

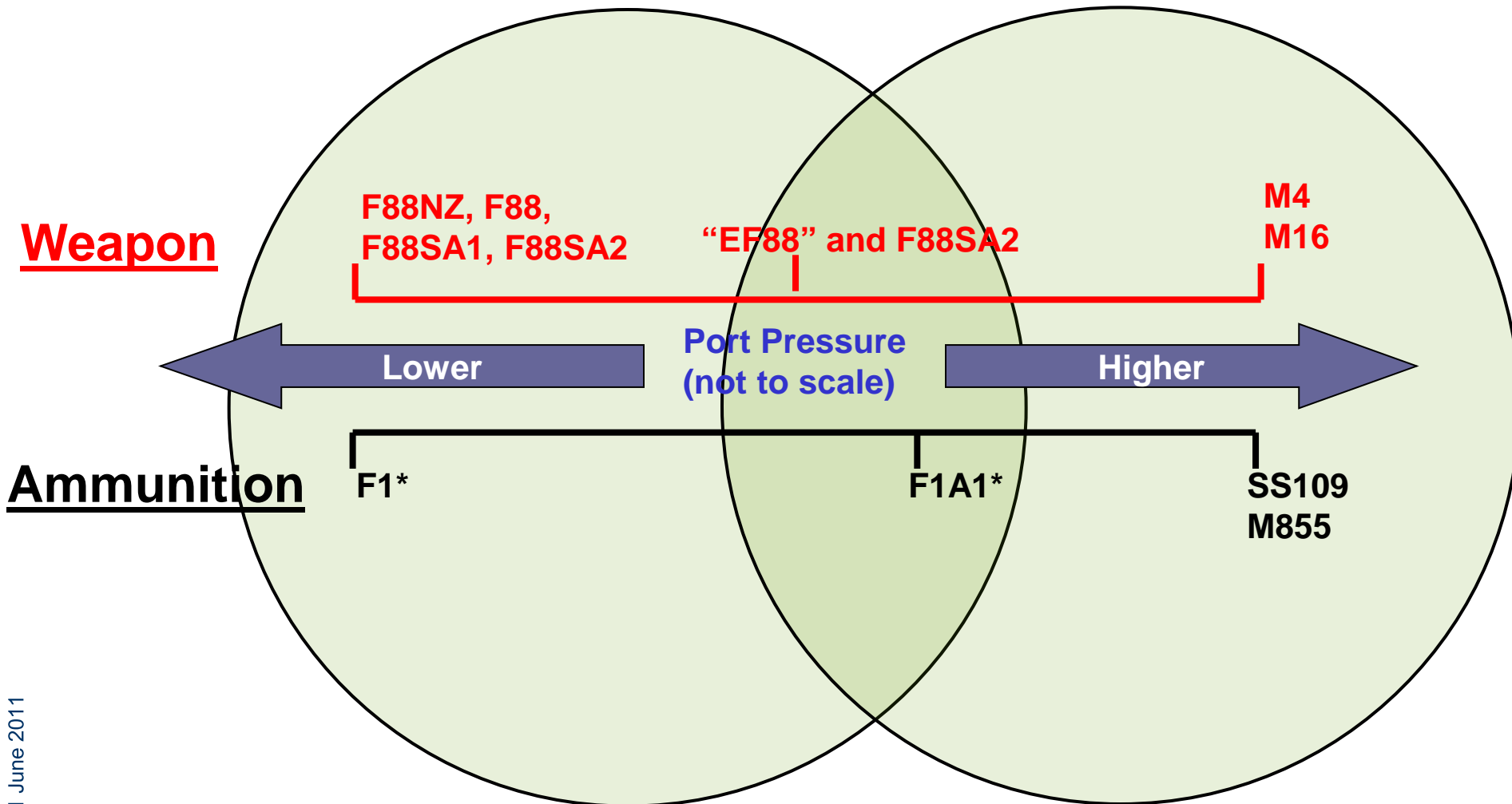


## Improving In-Service Small Arms Systems – An Australian Experience

1 June 2011

- *Mr Collin Galvin* – Chief Engineer Armaments Australian DoD
  - ▶ All engineering for Australian Defence Forces Small Arms up to 40mm and the Javelin Missile System.
- *Graham Evenden* – Soldier Systems Development Manager:
  - ▶ Thales Australia:
    - ▶ Employs circa 6,500 people.
    - ▶ OEM for Small Arms & Ammunition.
  - ▶ Small Arms Test & Evaluation.
  - ▶ Soldier Systems Business Development.

