



# Future Combat Systems



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## (Characteristics of) Critical Technologies for FCS

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# CSA Statement of the Problem



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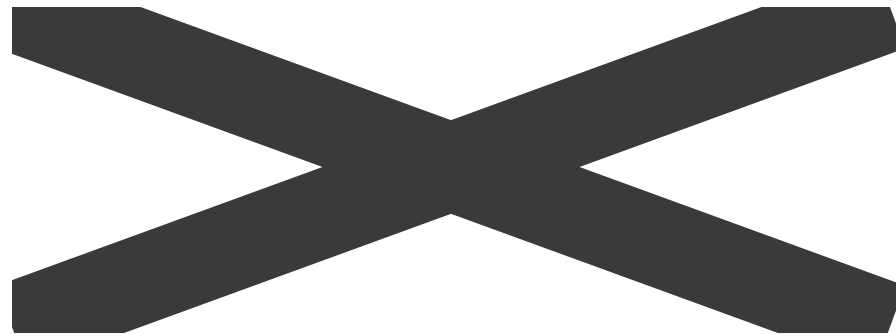
**“We must provide early entry forces that can operate jointly, without access to fixed forward bases, but we still need the power to slug it out and win decisively. Today, our heavy forces are too heavy and our light forces lack staying power. We will address those mismatches.” -- GEN Shinseki, CSA, 23 June 1999**



# The Army Transformation



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*... Responsive, Deployable, Agile, Versatile,  
Lethal, Survivable, Sustainable.*



# FCS is an Integrated System of Systems



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## Firepower

- Extended engagements BLOS On-The-Move
- All weather precision fires and targeting
- One Shot, One Kill, > 15 Km
  - Advanced Cannons/Propellants
  - Netted Fires
  - Foliage Penetration Sensors
  - Continuous Precision Tracking

## Maneuver

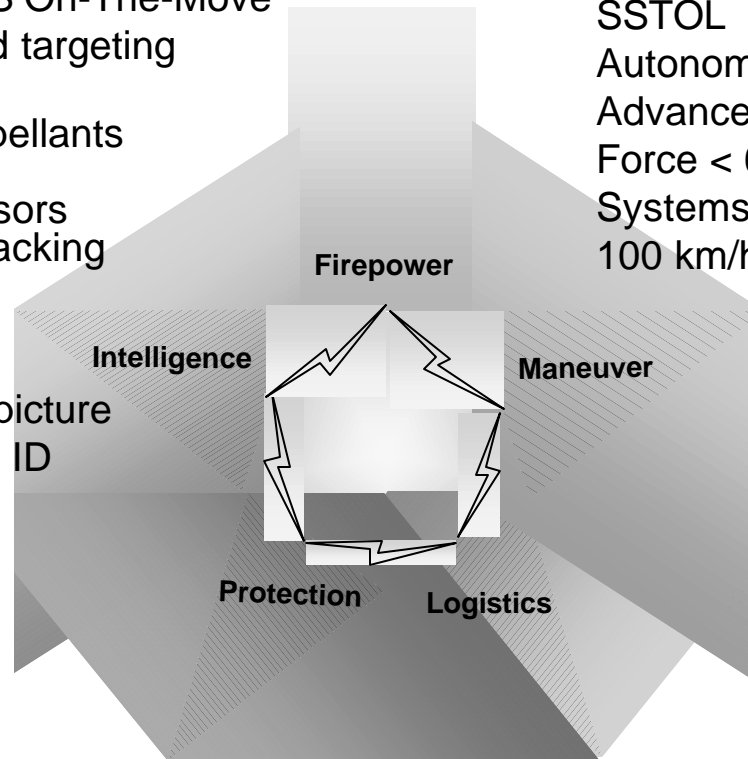
- Gain positional advantage, bring fires to bear
  - SSTOL
  - Autonomous Robotics
  - Advanced Propulsion Systems
  - Force < 6000 tons
  - Systems < 20 tons
  - 100 km/hr + air movement

## Intelligence

- Common relevant operating picture
  - Automatic Classification ID
  - Long Range Sensors
  - Netted Sensors

## Protection

- Profoundly better SA
- Extended engagement and agile maneuver
  - Low Observables
  - APS
  - Robotics



## Logistics

- Reduced footprint and tail
- Condition based maint
- Prognostic/ diagnostic
- Ultra Reliability
- Fuel Efficient
- High PK munitions
- Robotics
- Telemedicine/ maintenance

