



NATO STO SCI Panel
Specialists' Meeting SCI-308
Resiliency Concepts to Enhance Preservation
of NATO Space Capabilities

Bucharest, Romania 11-13 June 2018

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THE LAND WARRIOR PERCEPTION # 1





**THE LAND WARRIOR
PERCEPTION #1**

TRANSPARENT



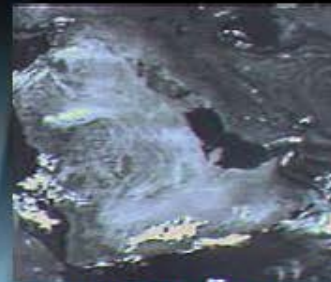
Space capabilities *in support* of operations



MISSILE
WARNING / DEFENSE



COMMUNICATION



WEATHER



NAVIGATION



PRECISION STRIKE



INDICATIONS & WARNING



INTELLIGENCE

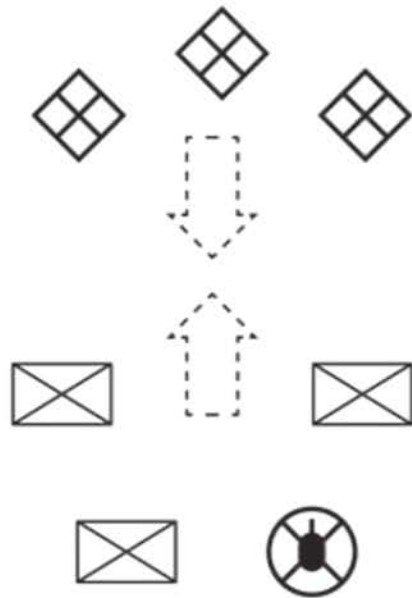


BATTLE DAMAGE ASSESSMENT

THE LAND WARRIOR PERCEPTION 4.0



Figure 3. Frontal Attack to Fix in Place



A meeting engagement occurs between two similarly sized infantry elements.
Both sides close to fix each other in place.

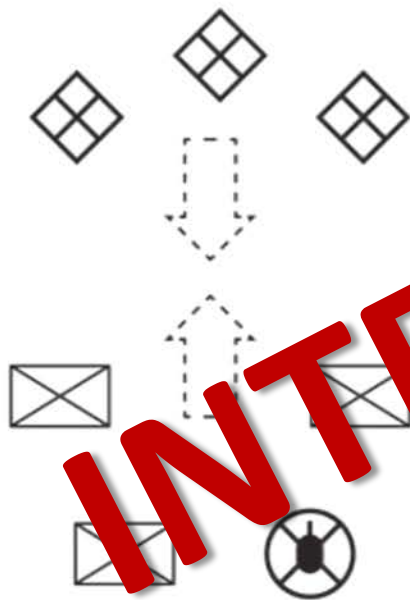


A swarm mothership occupies the center of the friendly element and releases a portion of its swarm. The Maneuver Swarm moves forward while the rearmost infantry element begins a flanking maneuver against the enemy position.

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INTEGRATED

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KEY WORDS

- ***Resiliency / Resilience***
- ***Space – Enabled** Capability*
- *Military **Operators***
- *Science & Technology **Experts***
- ***Non - Material** Developments*
- ***Continued** Access*
- *Effective **Leverage***

Some views on **resilience** - 1

- ✓ **Reliable, available** space capabilities are **critical** to military operations. What happens to the warfighter when space capabilities are not resilient?
- ✓ **Resilient** space capabilities are essential since they are very likely to be **attacked and be either degraded or destroyed**
- ✓ Resilient space means that **space capabilities must operate at degraded** levels, under stress and **rapidly recover after attack**

Some views on **resilience** - 2

- ✓ Resilience also means **alternatives to providing services** and capabilities – for example, alternative SATCOM frequencies, satellites, etc.
- ✓ Resilience must also be looked at from the functional level: **alternatives to space capabilities** must also be considered for example, using a compass for navigation when GPS is jammed

Some views on **resilience** - 3

- ✓ Users (soldiers) must be **trained in appropriate use of space capabilities under stressing conditions** so that they and their missions can be made resilient.
- ✓ Resilience in space is not only about attacks on space capabilities but also in **accommodating risks from the space environment**, engineering / system failures, operator errors, and the possibility that **political situations** result in the non-availability of some national space capabilities being provided to NATO.



Some topics to be discussed to address resilience - 1

- ✓ Understanding the problems of a **contested space environment**
- ✓ Develop adequate **policies to ensue coherence of actions** across the Alliance to jointly address resilience
- ✓ Develop **common policies to coordinate the protection of national space assets** in a contested space environment

Some topics to be discussed to address resilience - 2

- ✓ Develop **knowledge on countering threats** in the space domain
- ✓ **Accelerating the pace of innovation** to counter sophisticated adversarial threats in space
- ✓ **Role of small satellites** in enhancing global situational awareness



