



## Canadian Small Arms Demonstration Project

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Recherche et développement  
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Defence Research and  
Development Canada

Canada



# Background

## Soldier System Vision of the Canadian Forces

The Soldier as an integrated weapons platform:  
a “System of Systems”





# Background

## Capital Projects and Capability Development Plan Support the Soldier System Vision of the Canadian Forces



**Clothe the Soldier +**

**ISSP**  
**Sniper System**  
**SARP II**

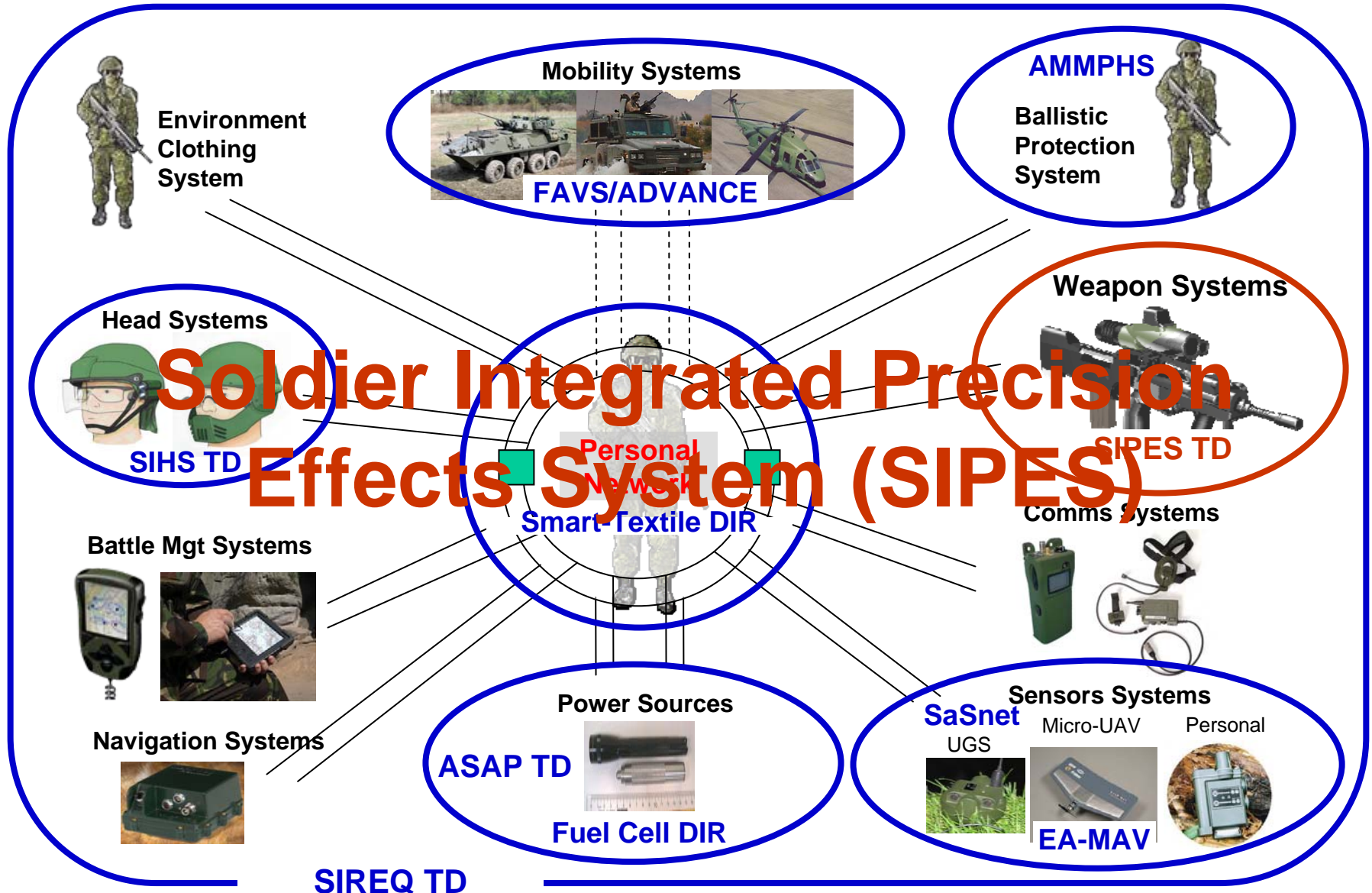


**Soldier System 2020**

**Integrated Soldier Systems Program (ISSP)**  
**Small Arms Replacement Project (SARP) II**

# Background

## S&T Projects Support the Soldier System Vision





## Background: SARP II

- In Oct 2007 the Options Analysis Phase of the Small Arms Replacement Project II (SARP II) was approved
- **SARP II** is a joint omni-bus project to deliver a modern, networked, integrated direct fire, multi-effect, portable anti-personnel and anti-material capability that includes weapons, fire control, munitions, training systems and logistic support for the 2012-2022 period.
- Total project cost for SARP II exceeds \$1 Billion
- **SIPES TD** is relevant to SARP II immediate needs, and also has longer term applicability (e.g. Soldier System 2020)



