



AUSTRALIAN  
DEFENCE FORCE

# Considerations for Manufacture and Prototyping of Explosive Ordnance

Discussion Panel:

Dr Michael Sharp – Research Leader Adv Propulsion & Wpn Effects, DSTG

Dr John Reid – Principle Explosive Safety Advisor EOB

Mr Dion Habner – Managing Director Australian Munitions

COL Tony Watson – Director Test and Evaluation GWEO Enterprise

Hosted By

MAJ Roger Brinkworth  
Technical Staff Officer – Army  
Directorate of Ordnance Safety

MAJ Christopher Donaldson  
Deputy Chief Engineer  
Land Explosive Ordnance Systems  
Project Office



# Scope

- Manufacturing Ecosystem
- Explosive Safety Considerations for Prototyping & Manufacture
- Discussion Panel Q&A



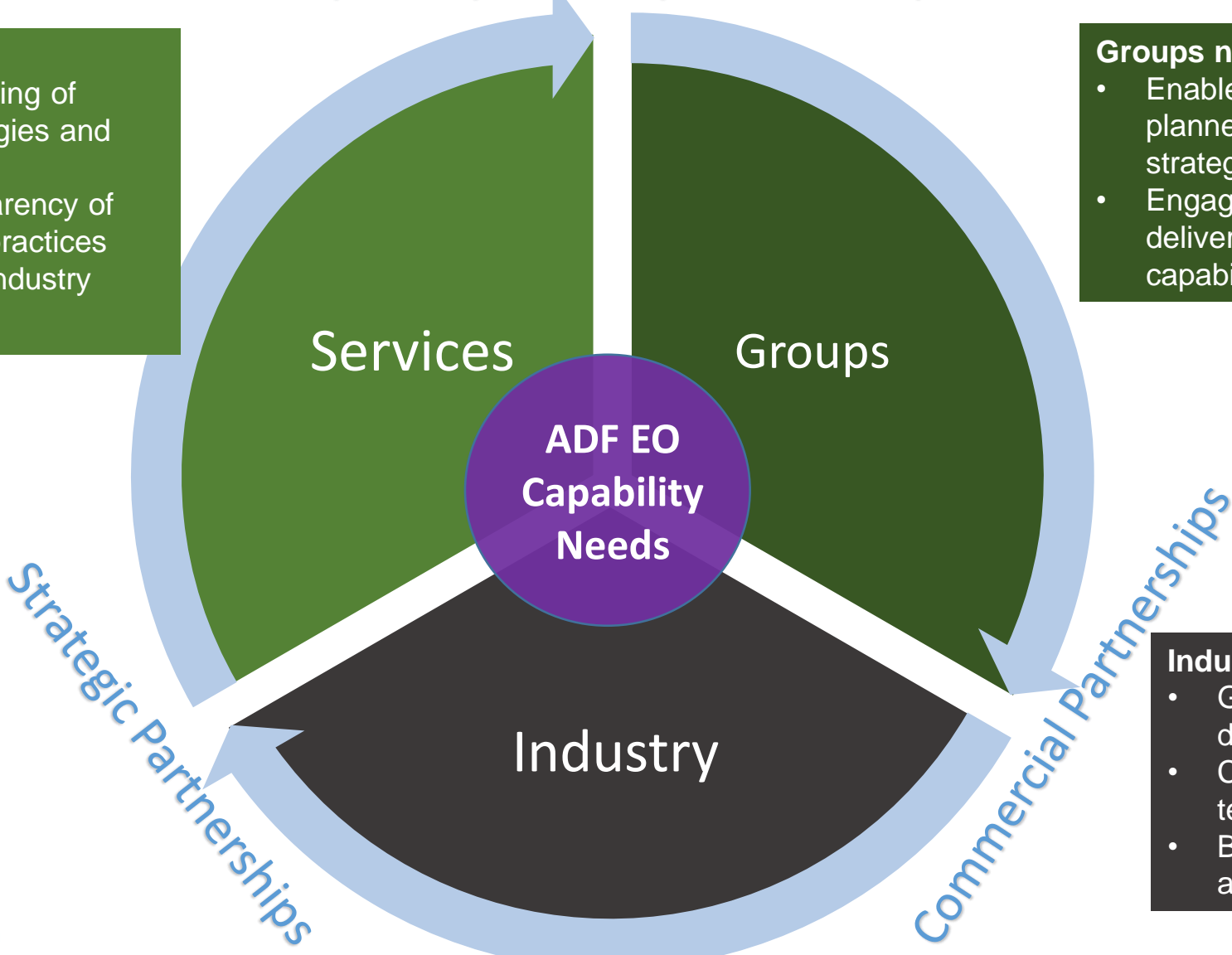
# Relationships for Manufacture

## Capability Delivery Partnerships

- Services need to:**
- Gain an understanding of innovative technologies and opportunities
  - Improve the transparency of Defence business practices
  - Better understand industry partners.

- Groups need to:**
- Enable capability through well planned and detailed acquisition strategies
  - Engage and support industry to deliver, sustain and dispose of capabilities.

