



Finding Space to Play in Wargames

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Joint Analysis and Decision Support Group, Dstl

40 ISMOR, July 2023

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The Space Domain

Why does Space OA matter to
decision makers?
2015- 2023

Wargaming as an OA tool

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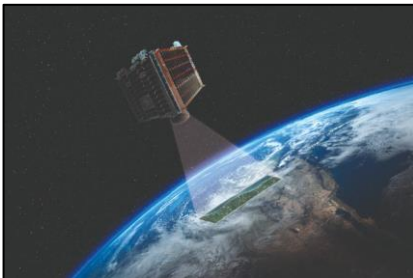


Soldier setting up satellite ground antenna
Credit: MoD, 2010

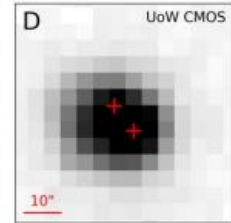
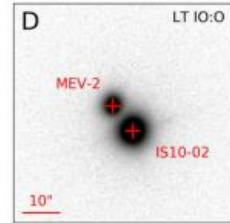
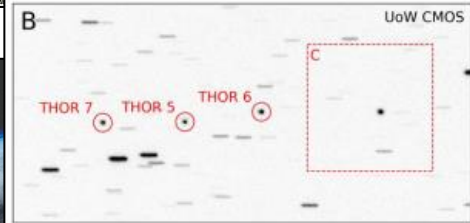
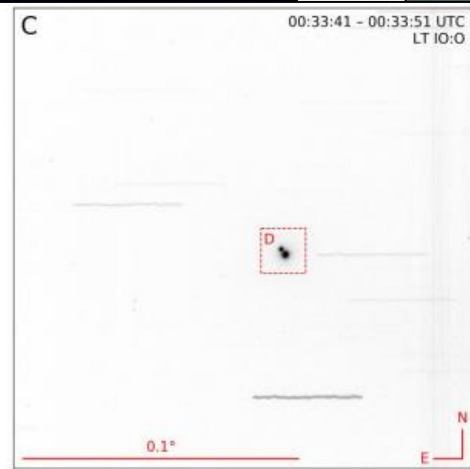
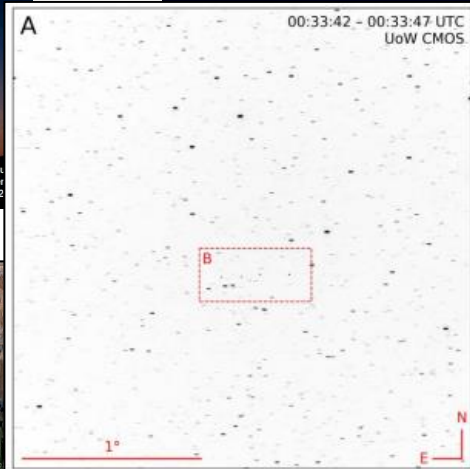
National Space Strategy, September 2021



UK Space Power (JDP 0-40), September 2022



Guidance: UK Space Command, April 2021



PHANTOM ECHOES 2: A Five-Eyes SDA Experiment on GEO Proximity Operations, September 2021

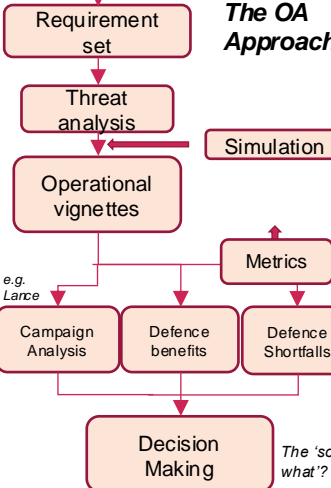
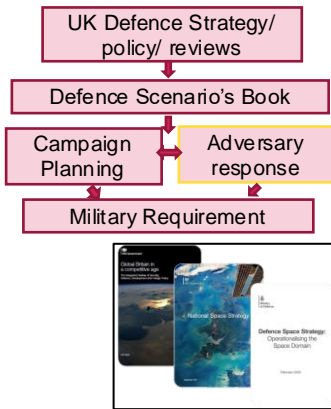


Space Primer, June 2010

UK Space Power (JDP 0-40), September 2022

Military Need

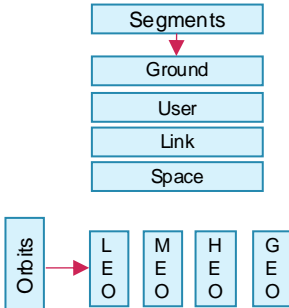
Why is space important to decision makers?