# Background: SARP II

## SARP II Capability Deficiencies

- **Lethality:** does not defeat increased personal protection
- **Ammunition:** Minimal multi-effects and few non-lethal capabilities
- **Accuracy:** Requires significant level of training for effect
- **Inconsistent Visibility:** Even with viewing aids, visibility by day/night is different.
- **Signature Management:** Noise/flash are distinctive.
- **Integration/Networking:** No direct link to the Integrated Soldier System
- **Adaptive Dispersed Operations (ADO):** Difficulty in integrating current small arms into the net-enabled and dispersed concept of ADO
- **Ergonomics:** Poor weight, compactness and operating commonality
- **Ancillaries:** Ancillaries available but not integrated.



# SIPES Objective and Key Deliverables

## Objective

To demonstrate the viability, utility and usability of integrated novel and high pay-off small arms related lethal and non-lethal technologies for future, lightweight, small calibre weapon systems which address current capability deficiencies

## Key Deliverables

- Scientifically rigorous requirements analysis for SARP II
- Optimized soldier lethality options
- Improved weapon systems evaluation capabilities
- A future small arms R&D program plan



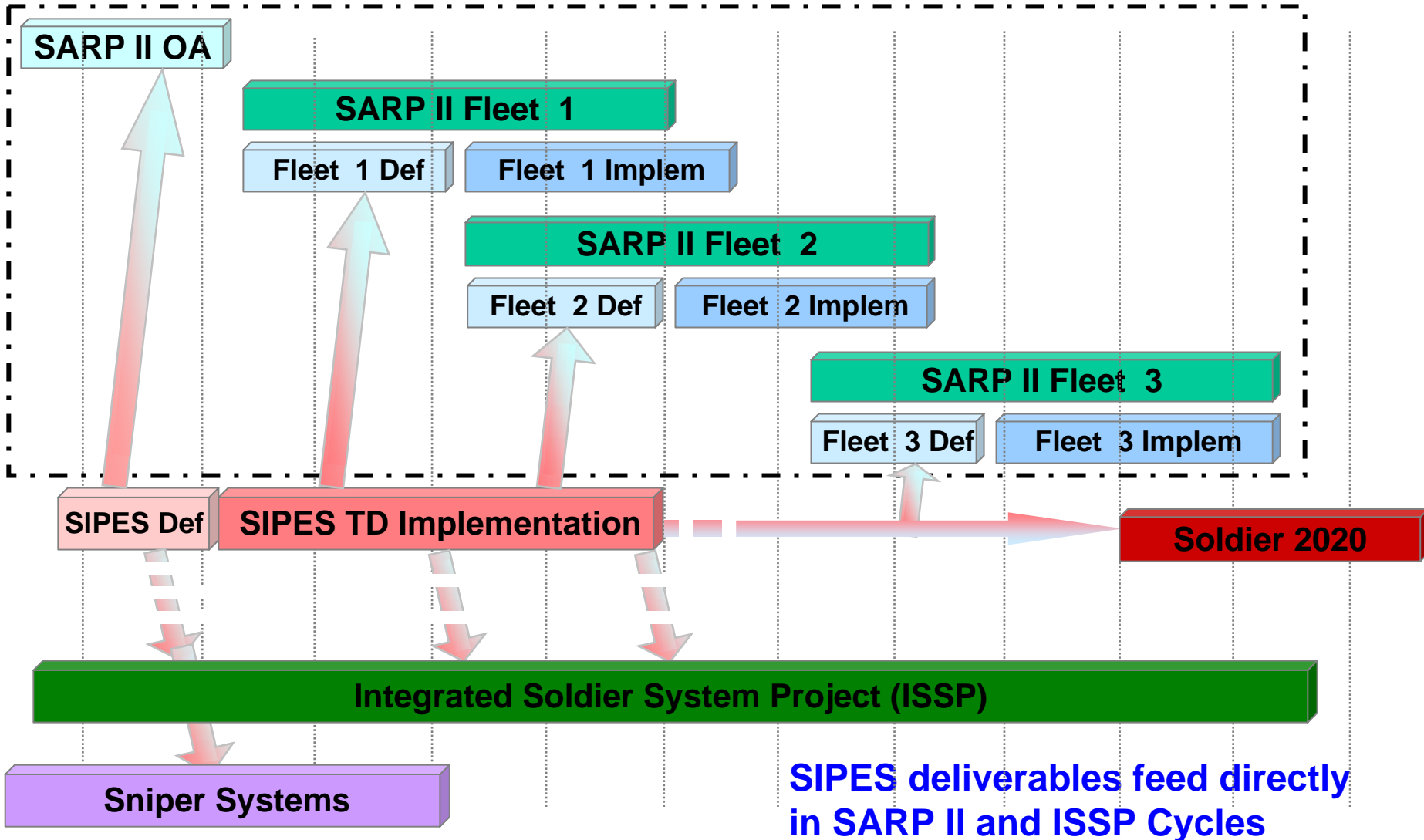
# SIPES Vision

- Make the Army of Tomorrow (AoT) **Soldier** a true network-enabled precise weapon system platform with the **ability for sensor to shooter linkage** and the capability for applying the right effect at the right place and the right time and thus supporting the AoT force employment concept



