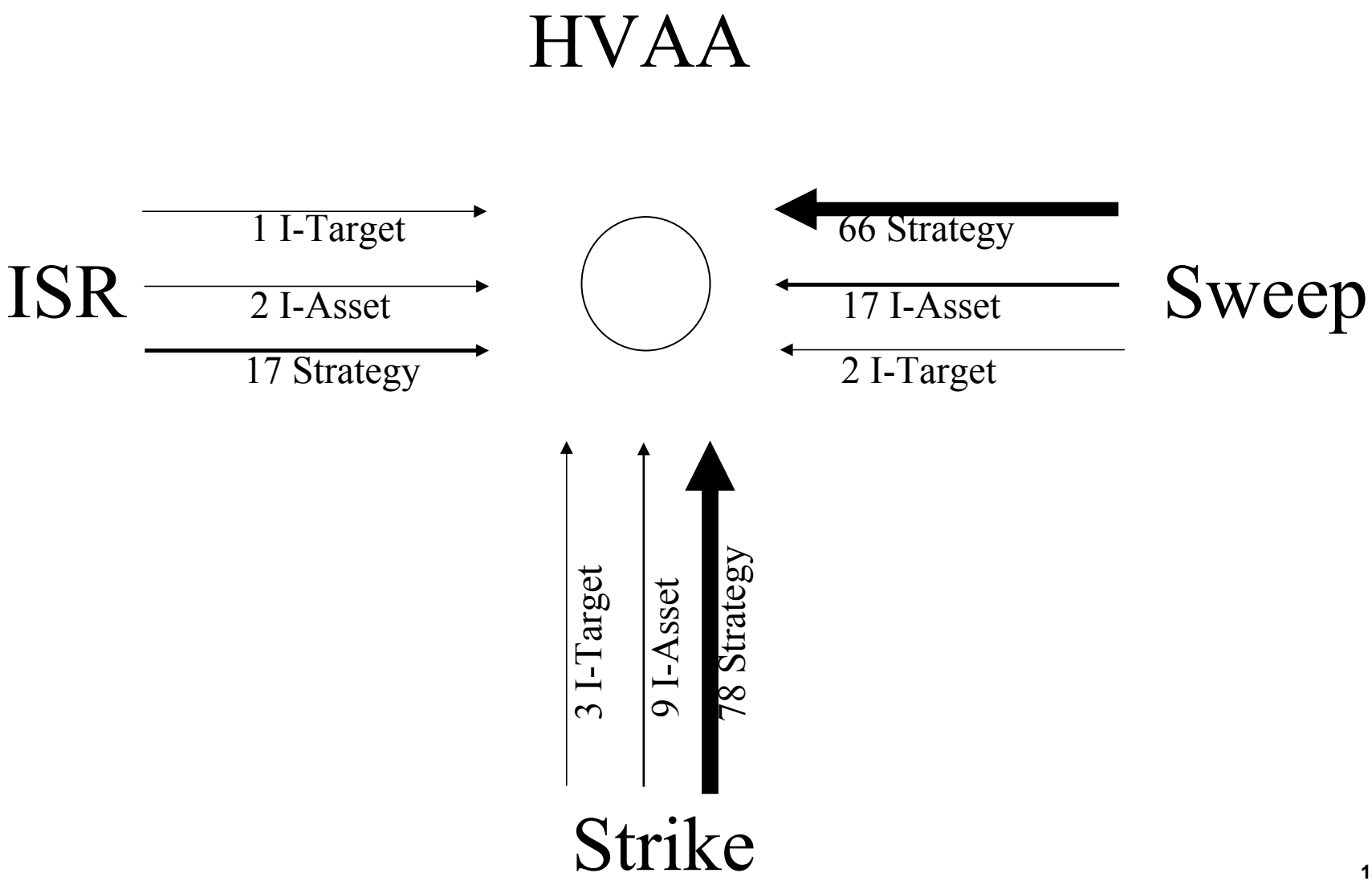
Mean mission outcome (N=4) =

(hostile loss – friendly loss) =

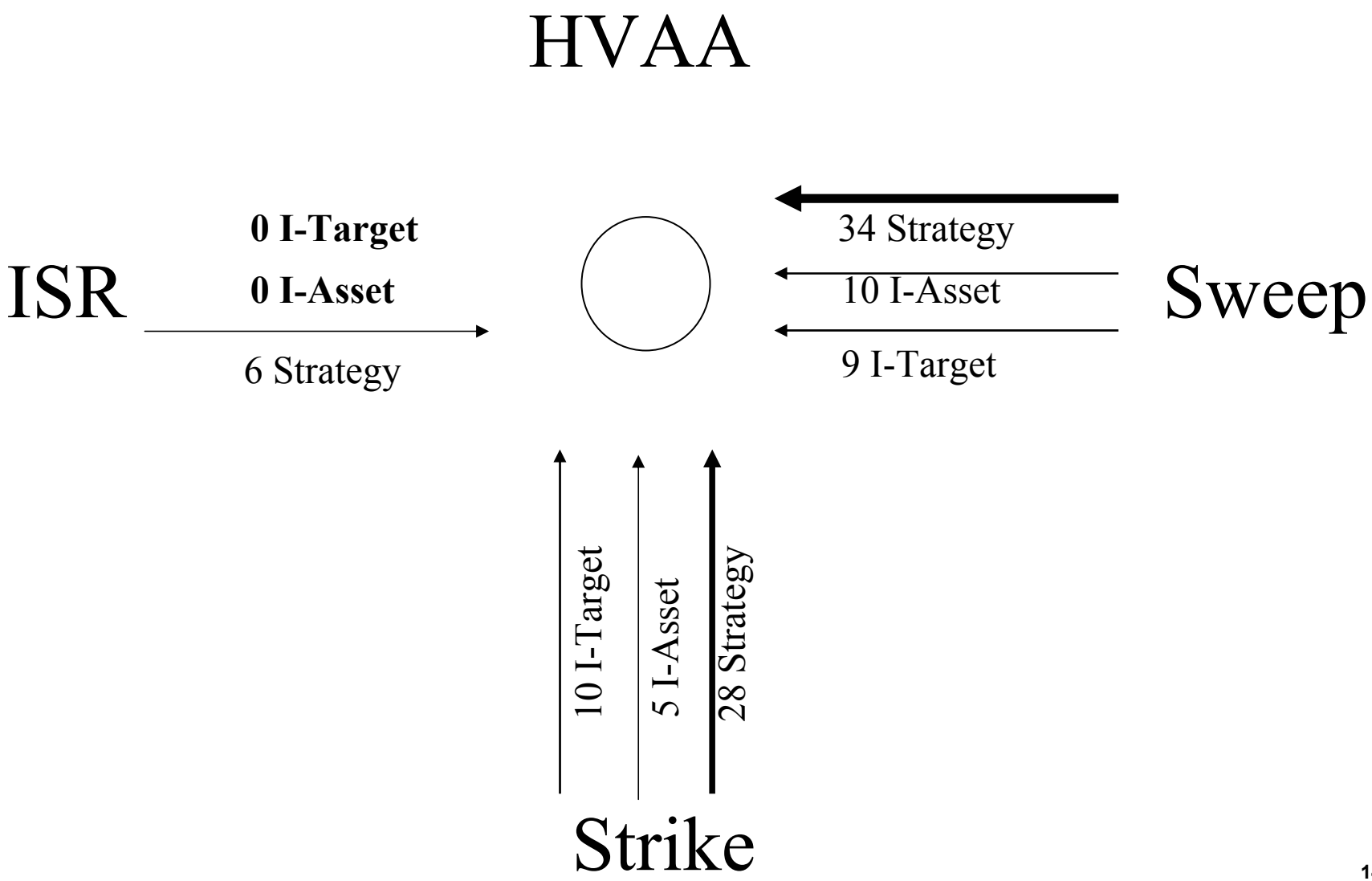
439.00

Request Information and Strategy