- ▶ Increasing demands on Defence whilst under increasing **budget pressures**
- ▶ Multi national operations resulting in a need for enhanced **interoperability**
- ▶ Higher tempo of operations resulting in a need for increasing **reliability**
- ▶ No off the shelf **technologically** advanced solutions available providing a step capability improvement
- ▶ All of these factors has resulted in the need to do more with current systems



1 June 2011

\* Offers Ballistic Temperature Stability (-46C - +71C, -50.8F – 159.8F)

- Interoperability
  - ▶ Australian 5.56mm ammunition Natures (F1, F1A1) and US M855 ammunition types.
- Reliability
  - ▶ The improved Australian 5.56mm assault rifle (AUF88SA2) – what and why.
- The Immediate Future (considering Technology)
  - ▶ The Future Australian assault rifle EF88 and Project Land 125 Phase 3C.

Green Tip Painting applied to denote SS109 type ammunition

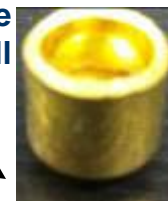


Current F1 projectile profile optimised. Improved tip diameter (Meplat) & modified Boat tail length



Current F1 Case bridge and wall thickness optimised to increase internal case volume, to allow the use of more progressive propellant

A new cup design with a lower base thickness to achieve optimised bridge and wall thickness on the Case.



Propellant AR2210 manufactured within a specific sub-set of the current specification to achieve increased port pressure, while maintaining AR2210's excellent BTI

Current F1 Cartridge components/parts optimised to meet interoperability requirements and improve performance.

Trajectory match with NATO reference, improved port pressure for optimisation in the M4 with no deterioration in performance in the F88

Propellant designated as AR2210V01



1 June 2011

- Operational feedback from deployed soldiers provided the catalyst for detailed analysis of the rifle design
- Primary observation raised was failure to fully lock with a full magazine after manual cocking

**A joint investigation between Australian Government and Thales “lets make things better now!”**



- The F88SA2 satisfied the original specification ARMY(AUST)6443 mid 1980s.
- The user expects more now – particularly on operations.
- Initially Australian DoD began investigations.
- As Thales built up their international Small Arms design and T&E capability the lead for the investigation and as a result design improvements responsibility was transferred to the design authority with overview by the DoD
- The Australian Soldier Modernisation Programme Land 125 Phase 3C, challenges are:
  - ▶ MRBS Requirement increased from 1:500 to 1:2,500
  - ▶ MRBF Requirement increased to 1:6000 Baseline and 1:10,000 desirable.
- Thales able to lever new capabilities quickly to make significant enhancements to the SA2 system – now in service.



