



AOC

AUSTRALIAN CHAPTER



**Nova
Systems**

100% Australian owned and controlled

Russian SAMS: Overview


[Florian <Flo> Sindel, C4ISREW Solution Architect]

follow-on discussion

Comprehensive Battlefield Guide of
Russian Surface to Air Missile (SAM) Systems

AOC 18 Sep 2025 [[Registration](#)]

[Agenda]

- recap of Mr. Stephen Olguin Comprehensive Battlefield Guide of Russian Surface to Air Missile (SAM) Systems
- ... continuing the conversation
 - countermeasures
 - adaptation for 'drone warfare'
- derived relevant concepts
 - conventional capability and modern warfare
 - threat  countermeasure cycle

follow-on discussion – Comprehensive Battlefield Guide of Russian Surface to Air Missile (SAM) Systems

- Planning errors and misconceptions
 - under- and/ or over-estimation
 - ... more than just a circle...
- Physics and Threat comprehension
 - RF (EMS) principles
 - Radar horizon vs. detection range
- Jamming – so what?
 - layered/ Multi-Domain effects

Contents

- Misconceptions and Planning Errors
- Radar Basics
- Missile Guidance Basics
- SAM Systems
- Jamming Effects (So you've jammed them, now what?)
- Conclusion



Conclusion

Identification of Sam Systems

- Know how to ID each SAM system
- Know how to ID each variant of each SAM system
- Know capability differences between variants

Correlation

- Know which ground formations are associated with each SAM system
- Know which radars are associated with each SAM system

Range/Altitude

- Advertised max ranges and missile flight parameters are in many cases irrelevant
- Reduced range for low RCS, maneuverable aircraft
- Reduced range for low altitude targets
- SAMs are limited by line of sight (Terrain Masking, Horizon)

Jamming and EW

- Jamming is not a silver bullet solution
- Know if and how jamming effects each SAM system

continuing the conversation...

Q: What is your opinion of **cross polarization** as a **soft kill mechanism** to protect against SAM systems? Have you seen increased interest in this area?

Q: The next question is, what is the **best radar for killing drones** today in the Ukraine?

A: [...] at the time [not] designed for some of those smaller, slower flying, low altitude drones that were hitting it.

[...] what we're doing now is all over the world really is trying to upgrade our systems to [counter Drone], rather than focusing on manned aircraft, [...]

Russian SAM Systems

MANPADS	Infrared	SPAAG (Self Propelled Anti-Aircraft Gun)	Short Range Radar	Medium Range Radar	Long Range Radar
 Strela-2 (SA-7)	 Strela-1 (SA-9)	 ZSU-23-4 "Shilka"	 Osa (SA-8 Gecko)	 Kub (SA-6 Gainful)	 S-300P/400 (SA-10/20/21)
 Strela-3 (SA-14)	 Strela-10 (SA-13)	 2S6 Tunguska (SA-19)	 Tor (SA-15 Gauntlet)	 Buk-M1 (SA-11 Gadfly)	 S-300V (SA-12/23)
 Igla (SA-16) (SA-18) (SA-24)	 Laser Beam Riding Sosna-R (SA-X-25)	 Pantsir (SA-22)		 Buk-M2 (SA-17 Grizzly)	 S-350 (SA-28)
 Verba (SA-29)				 Buk-M3 (SA-27 Gollum)	

Effects of Jamming

MANPADS	Infrared	SPAAG (Self Propelled Anti-Aircraft Gun)	Short Range Radar	Medium Range Radar	Long Range Radar
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No Change Search: Degraded Engagement: No Change Search: Degraded Engagement: Degraded Search: Neutralized Engagement: Neutralized
 Assuming radar is successfully jammed, and SAM can use backup EO tracking or alternative engagement method