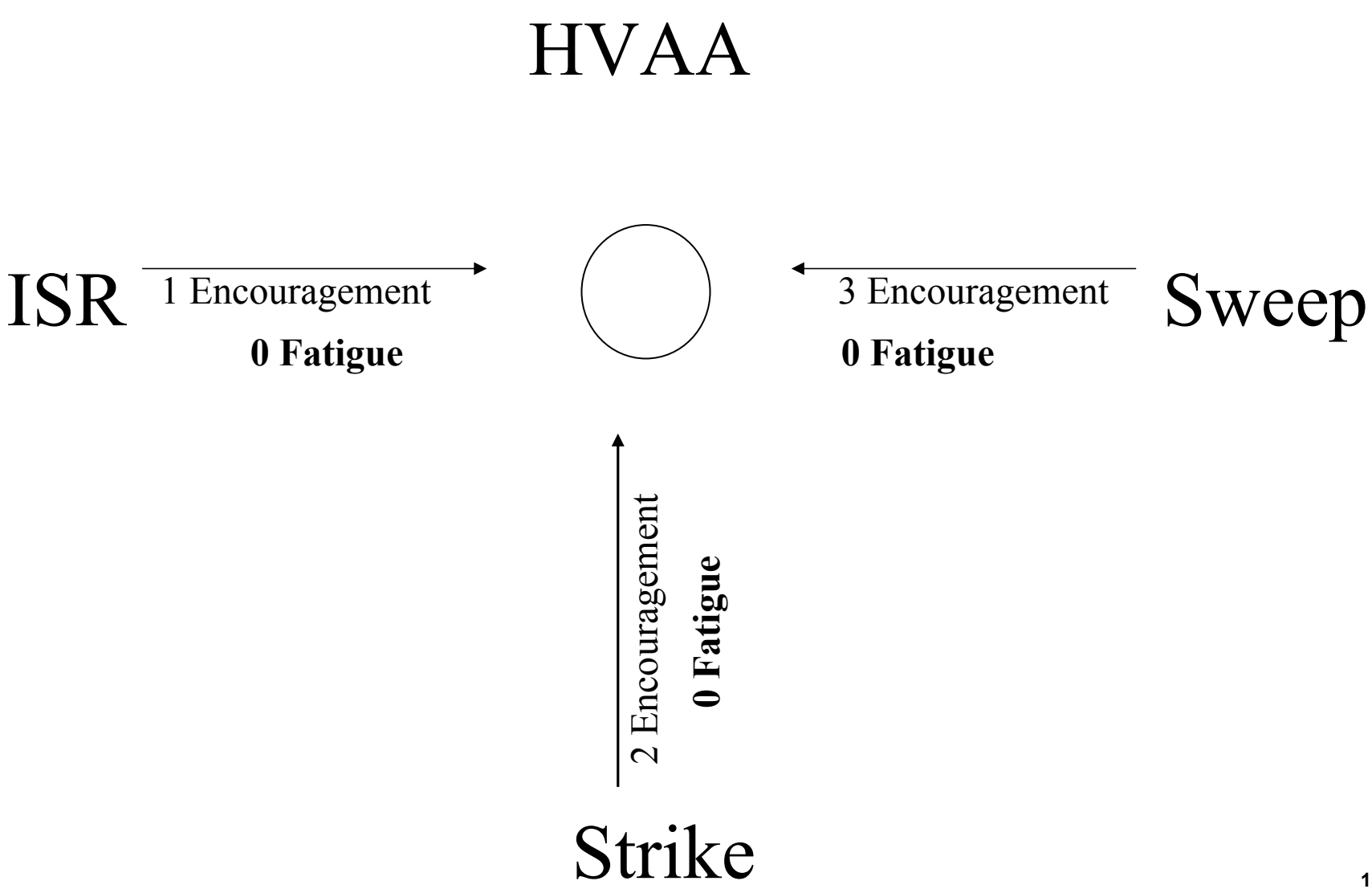
Scenario 1 Preliminary Data



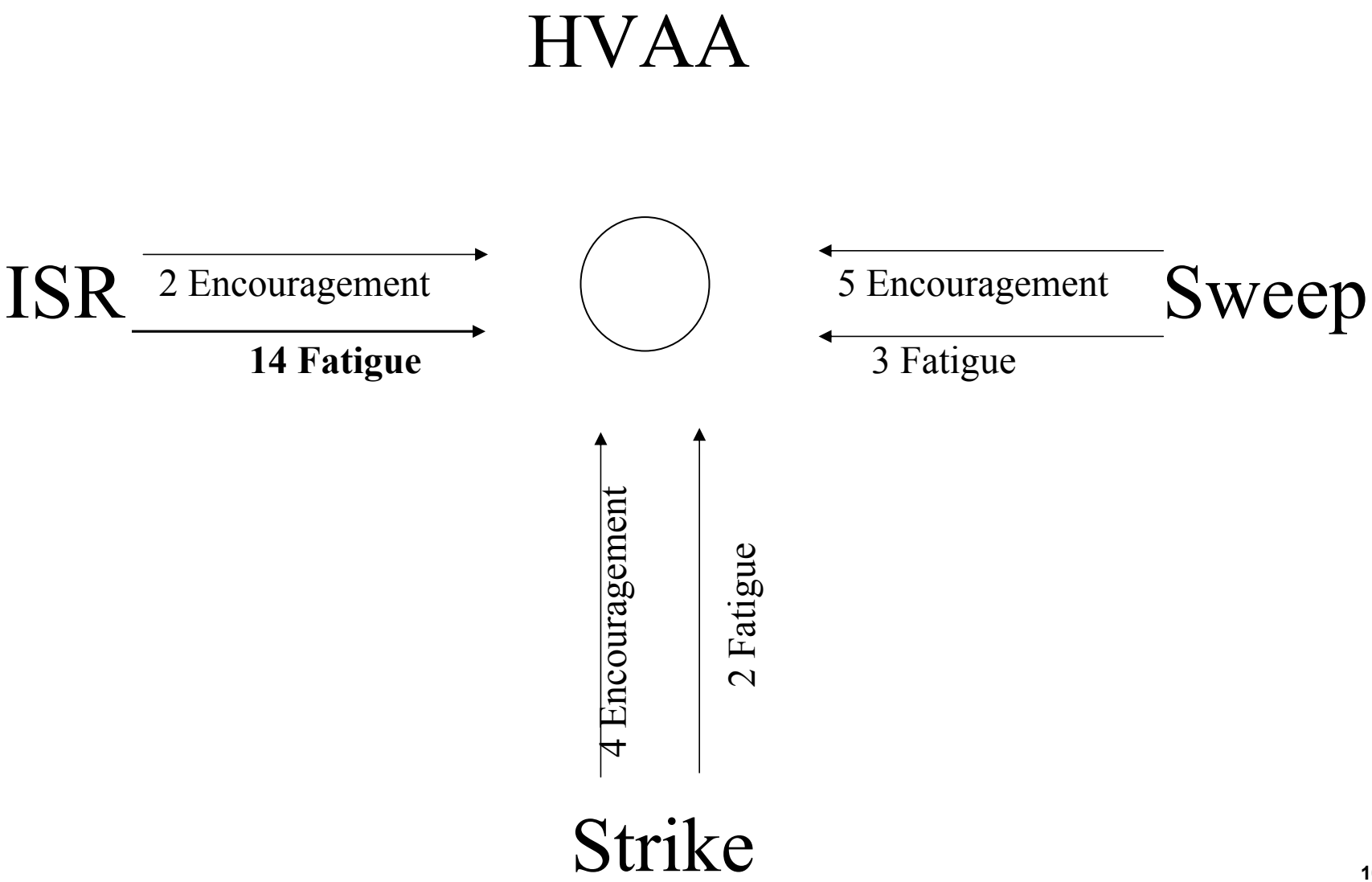
Request Information and Strategy
Scenario 6 Preliminary Data



Encouragement and Fatigue
Scenario 1 Preliminary Data



Encouragement and Fatigue
Scenario 6 Preliminary Data



Fatigue Effects on Mission Outcomes (N=4)

	Scenario 1 Means, SD	Scenario 6 Means, SD	p
Mission Outcome (hostile lost – friendlies lost)	787.25, 293.54	439.00, 88.62	.001
Friendly fuel outs	48.75, 33.26	22.50, 28.72	.004
Friendly jammers lost	7.5, 15.00	0, 0	.015

Contact Information

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