## SA based Real-Time 4D

Dynamic Battlespace Deconfliction



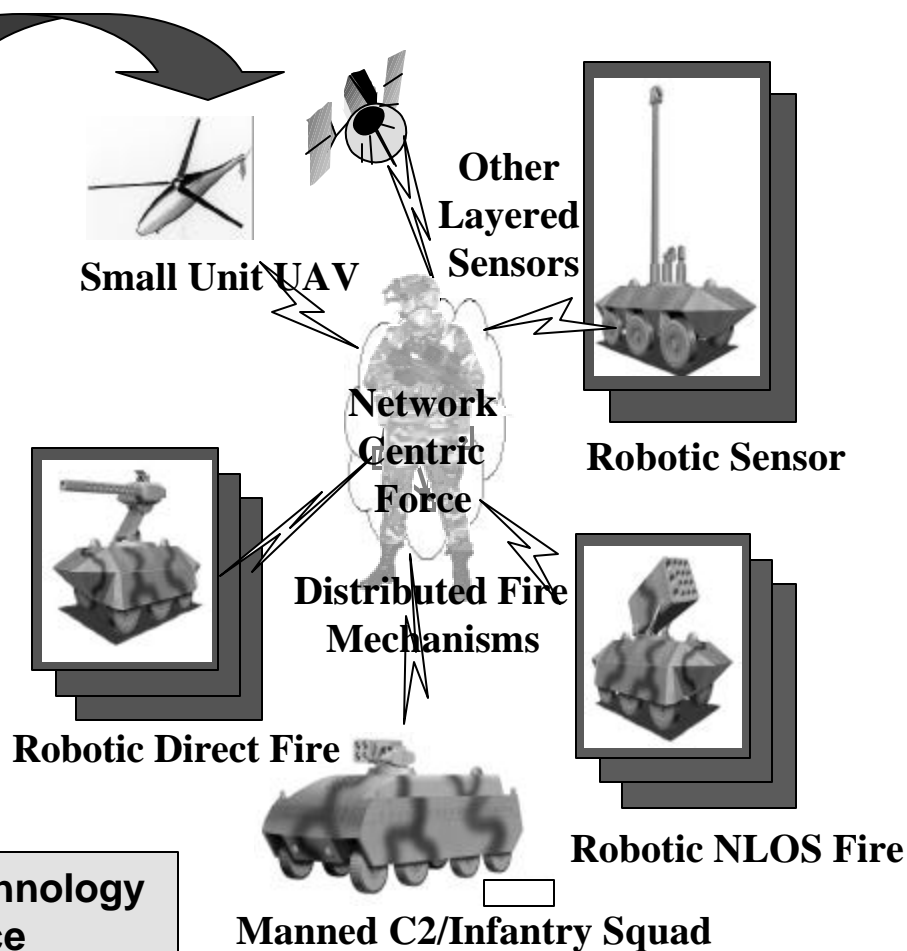
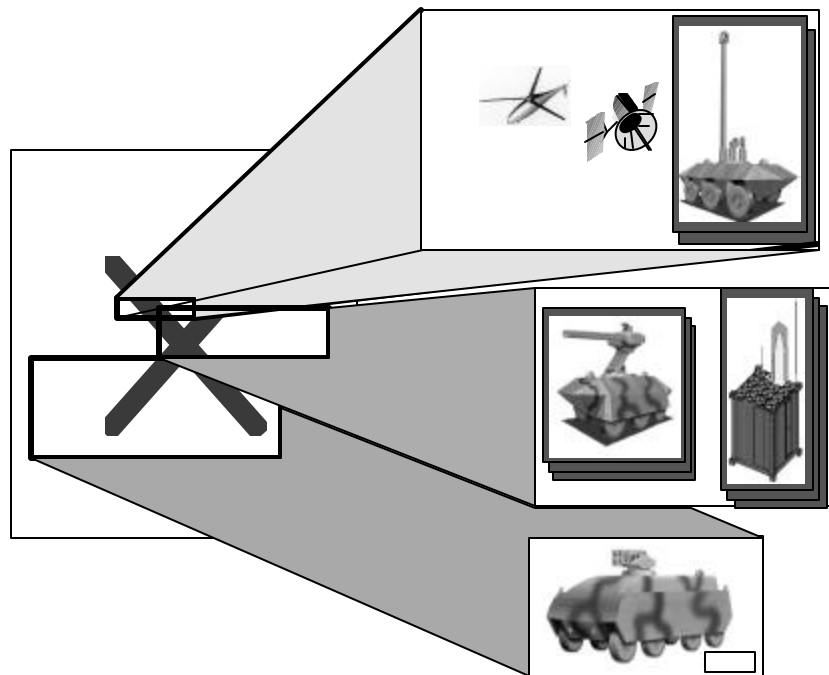
# Technical Approach



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## Network Centric Distributed Platforms

To This...