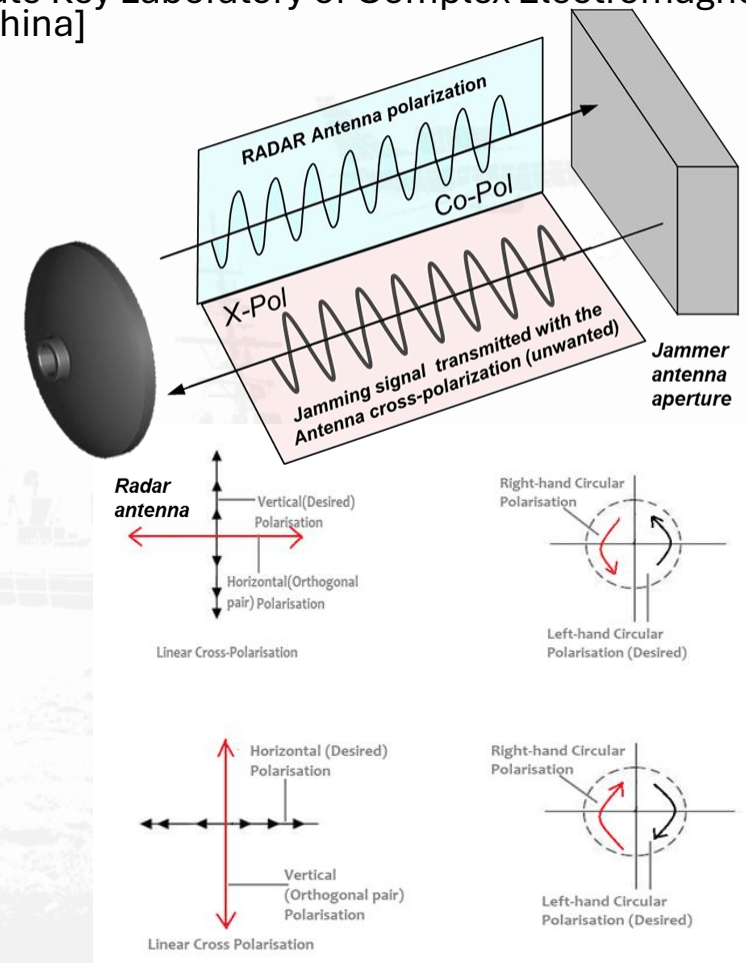
Cross Polarisation as Soft Kill ?!

[Cross Polarization Jamming and ECM Performance of Polarimetric Fusion Monopulse Radars; [Cross Polarization Jamming and ECM Performance of Polarimetric Fusion Monopulse Radars | SpringerLink](#); State Key Laboratory of Complex Electromagnetic Environment Effects on Electronics and Information System, 2020, Luoyang, China]

- **(Monopulse) Radar systems** often use a specific polarization (linear, circular, etc.) for both transmission and reception.
- **Countermeasure systems** can emit or reflect signals with a polarization orthogonal to the radar's.
- Many radar receivers are designed to **filter out or ignore signals with the "wrong" polarization**, so cross-polarized returns are significantly attenuated or rejected.
- The radar **may lose track of the target or receive misleading information**, reducing the effectiveness of radar-guided weapons or surveillance.

Cross-polarization to cause angular measurement errors in the monopulse radar by radiating a jamming signal that is polarized orthogonally with respect to the polarization of the radar antenna.

[[Anti-Monopulse techniques - Cross-polarization - EMSOPEDIA](#)]



Killing (countering) drones ?!

Establishment of the drone threat on 'global scale':

- Expedited technology modernisation cycles
- Industrial scalability
- Expandability of assets

... different perspectives...

"I'm personally not convinced that the UAV business is as big as a lot of people think," Papperger [Rheinmetall CEO] said in an interview at the Defence and Security Equipment International fair in London. "I believe that the UAV business could be a big bubble."

[\[Military Drones Could Be Defense Industry's Big Bubble, Rheinmetall's CEO Says\]](#)

Counter Drone – quo vadis (where to from here) ?

... derived concepts

- conventional capability and modern warfare



conventional capability and modern warfare

Trench warfare

[\[Dig or Die: Trench Warfare in the 21st Century\]](#)

Artillery shelling

[\[Russians intensify artillery shelling in southern Ukraine – Voloshyn\]](#)

...

- Traditional Constituents - FICs
- Defence Programs
- Posting Cycles

...

VS

Multi Domain Operations

[\[Multi-Domain Operations in NATO - Explained - NATO's ACT\]](#)

Autonomous Warfare

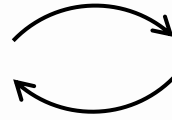
[\[ARTIFICIAL INTELLIGENCE'S GROWING ROLE IN MODERN WARFARE - War Room - U.S. Army War College\]](#)

...