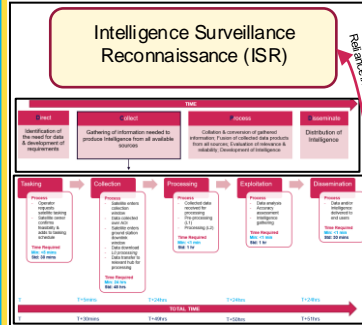
Space Domain Awareness (SDA)

- Detect, track and identify
- Threat warning
- Data integration
- Characterisation

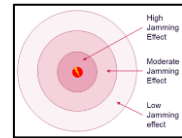
Space Control



Space support to Operations



Position, Navigation, Timing (PNT) GNSS



Missile Warning

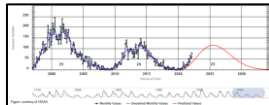
Satellite Communications (SATCOM)

- Allied
- Sovereign Skyenet
- Commercial

Hazards Space Weather



NASA, (accessed July 29/23)



	MID 20th Century					LATE 20th Century				
1st September 2017	4.7	5.0	4.9	4.8	4.7	4.7	4.8	4.9	5.0	4.7
Transmit/Receive	4	4	4	4	4	4	4	4	4	4
Service/Control	4	4	4	4	4	4	4	4	4	4
GNSS/Comms	4	4	4	4	4	4	4	4	4	4
Continuity/Link	4	4	4	4	4	4	4	4	4	4

Met Office Space Weather Operations Centre (MOSWOC)

The Roles of Space Power for Command and Control

Threats

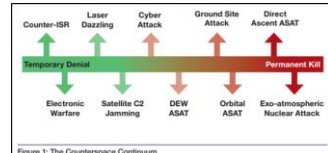
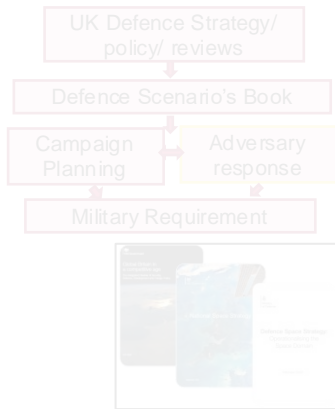


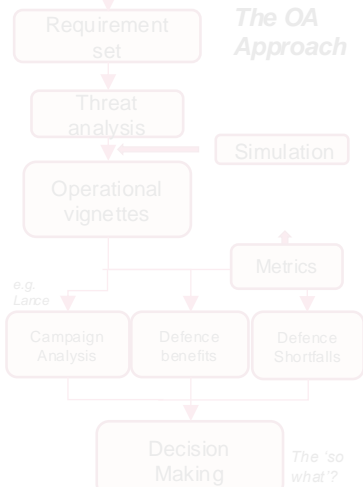
Figure 1: The Counterspace Continuum
Defence Space Strategy, February 2022

Military Need

Why is space important to decision makers?



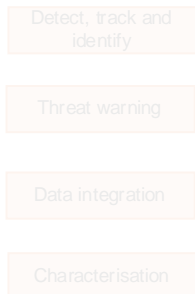
The OA Approach



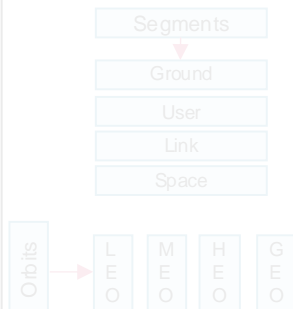
e.g. Lance

The 'so what'?