**Photron**

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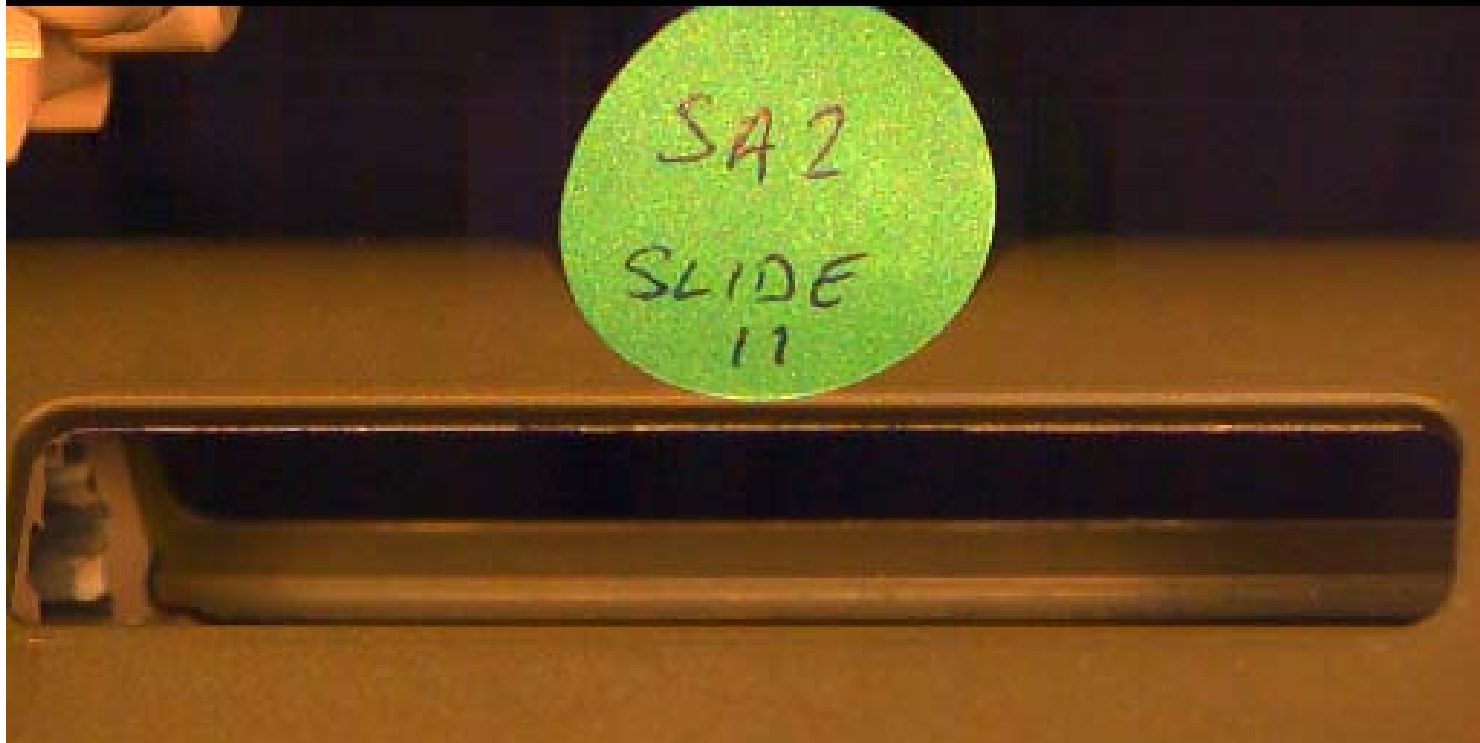
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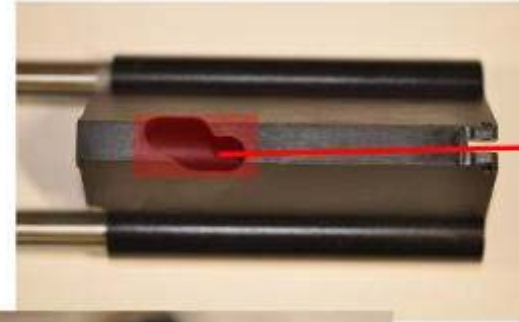


