# Technology Long Poles Introduction

1. Workshop overview and procedures used:
   - 50+ attendees and five panelists participated
   - Formal presentations initiated the discussions
   - Audience introduced themselves noting interests
2. Process to ID Technology Longpoles was to:
   - Brainstorm to capture everyone's ideas (no filter)
   - Categorize technologies into a few major topics
   - Prioritize entire list (25) into top five and top 9
3. Consensus voting was used to rank all items
   - Everyone voted for their top five to rank top 9
   - Everyone voted for their top two to rank top five
   - Winner was the Situational Awareness category

# Technology Long Poles (Continued)

1. Additional Workshop Procedures Used:
   - A running summary of notes was written
   - Technology candidates were all debated
   - All wording was reviewed and corrected
2. Policy issues removed as non-Long Pole
3. Thoughtful insights shared on paradigms
   - Technologies not enough in/of themselves
   - Changes in US concepts are also required
   - Unmanned from start + unmanned logistics
4. 25 Long Poles in five categories prioritized:

# Technology Long Poles (Top 5) (Top 9)

1. C4
   - Human-machine interface focused on planned events (EBP)
   - **Control of the army of robots in a multi-robot environment**
   - Ability to do close-in operation robustly and remotely
   - **Secure and reliable communications is a vulnerability**
   - Mixed (Sliding) autonomy (build trust)
   - Decentralized parsing of tasks
   - Effective control of an autonomous weapon/failsafe (FMEC)
2. SSA
   - Perception methodologies for sensor strategies amongst teams of robots
   - Robot to explore to determine intent (engage it actively)
   - **Presenting current state to operator and to robot**
   - Human visibility (operator's intent)
   - Threat inference prediction
   - Robot Self-awareness
3. ACT
   - Planning for heterogeneous systems (planning for dissimilar systems)
   - Taxonomy of achievements
   - Safety for industrial interactions aimed at robot-human interactions and for manned unmanned systems
4. SYSTEMS ENGINEERING
   - **Power Generation &/or storage**
   - Families of cascading unmanned systems as a solution
   - Modular design is not routine
   - Minimum set of components to deliver functional capability
   - Standards across the industry driven by scale
   - Design for robotics assembly could be an enabler
   - Creating simplicity (improved decision accuracy by inferences)
5. LOGISTICS
   - Power management (air refuel-able as an example)
   - **Reliability and availability (designed in) especially for weaponized process**

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# Technology Long Poles Results

1. Summary of Long Pole workshop results:
   - Excellent participation by all attendees
   - Thought-provoking panelists briefings
   - We did not lack for opinions nor ideas
   - 25 Technology Long Poles were listed
   - All fit in Five representative categories
   - Top 9 Long Poles prioritized by voting
   - Top 5 Long Poles selected by consensus
   - Thank you to panelists and all attendees
   - Special thanks to Phillip Koon for note taking
2. Top 5 should keep us busy for 10 years