Space Domain Awareness (SDA)

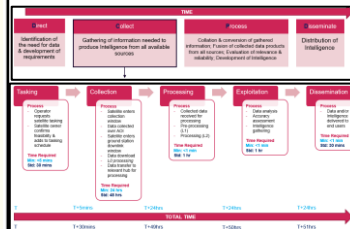


Space Control

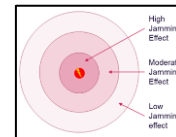


Space support to Operations

Intelligence Surveillance Reconnaissance (ISR)



Position, Navigation, Timing (PNT) GNSS



Missile Warning

Satellite Communications (SATCOM)

Allied

Sovereign Skynet

Commercial

Hazards Space Weather



NASA, (accessed July 2023)



Parameter	2020-2021	2022-2023
Maximum Solar Wind Speed	~400 km/s	~500 km/s
Maximum Solar Wind Density	~5 cm ⁻³	~10 cm ⁻³
Maximum Solar Wind Pressure	~1 nPa	~2 nPa
Maximum Solar Wind Temperature	~10 ⁶ K	~10 ⁶ K

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The Roles of Space Power for Command and Control

Threats



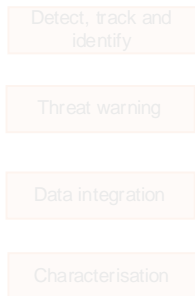
Figure 1: The Challenges of Space Power for Command and Control
Defence Space Strategy, February 2021

Military Need

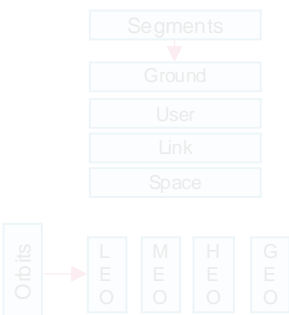
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Space Domain Awareness (SDA)



Space Control



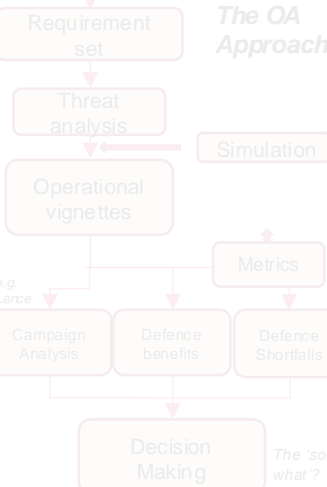
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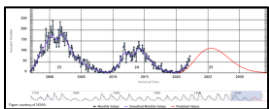
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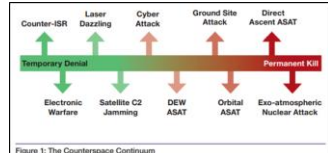


	MID 20th cycle 2				MID 21st cycle 2			
1st September 2017	4.7	5.0	5.2	5.4	4.7	5.0	5.2	5.4
Threatened Satellites	0	0	1	1	0	0	1	1
Endangered Satellites	0	0	0	0	0	0	0	0
GOES Satellites	0	0	0	0	0	0	0	0
Comments: Low risk of orbital debris impacts on high satellites.								

Met Office Space Weather Operations Centre (MOSWOC)

The Roles of Space Power for Command and Control

Threats



Defence Space Strategy, February 2022

Satellite Communications (SATCOM)



Military Need

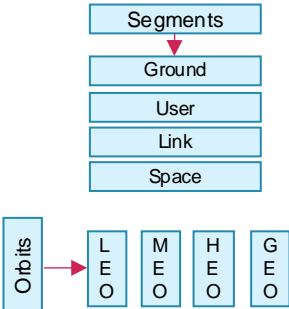
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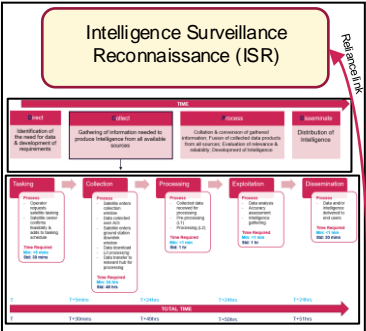
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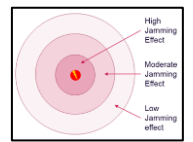
Space Control



Space support to Operations



Position, Navigation, Timing (PNT) GNSS



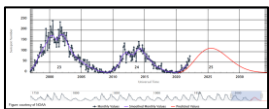
Missile Warning

Satellite Communications (SATCOM)

Hazards Space Weather



NASA, (accessed July 29/23)



