Interoperability and Integration of Dismounted Soldier System Weapon Systems Update

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SCI-178 RTG-043
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Overview

- NATO Research and Technology Organization: formed in 1998; ensures the Alliance has at its disposal the best scientific knowledge and technical capability that member nations are prepared to make commonly available. R&T must be responsive to changing requirements and conditions, long term capability requirements, and new science and technology advancements. See www.rta.nato.int for more info.
- Land Capability Group-1 Weapons and Sensor Sub Group desired to initiate a R&D effort to answer critical weapons subsystem problems for current interoperability issues and long term soldier system interfaces and development issues.
- 10 Countries from LCG-1 teamed together: Canada, Germany, Italy, The Netherlands, Norway, Romania, Slovakia, Spain, Sweden, and United States (Army and Marine Corps). Submitted a proposal to the NATO RTO Panel which was approved.
- Exploratory Team developed Terms of Reference, Technical Activity Plan, and Plan of Work during 2005. A Task Group was initiated in January 2006 with a completion timeline slated for December 2008.
- Membership in the Task Group requires countries to allocate resources to support the Task Group.
- Task Group meets every 3-4 months.
- Includes live fire events with current and prototype soldier system equipment.

Objectives

- Recommendation for NATO standard Weapons System Interface STANAG.
- Define and Outline Human Systems Integration principles and concepts for future Soldier Weapons Systems.
- Investigate the Power Requirements for future weapon systems and methods of providing or generating power.

Organization

- The Task Group is led by the Chairman and the Heads of Delegation of the 10 countries.
- Three sub groups
  - Technical Interface Team: Led by Mr. Per Arvidsson from Sweden.
  - Human Factors Team: Led by Major Linda Bossi from Canada.
  - Power Team: Led by Mr. Karl Heinz Rippert from Germany.
- All three Teams have to work together because of overlap in various areas.
- Completion of tasks: NLT December 2008
- One year extension requested for increase scope of work. Pending approval by RTO HQ's.

Requirements for future rail

- Straightness
- Repeatability
- Zero retention
- Power supply
- Data transfer
- Physical characteristics
- Environmental resistance

- Per Arvidsson will cover this in more detail in his presentation following this one.

Digital Models

1	M203 Grenade Launcher	
2	Bayonet	
3	C79 Scope	
4	Tactical Flashlight	
5	Holographic Sight	
6	Laser Sight	
7	Tri Rail Mount	

8	AN/PVS-13 Thermal Weapon Sight	
9	AN/PVS-14 I2 Sight	
10	Off-bore Camera	
11	Controls (e.g. Radio)	
12	FCU-HW Fire control for M203	
13	Battery Stock	
14	Butt-stock Magazine Pouch	

Preliminary Model

- Example digital models of rifle and ancillary equipment.

Equipment

1. M203 Grenade Launcher
2. Bayonet
3. Telescopic Scope (Elcan C79)
4. Tactical Flashlight
5. Holographic Sight
6. Laser Sight (e.g. red dot)
7. Tri Rail Mount
8. Off-bore camera
9. Controls (e.g. radio controls)
10. Battery Stock
11. Butt-stock magazine pouch
12. Thermal weapon sights (AN-PVS-13 Medium, Small)
13. I2 (Image Intensification) sight (AN-PVS-14)
14. Fire control unit for M203

Configuration	Equipment	Total Mass
Light	C7A2 only (loaded)	3.53 kg
Medium	C7A2 plus 1,2,3,4	6.45 kg
Heavy	C7A2 plus 1,2,4,7,8,10,11,12, 14	9.68 kg

Light Weight Rifle

Light (3.78 kg): C7 assault rifle, holographic sight,
and 1 loaded (30 round) magazine