1 June 2011

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1 June 2011



Location and pitch of cam slot



Height of D slot

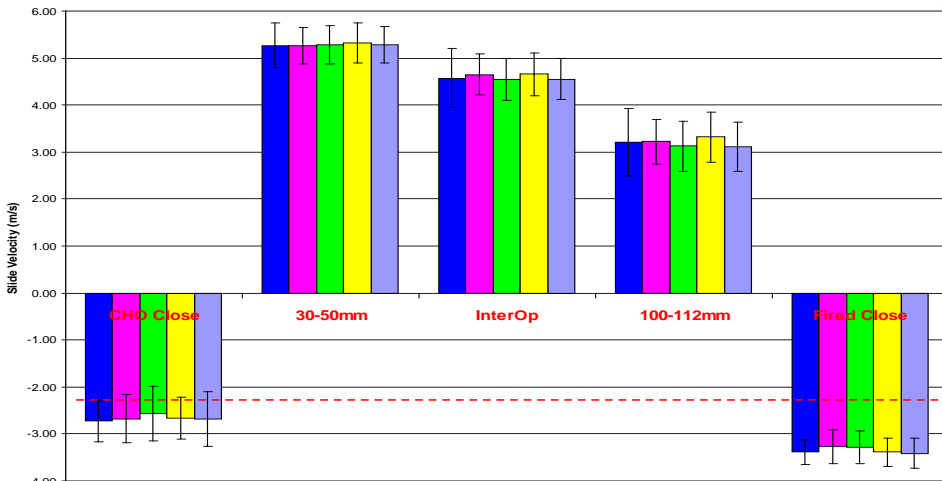
Location of D slot relative to position of tube holes

Parallel of D slot



Exterior Form of slide

Position of tube holes relative to D slot



1 June 2011

## Photron

3000 fps

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**Photron**

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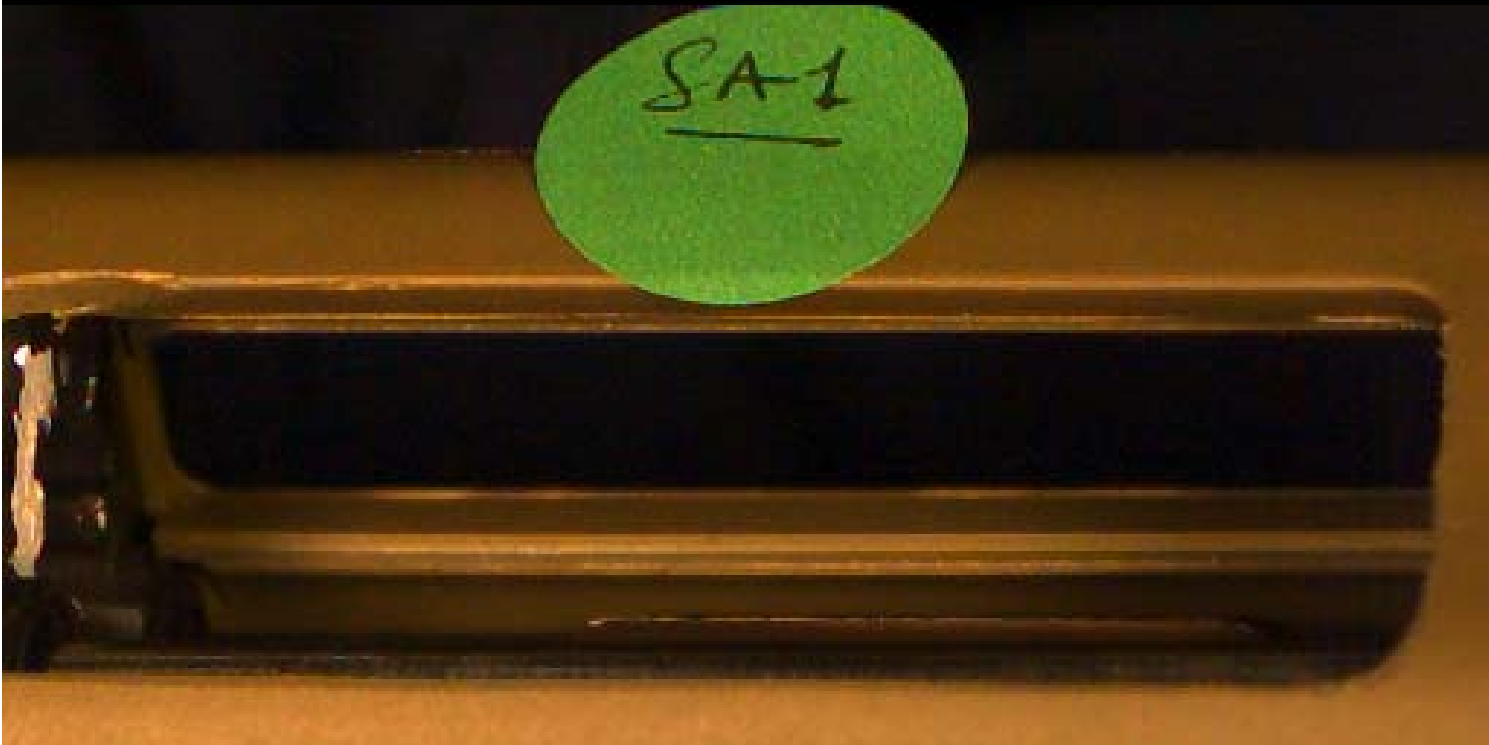
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1 June 2011