	MID 20th Solar 2					MID 21st Solar 2				
20th September 2017	4.7	5.0	4.9	4.8	4.7	5.2	5.0	4.9	4.8	4.7
Transient Coronal Mass Ejections	4	5	4	3	2	5	4	3	2	1
Extreme Coronal Mass Ejections	0	0	0	0	0	0	0	0	0	0
GOES Coronal Mass Ejections	0	0	0	0	0	0	0	0	0	0

Met Office Space Weather Operations Centre (MOSWOC)

The Roles of Space Power for Command and Control

Threats

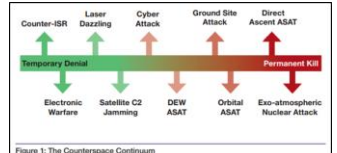


Figure 1: The Counterspace Continuum
Defence Space Strategy, February 2022

- Allied
- Sovereign Skyenet
- Commercial

The Space Domain

Why does Space OA matter to
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2015- 2023

Wargaming as an OA tool



AIRBUS

The flags of the United States and the United Kingdom are displayed side-by-side.A diagram showing a globe with several satellites in orbit, connected by lines, representing a satellite network.

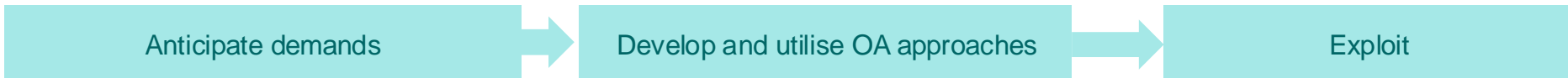
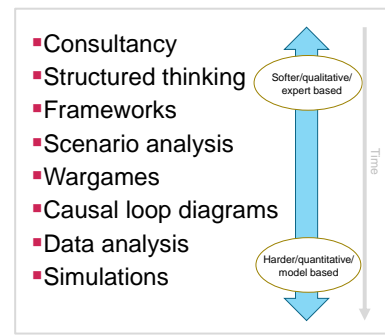
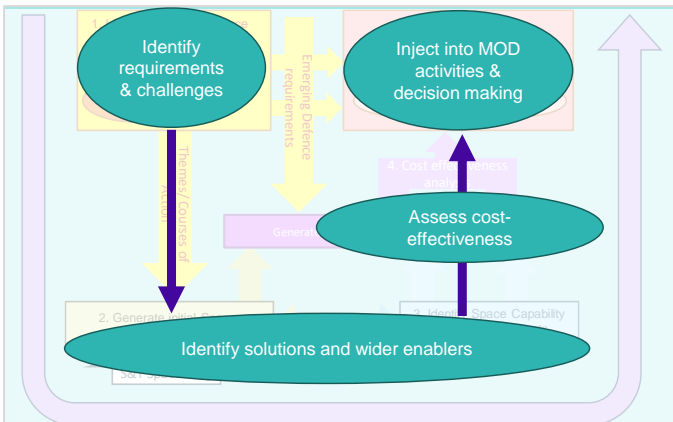
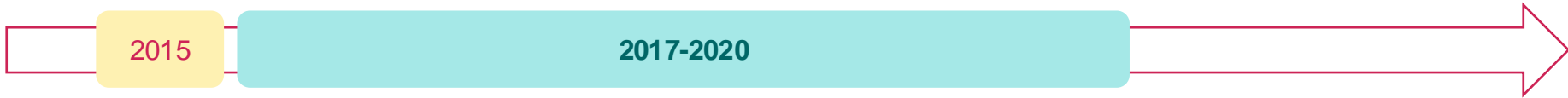
UK Military Space Primer, June 2010

The cover of the 'SDSR 2015 Defence Key Facts' document from the Ministry of Defence is shown, with a large red prohibition sign overlaid on it.

The Strategic Defence and Security Review 2015: defence facts and figures, November 2015

DST identified need to complement continuing Space S&T dev activity with OR to provide that *evidence*

Space OR Timeline - Approach





Space Cap Strategy (draft) – para 3
“The invaluable work that Dstl has carried out to provide us with evidence-based decision support into Defence’s Space enterprise highlights...”