Some topics to be discussed to address resilience - 3

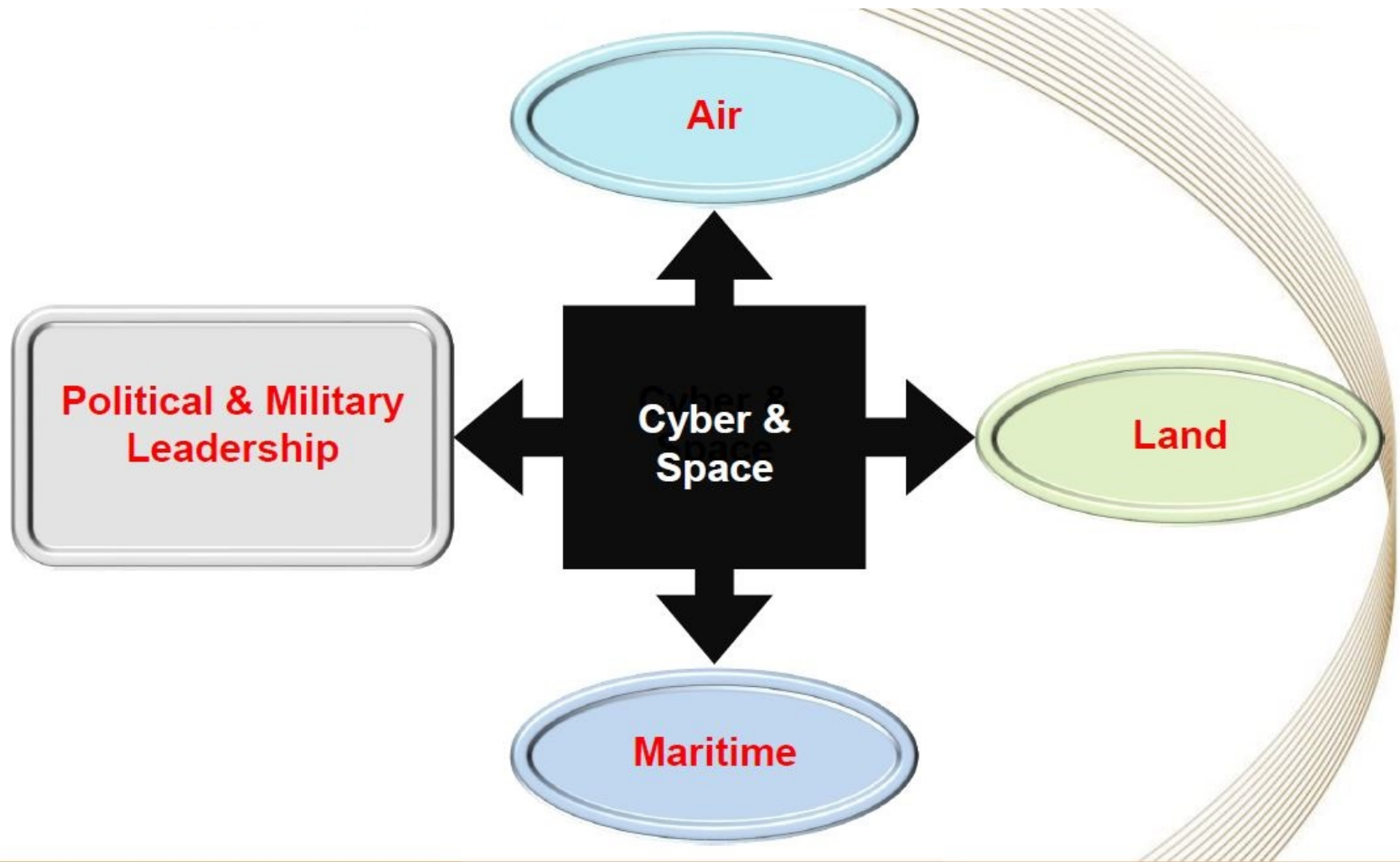
- ✓ Develop an **effective space traffic control and management**
- ✓ Increase our current capabilities for **space-based situational awareness at joint level**
- ✓ Develop increased **on-board hardening and adaptability**
- ✓ Develop a **new approach to disaggregation** of capabilities



A provocative idea: suborbital systems for resilience and more

- Traditionally two are the main domains as we leave the Earth surface: air and space
- **New (?) high ground**: between 18 and 100 Km
- **New strategic importance** due to new opportunities, lower development costs, lower operations costs
- Specific focus on applications like:
 - **air transport**
 - **access** to space
 - **scientific research** for military purposes
 - **surveillance, intelligence and reconnaissance**
 - small **satellites insertion** into orbit
 - **maintenance and refueling** of operational spacecraft

Support Vs. New Domain



A “selfish” final challenge



As Commander
of a School,
here is my final challenge to
you



How much time and effort must,
should or should not be devoted to
building an awareness and a culture
of space as a fighting domain in the
future generation of Officers?





CONCLUSIONS

- ✓ The Alliance reliance on space is seen as **a key vulnerability** by our opponents
- ✓ Most of our current space systems were **designed when space was considered a benign environment**: how much of them would survive in case of a serious and organized threat (not to mention a war that would extend into space)
- ✓ Continue to develop resilient space systems and technologies that **preserve our ability to operate from space.**
- ✓ Looking forward - we must always be thinking **15 years ahead.... Or less?**