Smarter. Safer.

# The F88SA2 – Design Improvements



1 June 2011



**BUTT:**

- Additional gauging
- Revised welding and scraping process.

Reduced erroneous friction on slide.

**GUNLOCK:**

- Data pack tolerances of key features tightened
- Bolt face chamfer increased
- Additional gauging.

Quantity and consequence of clash decreased.

**FORCE OF SPRING LOCK LONG:**

- Raw material used is at higher end of spec
- Return to raw (uncoated) spring.

Spring consistently produces required force through extended life.

**EJECTION PORT COVER:**

- Using a new design
- Less likely to bend and interfere with slide

Reduced erroneous friction on slide

**HAMMER MECHANISM:**

- Hammer spring redesigned improved for manufacturability
- Move back to carbon steel to eliminate the gauling potential for stainless steel

More consistent hammer operation through extended life

## Acceptance Endurance and Environmental Testing

- 4 randomly selected weapons each fired 6,000 rounds
- 2 stoppages
- All component wear characteristics measured.
- To be extended to 12,000 rounds.
- This will help inform a usage based Maintenance Program currently being investigated the DoD





In addition to normal testing the following AQL Sample Acceptance Testing occurs:

- 150 round function tests – zero stoppages.
- Slide velocity – criteria for opening and closing - zero failures.
- Over 700,000 rounds fired in F88SA2 programme so far.



A weapon that surpasses the demanding reliability requirements set by the Australian Defence Force for the next generation – **today!**