MOD IR submission to CO – para 1
“Since then, we have undertaken science-led operational analysis and specific capability investigations into the types of space systems Defence needs.”

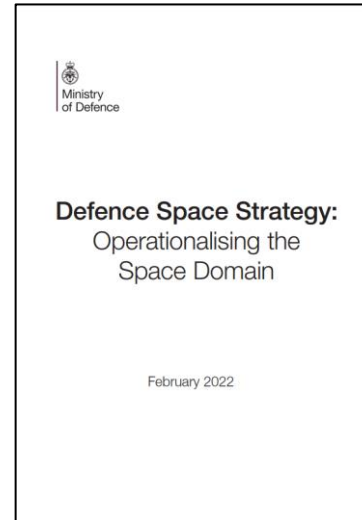
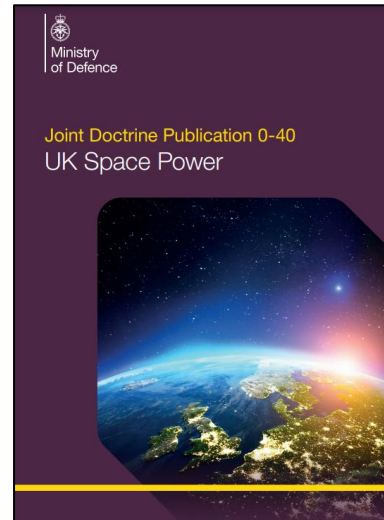
MOD BOI– para 3
“We have undertaken 5 years of focused, science- led operational analysis (OA)...”

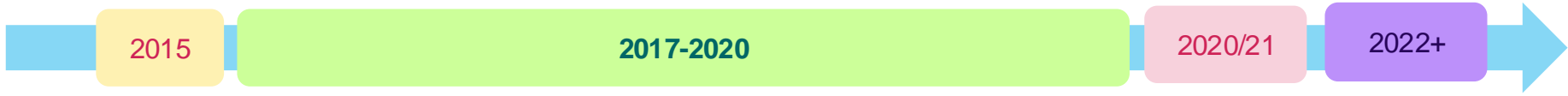
Why should space matter to decision makers?

IR21 led to significant increase in MOD Space allocation

- £1.4B over 10 years
- ISTAR1 programme, along with investments in Space Ops and SDA, to complement SKYNET
- Formation of UK Space Cmd

“Space is a key enabler for Defence operations and is now an operational domain in its own right. It is also fundamental to our aspiration to integrate across those five domains.” - UK National Defence Space Strategy February 22





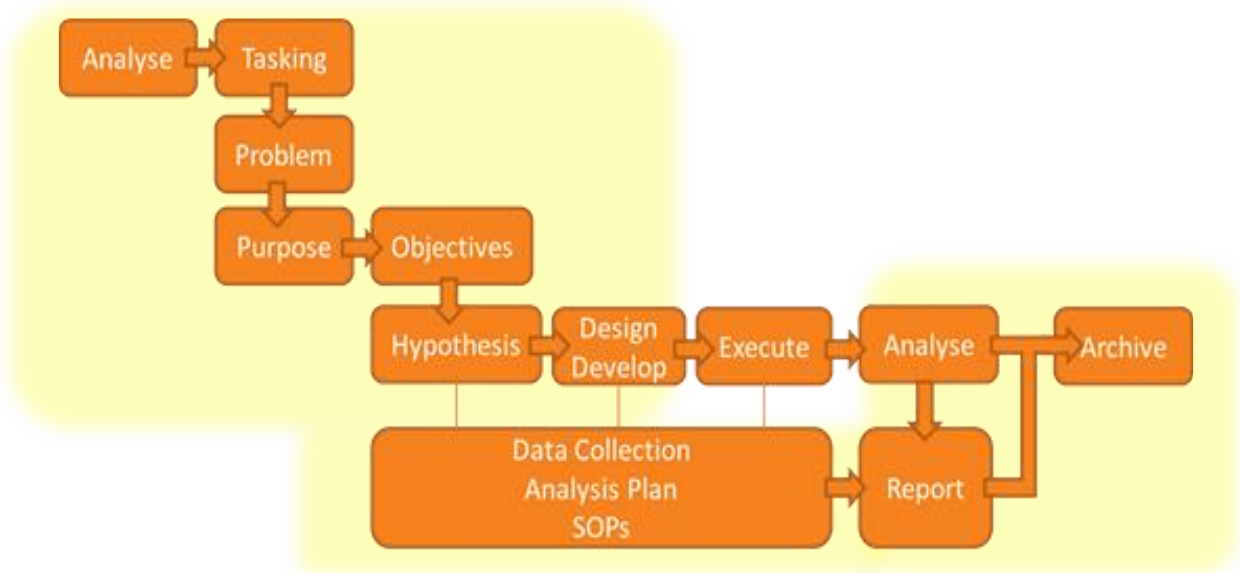
Now and the future:

- Working with SpaceCmd to normalise OR demand/utility
- Continuing to support S&T concept development
- Sustaining and develop OR capabilities
- Continue to be responsive to short-term demands and requests

The Space Domain

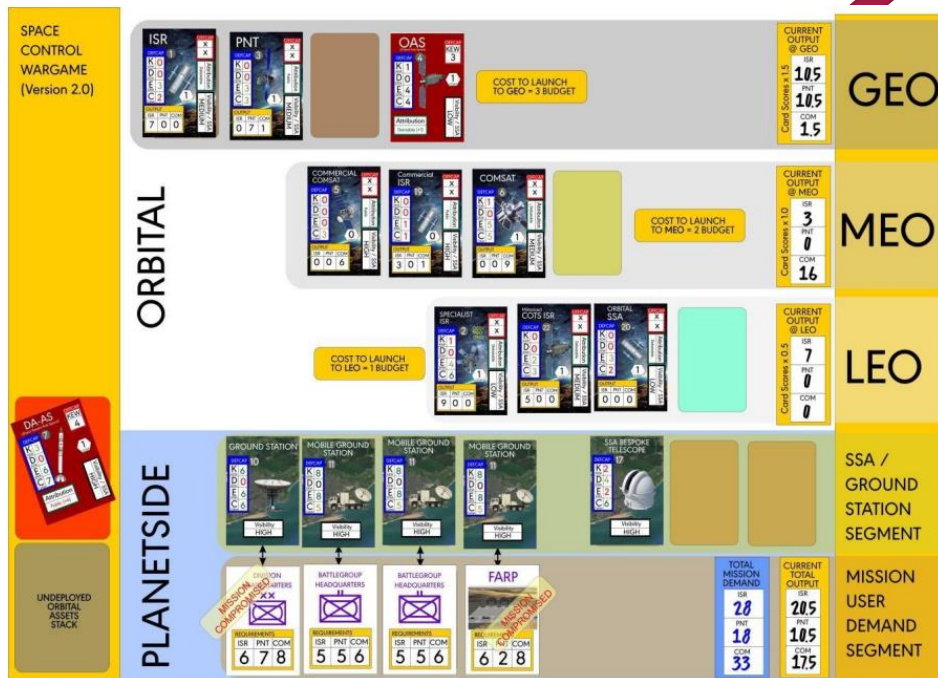
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Wargaming: What are we trying to achieve?

	Creating knowledge	Conveying Knowledge	Experiential/Engagement
Unstructured problem	Discovery Games	Educational Game	Role-playing games
Structured problem	Analytical Games	Training Games	Commercial games



Strengths:

Flexible, scalable, deployable, focused

Challenges:

Tactical limitations, complexity 'for the sake of it'

Walman, JG, Marston, CA: *SPEEDS: Exploring Space Control through wargaming- Game Designer notes* (March 2021)

- Primary large military UK wargame is PFT9
 - PFT: MOD Centre (FMC CapStrat) led activity (with extensive Dstl support) to explore ability of anticipated/planned force structure against specific policy requirements
- Up to 2018, Space has not had strong representation within such activities
- Since 2018, Space OA has endeavoured to provide support to
 - PFT7: + generation of assumptions; provision of SMEs into adjudication
 - PFT8: + direct support to associated variation analysis; Rainbow Cell; COA review
 - PFT9:

Planned Force Testing 9:

- **Medium scale intervention**
- **Investigate** Defence's force elements across the **5 domains** (Land, Air, Maritime, Cyber and Space)
- Generate **evidence** on the strengths and weaknesses of the **force structure**
- Operate turns after the Execute phase through a **simulated model** to give **analytical** outputs

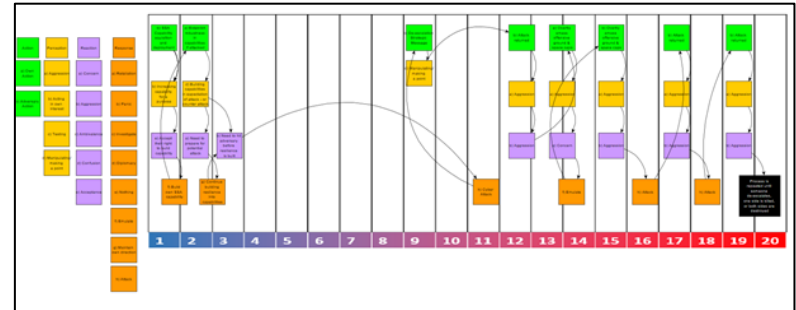
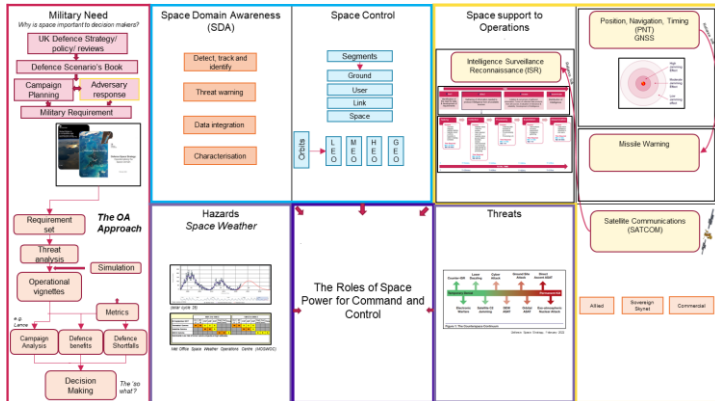
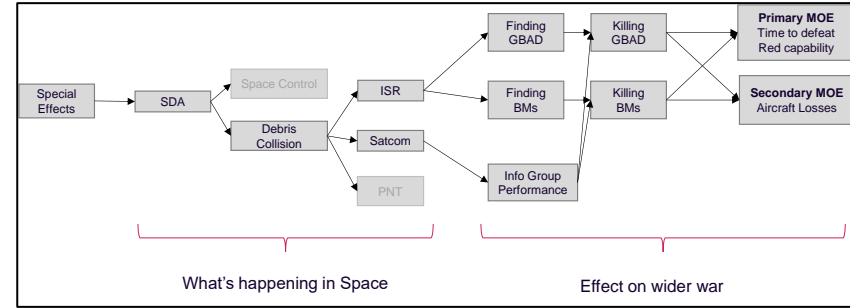


Mechanisms for Space- PFT9

Space Based ISR
Space Based ISR
Space Based ISR

Description	Commercial multispectral electro-optical imagery.
Access Threshold	Priority
Level of Assurance	High
Resolution	Medium
Cost	£

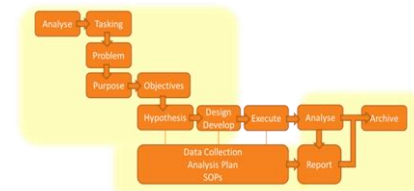
ISI
ISF
ISR-01



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NB: Illustrative examples

- Co-operation
- Doctrine
- Understanding
- Priorities of the game overall
- Classification debate
- Involved in whole process
- Wargaming as a means to an end



The Space Domain

*Provides critical information services for all operations.
Underpinned by Space Domain Awareness and Operations*

*Why does Space OA matter to decision makers?
OA has proven to be a key source of evidence and
understanding of Space as a military domain*

Wargaming as an OA tool

*There have been developments of Space representation through
small to large wargames, including PFT iterations, but still got a
way to go*

- Aaron Tinney (July, 2023) *Daily Star: China's cosmic moon nukes*
 - “New arms race mining space rocks to make super weapons”

[dstl] The Science Inside

Discover more



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