- Artificial Intelligence, Machine Learning, Cyber, Digital Mission Engineering, Quantum, ...
- Speed to Capability
- Defence Industry partnerships (As a Service)

...

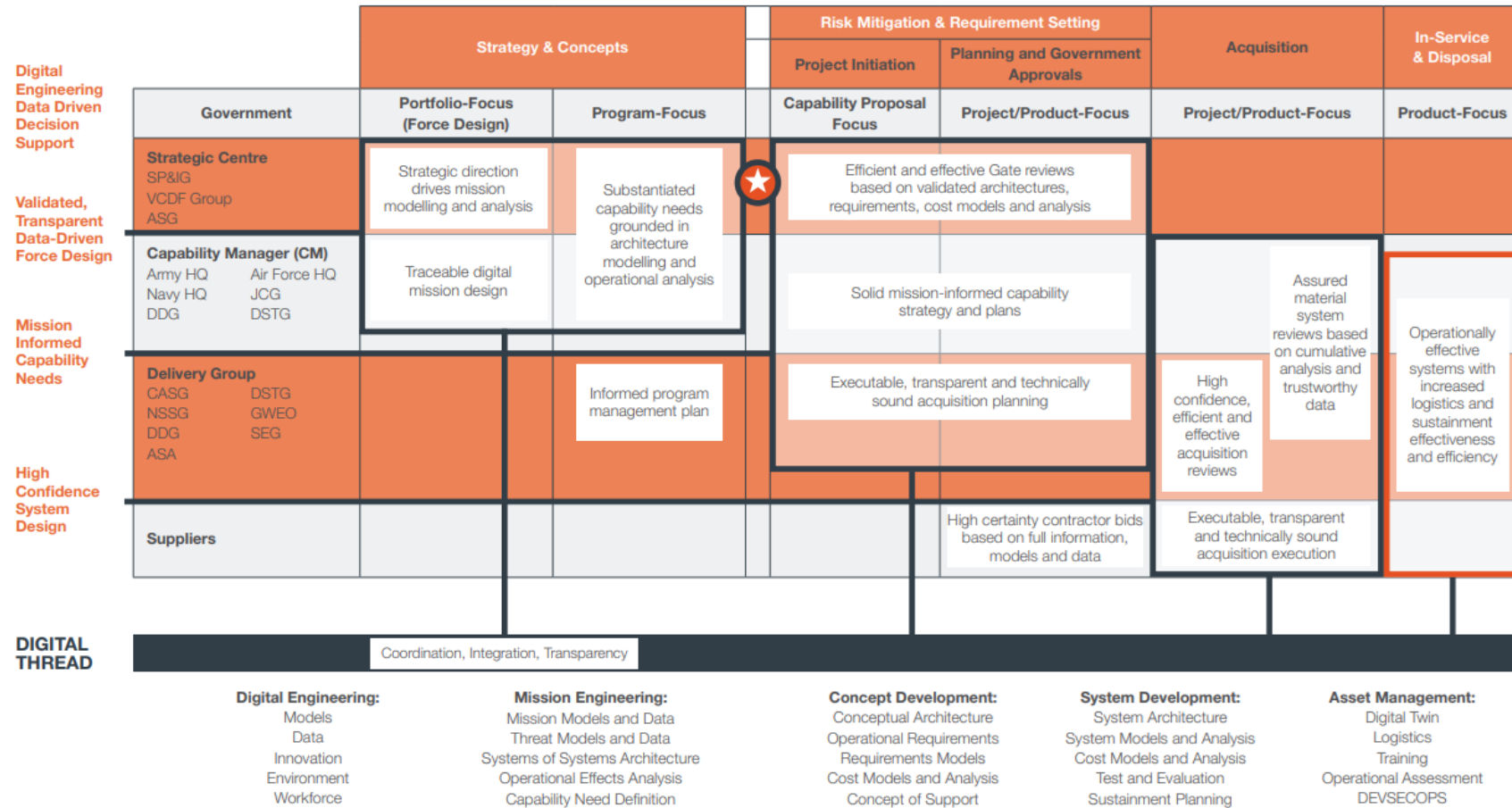
continuous threat



countermeasure cycle



Conceptual digital engineering capability lifecycle model



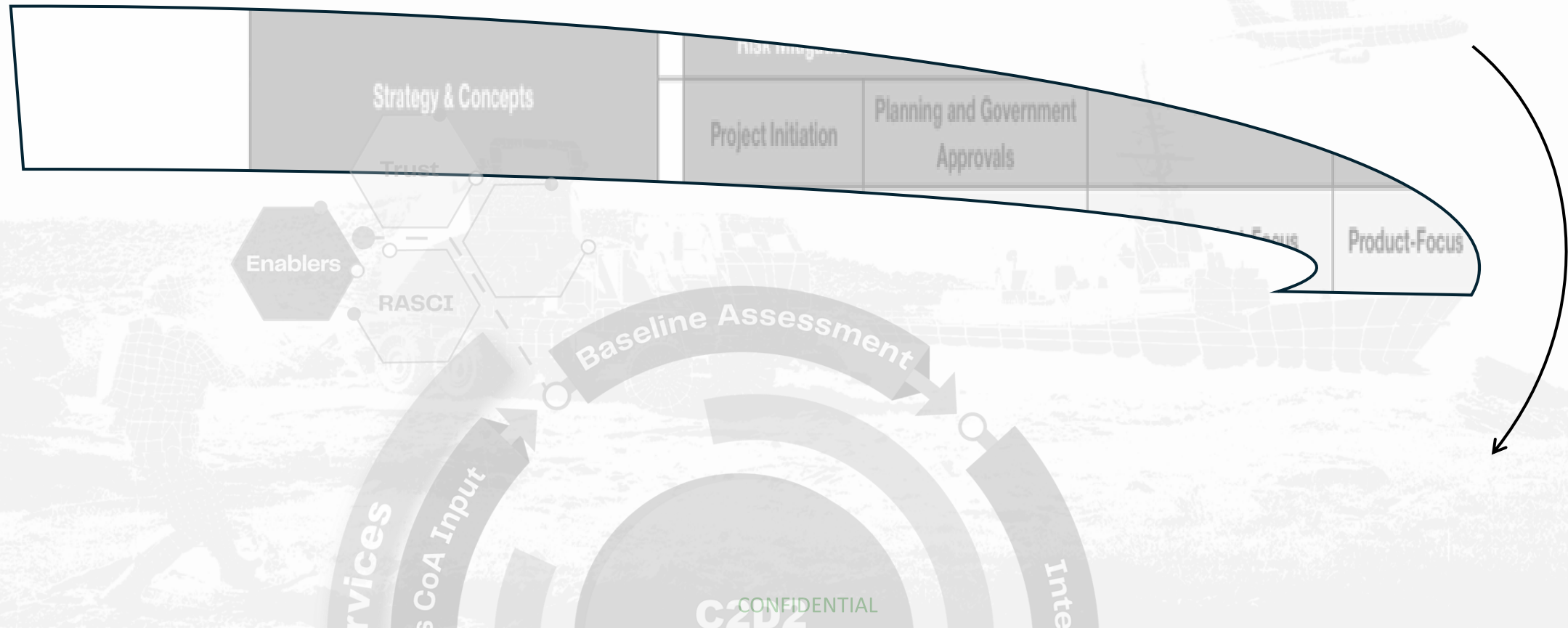
SP&IG = Strategy, Policy and Industry Group
VCDF = Vice Chief of the Defence Force
ASG = Associate Secretary Group
HQ = Headquarters

JCG = Joint Command Group
DDG = Defence Digital Group
DSTG = Defence Science and Technology Group
CASG = Capability Acquisition and Sustainment Group

NSSG = Naval Shipbuilding and Sustainment Group
GWEO = Guided Weapons and Explosive Ordnance
SEG = Security and Estate Group
ASA = Australian Submarine Agency