Exploit Battlefield Non-Linearities using Technology to Reduce the Size of Platforms and the Force



# What is FCS?



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**Would you recognize FCS if you saw it?**

**FCS is more like a Carrier Group, or a Bomber Group, than anything the Army has ever had.**

**FCS is a network centric, collaborative fighting entity.**

**FCS is 3-dimensional; FCS is designed to fight at Extended Ranges.**



# Technology Axioms



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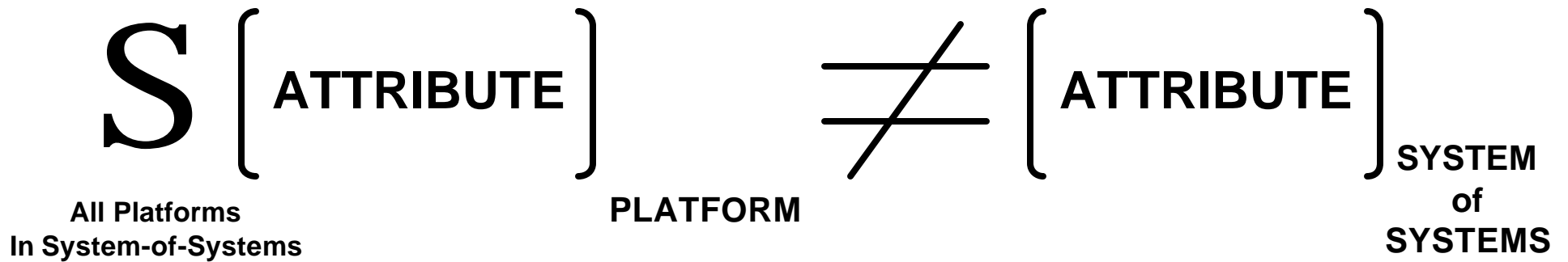
- There are ***NO OBVIOUS*** technologies for FCS.
- Many (technologies) are called, but few are chosen.
- 3) Any technology not chosen for FCS ***could still be useful*** for the Objective Force.
- 4) The goal ***IS NOT*** to be the biggest, strongest thing on the battlefield. Rather, it ***IS*** to be the smartest, fastest, ***WINNINGEST*** thing on the battlefield.
- 5) Technologies in the absence of Tactics, Techniques, and Procedures (TTPs) are certainly ***interesting***, but not necessarily ***useful*** to FCS.



# Walbert's Law



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# Theorems, Counterexamples, etc.



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## FCS is all about paradigm shifts

### 1) When is stealth not stealth?

Do I choose PM Squirrel, or PM Canada Goose?  
The Stealth Bomber

### 2) Network Centric Warfare is less about the Network, than about Networking.

### 3) Getting your technology on FCS is like getting it on an aircraft

Stringent weight/space requirements.

Your technology is *OFF* the system until proven necessary.

### 4) There is *NO* room for weight growth.



# Self-Scoring System



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## How does your technology stack up?

### If your technology:

- is labeled “for FCS” 0 points
- can be made “non-platform-centric” 2 points
- can work “on-the-move” 2 points
- will be at “TRL 6 by 2006” 2 points
- works at “extended ranges” 2 points
- is “smaller than a breadbox,  
and weighs less than a feather” 2 points \* non-tradable

### Bonus points awarded for

- Remote control capability 2 points
- Robotic-enabled capability 2 points

**10 points or more is a good score!!**



# Okay, so what technologies ARE important?



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- 1) Infostructure**
- 2) Networking Architecture**
- 3) Software**
- 3.5) Decision Aids**
- 4) Sensors**
- 5) Precision guided/smart munitions**
- 6) Materials**
- 7) The rest of the stuff**



# Technical Challenges



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- **Designing a robust, *survivable* networking architecture.**
- **Designing a robust software architecture.**
- **Systems Integration (hardware, software, network).**
- **Human/Machine Interface.**
  - Tactical use/trust of robots
  - Situational Understanding
  - Span of control of robots
- **Designing FCS for seamless technology transition.**
  - Platform/component weight ceilings are fixed
  - Block modifications/Engineering changes will be *different*
- **Demonstrating to the soldiers that FCS works.**



# Conclusions



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**We *CAN* achieve the CSA's vision for FCS,  
and for the Objective Force.**

**Achieving that vision means transforming  
the *ENTIRE* Army, including *YOUR* part.**

**The largest single barrier is *NOT* technical,  
it is mental: there is no "standard method"  
for FCS; there are no *a priori* accepted  
principles except the laws of physics.**



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