- Industry needs to:**
- Gain insight into Defence capability development priorities
  - Continue to innovate and explore new technologies
  - Be able to position their capabilities and workforce for the future



# The EO Safety Goal

- ESRF - Outcome focused, Principle based



## EO Safety Objective:

*The elimination or minimisation SFARP of all EO hazards and risks within the context of operational effectiveness, time and cost **throughout all phases** of the CLC*

(Explosive Ordnance Safety Strategy 2017-21)

- The fundamental concepts to control the Explosives Safety Hazard are applicable to Prototyping and Manufacture



# Manufacturing and Prototyping Considerations

- EO development is unique to military application
  - no other industry has similar requirements
  - The services and industry work closely with DSTG to develop the capabilities for a future ready force
- Emergent technologies applied to EO
  - relevant to Defence
  - rapid development is needed to respond to requirements
- Not just proof of concept and performance
  - Reliability considerations and safety testing requirements to introduction into service should be considered during development and industrialisation

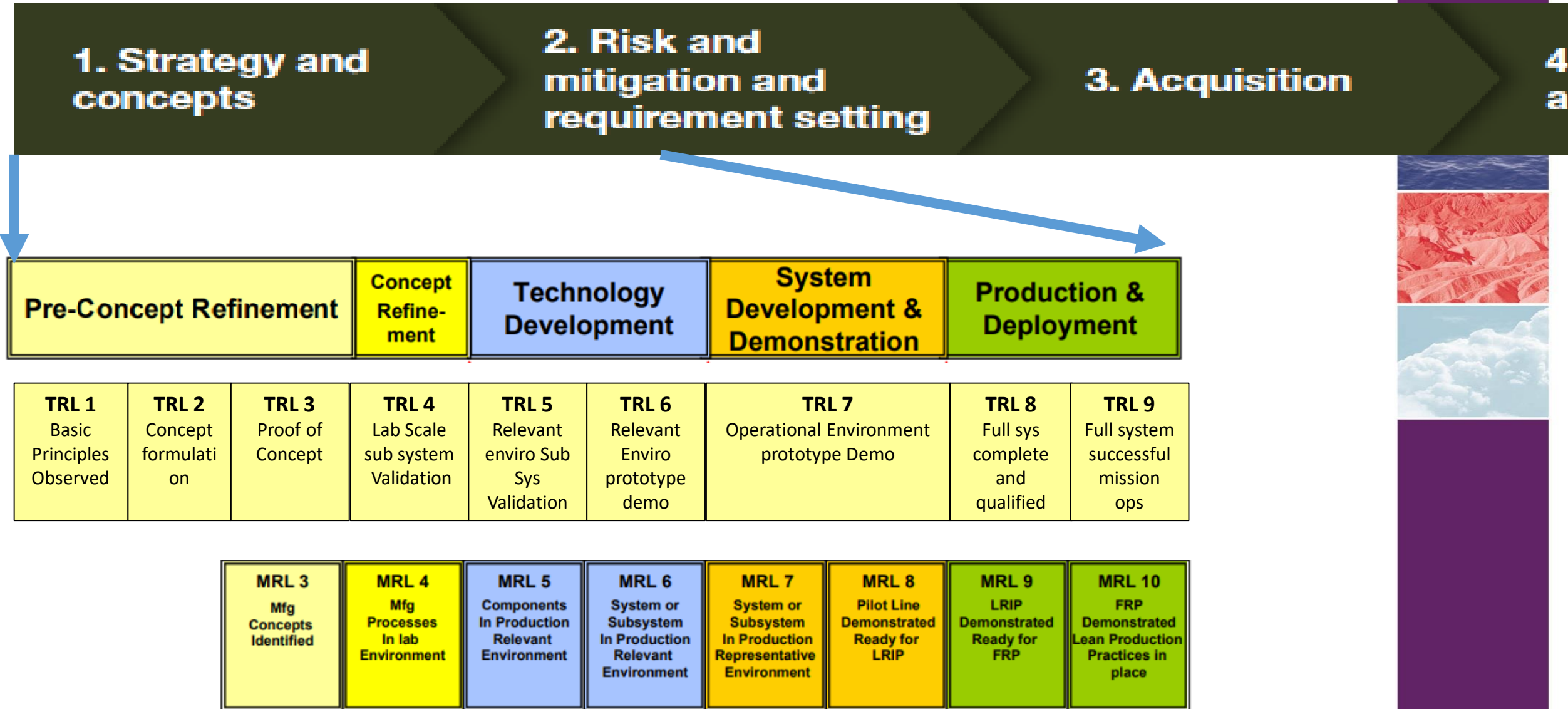


# Proof of Concept Design Vs. Product Design

- Proof of Concept Design (the R in R & D)
  - Focuses on performance
  - Technology Readiness Levels (TRLs) can help assess the performance maturity – but its not the end of the story
- Product Design (the D in R & D)
  - Should Focus on manufacturing and Safety considerations
  - Well defined requirements for cost, safety, performance, size, reliability, maintainability, etc



# Manufacturing Readiness Levels Relationships





# Who else does Prototyping & Manufacture

- U.S. Army Combat Capabilities Development Command Armaments Centre:
- Unique Safety Requirements of Munitions
  - Must be both safe and lethal, just not at the same time
  - Must be safe to manufacture, handle and transport at all times
  - High Reliability Requirements
    - Items are mission and safety critical
    - Energetic items cannot be 100% tested but are expected to work 100% of the time
- Human factors
  - Experience, Competence and qualification Influences Time to Market
  - The workforce will always undergo turnover so where does EO experience come from?
  - Our public educational institutions do not teach students how to make munitions





# Explosive Safety – Speed hump or welcome passenger?

- **Manufacture and Prototyping activities involve**
  - The explosives safety goal
  - **it's the LAW!**
- **ESRF Principle 2.**
  - All capability systems that involve explosives and munitions and the activities associated with **research and development**, procurement, **manufacture**, handling, maintenance, storage, transfer, testing, transportation, operation, firing (in trials, training or use) or disposal of explosives and EO must be developed, authorised and conducted in accordance with the applicable Service or Group Safety Management System and Defence Security Principles Framework (DSPF)





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