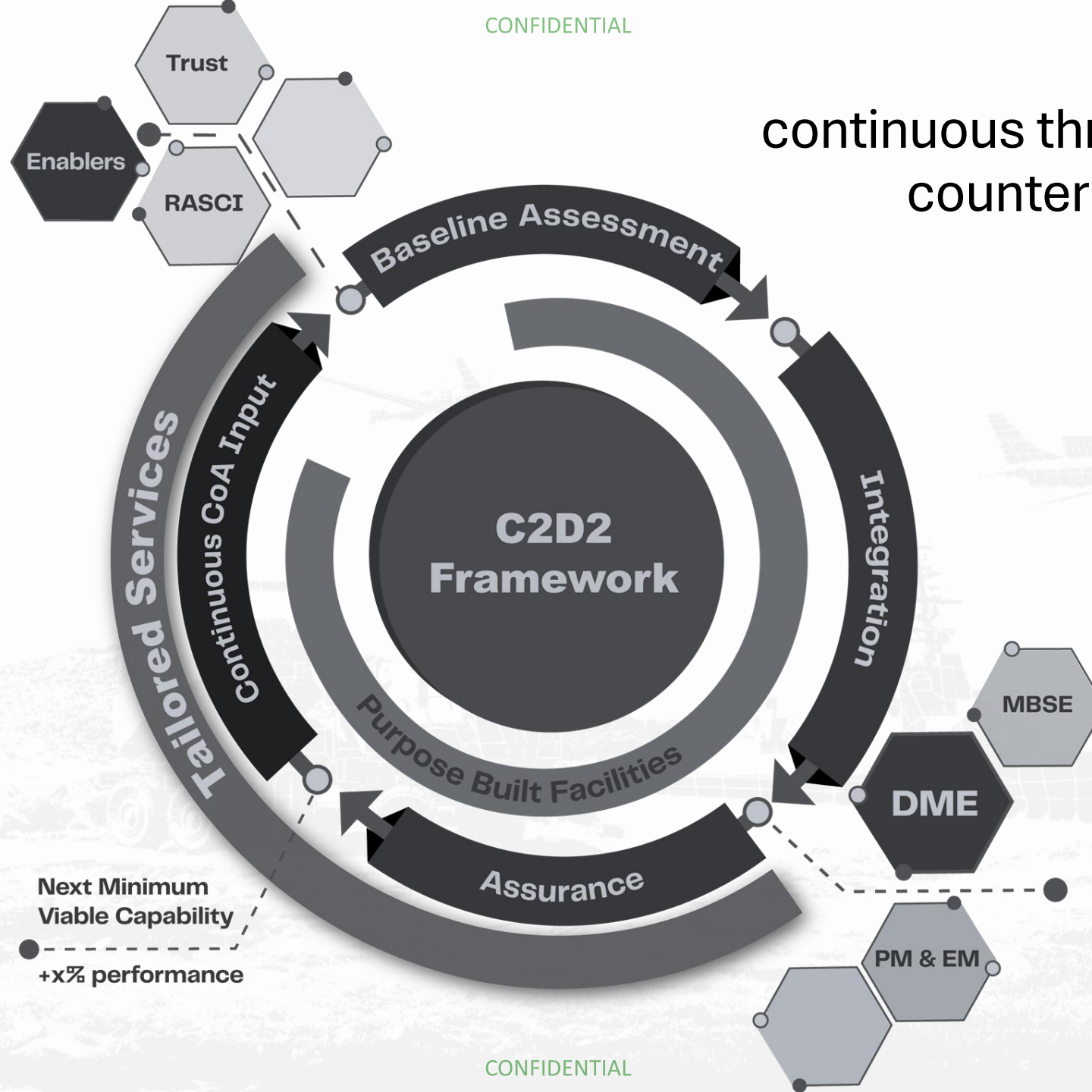
continuous threat countermeasure cycle

	Strategy & Concepts		Risk Mitigation & Requirement Setting		Acquisition	In-Service & Disposal
			Project Initiation	Planning and Government Approvals		
Government	Portfolio-Focus (Force Design)	Program-Focus	Capability Proposal Focus	Project/Product-Focus	Project/Product-Focus	Product-Focus



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continuous threat
countermeasure cycle



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Thank you



[Florian <Flo> Sindel, C4ISREW Solution Architect]

sources

Comprehensive Battlefield Guide of Russian Surface to Air Missile (SAM) Systems; AOC 18 Sep 2025; [Registration](#)

Cross Polarization Jamming and ECM Performance of Polarimetric Fusion Monopulse Radars; [Cross Polarization Jamming and ECM Performance of Polarimetric Fusion Monopulse Radars | SpringerLink](#); State Key Laboratory of Complex Electromagnetic Environment Effects on Electronics and Information System, 2020, Luoyang, China

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