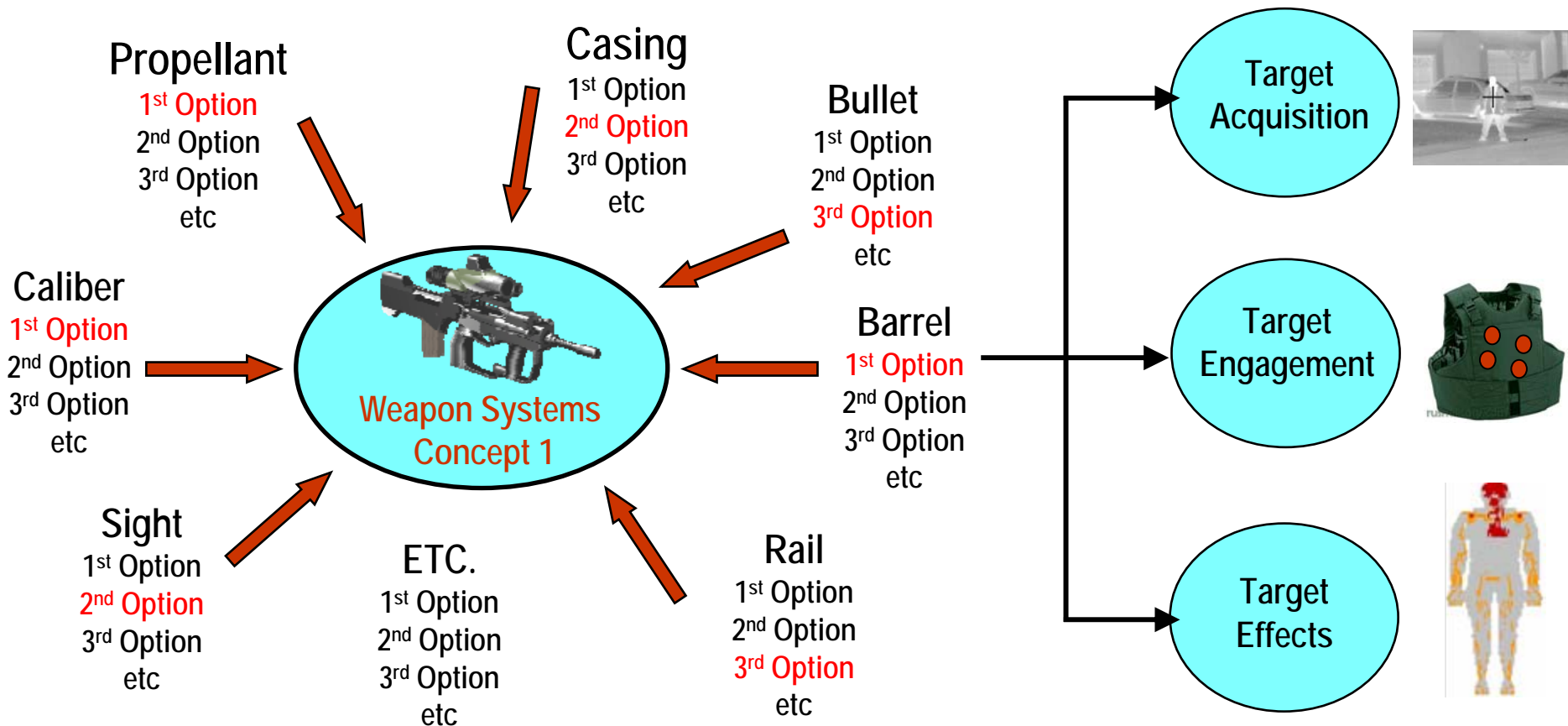
# Program Relationships

FY 08/09 09/10 10/11 11/12 12/13 13/14 14/15 15/16 16/17 17/18 18/19 19/20



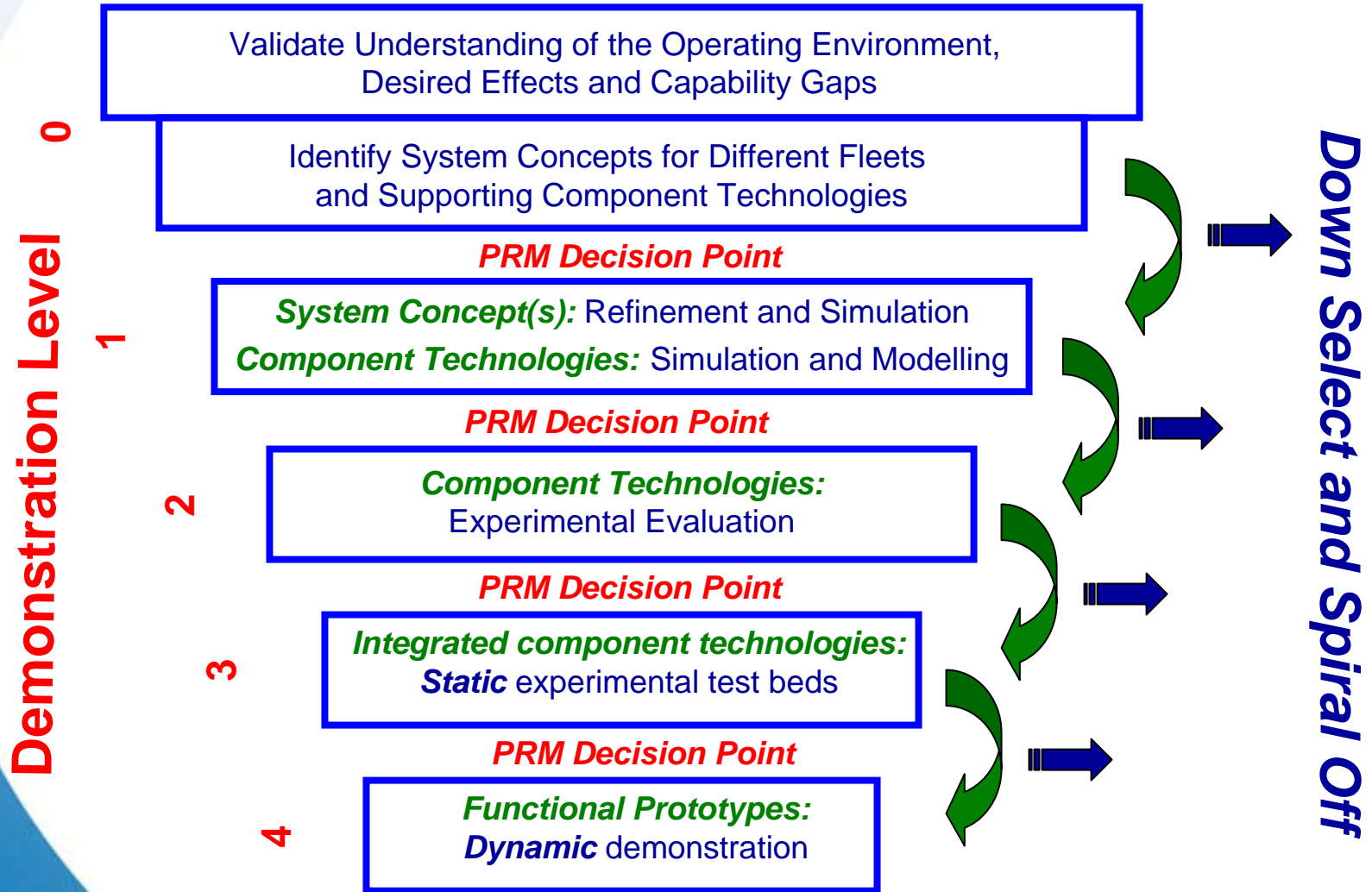
# SIPES Concept

Small arms functional prototypes based on component technologies that are optimally integrated to maximize weapon system effectiveness. A systems approach will be used to select component technologies based on **Analytical Hierarchy Procedure** and **Human Systems Integration** principles. **Operational Analysis** will be used to predict and assess weapon systems options.