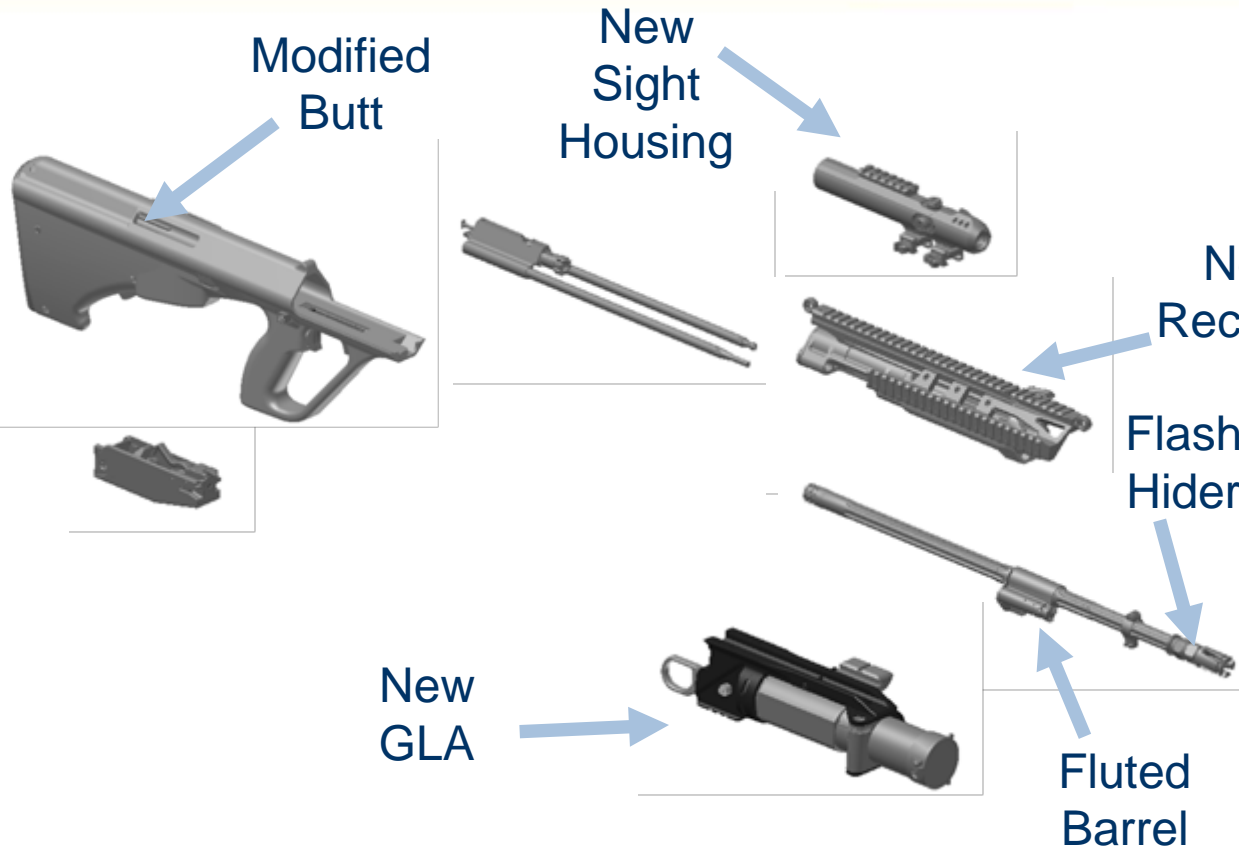
# F88 EVOLUTION



Enhancement and General Requirement Mapping						
Enhancement Outline	Key User Requirements (From URD 1 – 11 September 2010)					
	> Adaptability & Modularity	= / + Performance	< Weight + Integration	Growth	Accessories	Improved GLA
F88SA2 Reliability Enhancements	0	1	0	1	0	1
Lightweight Barrel	1	1	1	0	1	0

EF88 Design is therefore a direct consequence of User Requirements

Enhanced Receiver	1	1	1	1	1	0
Enhanced Signature Management	0	1	0	1	1	0
Enhanced Integrated GLA	1	1	1	1	1	1



Weapon	Barrel Length (mm)	Day Sight Included (Yes / No)	Weight (Kg)
F88SA2	508	Yes	4.1
F88SA2	508	No	3.79
Enhanced F88	508	Yes	3.62
Enhanced F88	508	No	3.4
H&K G36	480	No	3.63
H&K 416 D20RS	505	No	3.85
FN SCAR (L)	457	No	3.5

- This stage will deliver a **tested and production ready** EF88 rifle.
- Key dates are:
  - ▶ Commenced Apr 2011.
  - ▶ Design and Testing activities complete and data ready for Government approval in Dec 2012.
  - ▶ Ready to manufacture in 2013
- The EF88 builds on the new F88SA2 now in service and incorporates successful technologies from the XF90 CD.
- High levels of backwards compatibility with current systems.

- The pace of current Small Arms technological advances confirms a need to extend life of current Austeyr System and its ammunition via enhancements.
- Land 159 is the next small arms replacement project for the Australian Defence planned for 2022.
- Move to F1A1 ammunition.
- Armaments Logistical Support Contract a joint Australian Defence Organisation and Thales initiative to provide a more efficient support to sustainment of ADF weapon system.