# SIPES Methodology





# Demonstration Level 4



**Component**  
Functional  
Prototypes



**System** Functional Prototypes



Human Factors Type  
Controlled User Field Trials  
on  
Instrumented Ranges



# System Functional Prototypes:

## Sample platforms for technology integration and evaluation

Developer	Designation	Description
FN Herstal (Belgium)	SCAR	Assault Rifle for the U.S. Special Operations Command
Beretta (Italy)	ARX-160	Assault Rifle for Soldato Futuro program
HK (Germany)	MP-7	4.6 mm caliber PDW
FN Herstal (Belgium)	P90	5.7 mm caliber PDW



SCAR



ARX-160



MP-7



P90



# Technology Building Blocks

- **DRDC Related S&T Projects:**
  - Technology Demonstration Projects: SIREQ – Information, ASAP – Power, SIHS – Helmet, JFS – Networking, Righttrack – Green Munitions
  - Applied Research Projects: Improved penetration, I2/IR Weapons Sights, Wound ballistics, Non-lethal weapons
  - Small Arms Scoping Studies – 2005 (Jane's)
- **NATO RTO** group on Future Soldier Small Arms (interfaces, power and human factors)
- **Extensive DRDC core competencies and facilities**
- **Industrial expertise from Canadian companies and those in Allied countries**
- **International cooperation and collaboration**



# DRDC Core Competencies & Facilities

## Valcartier

- Wound ballistics & lethality assessment
- Aerodynamics/CFD
- Aeroballistic range
- Internal ballistics
- Energetic materials
- Green munitions
- Integration of Electro-Optics/Sensors
- Design/prototyping

## Toronto

- Human Factors Design and Systems Integration
- Information Displays
- Man Machine Interface
- Interface Design
- 3D Anthropometry
- Small arms trainer

## Atlantic

- Novel materials
- Material testing

## Operational Research (CORA)

- Constructive simulation
- OR studies
- Gap analysis

## Munitions Evaluation and Test Center (METC)

- Weapon & munitions testing



# Sample Technology Area Maturity Levels

Key Technology Areas		Current TRL	Potential Goal
<b>Weapons and Components</b>	High cyclic rate	6	7
	Soft sensor mount	5	7
	Ceramic barrels	6	7
	Injected Metal Matrix stock	4	6
	New caliber and modular barrels	6	7
<b>Ammunition</b>	Caseless Telescoped	3	4
	Cased Telescoped	4	5
	High energy Nano Powder	3	4
	Green ammunition	5	6
	Segmented core bullet	2	4
	Tunable (non lethal to lethal concepts)	3	4

TRL 1	TRL 2	TRL 3	TRL 4	TRL 5	TRL 6	TRL 7	TRL 8	TRL 9
Basic research	Applied research	Applied research	Tech dev.	Tech dev.	Tech demo.	Tech demo.	System dev.	System fielding





# Sample Technology Area Maturity Levels

Key Technology Areas		Current TRL	Potential Goal
<b>Sensors and Fire Control System (FCS)</b>	Non-conventional aiming	6	7
	Modular FCS	6	7
	Fused SWIR / LWIR sight	5	6
	Sight with Automatic Target Recognition	4	6
	Automatic tracking and firing (firing on the move)	3	5
	Energy harvesting (thermo-electric systems)	3	4
<b>Networks and Interfaces</b>	Wireless real-time link to soldier system	5	7
	Plug and play Ethernet based architecture	3	5
	Biometric and RFID tagging	6	7
	Power / data rail	4	7

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# Project Status

- Project Definition Phase formally approved in March 2008
- Project Definition Phase to run from April 2008 to February 2009
- Objectives for the Definition Phase
  - Clarify Stakeholder's Needs and directives
  - Perform high-level technology review
  - Clarify project scope
  - Obtain approval for project implementation
- Integrated technology teams have been formed
- High-Level Technology review process to be carried out by teams including personnel from government and industry
- Contractors to assist in High-Level Technology review are being identified with contracting to begin in June



# Questions ??

DEFENCE



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