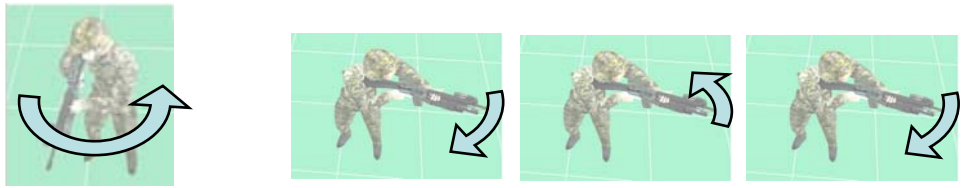
Medium Weight Rifle

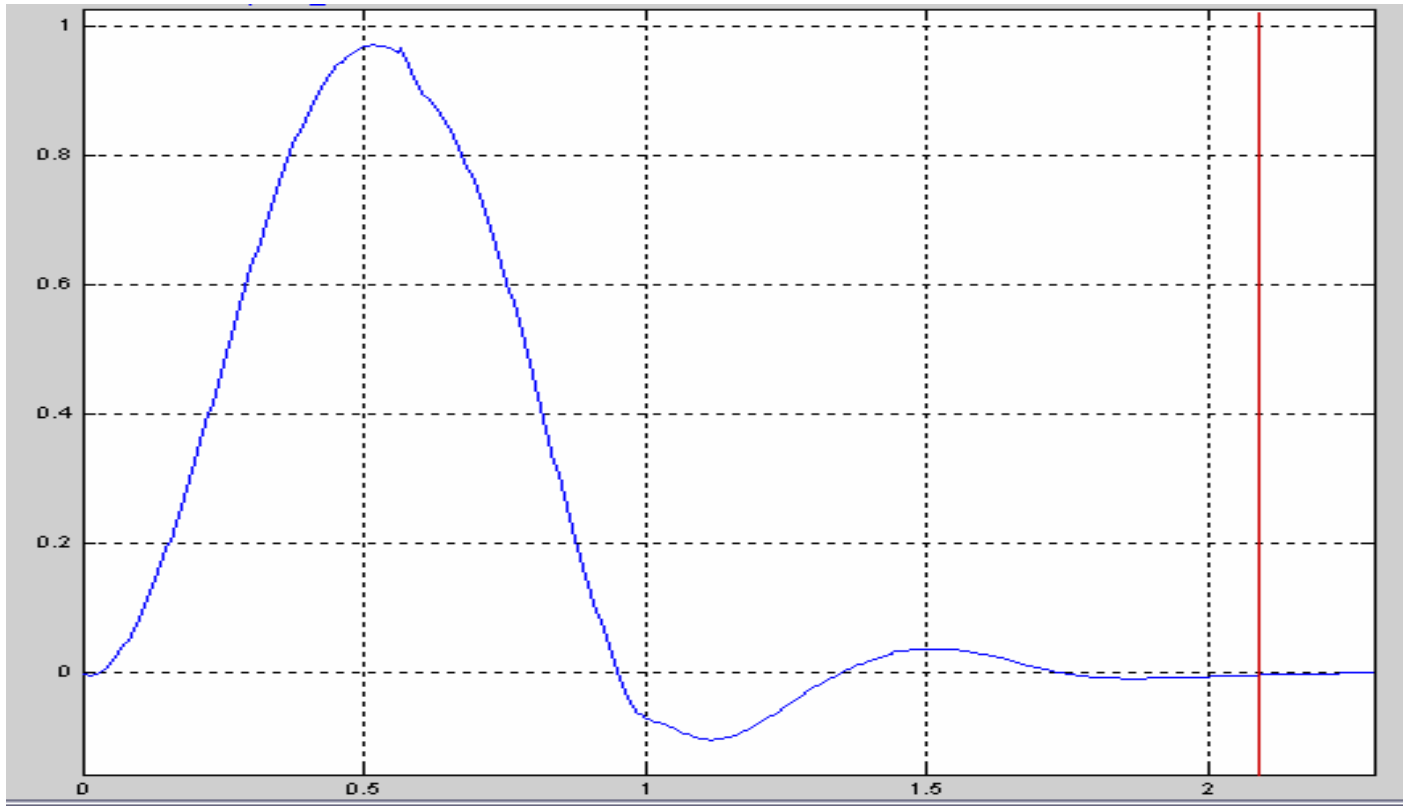
Medium (6.14 kg): C7 assault rifle, 1 loaded (30 round) magazine, ELCAN C79 Optical Sight, M203 Grenade Launcher, Flashlight, and Laser Aimer

Heavy Weight Rifle

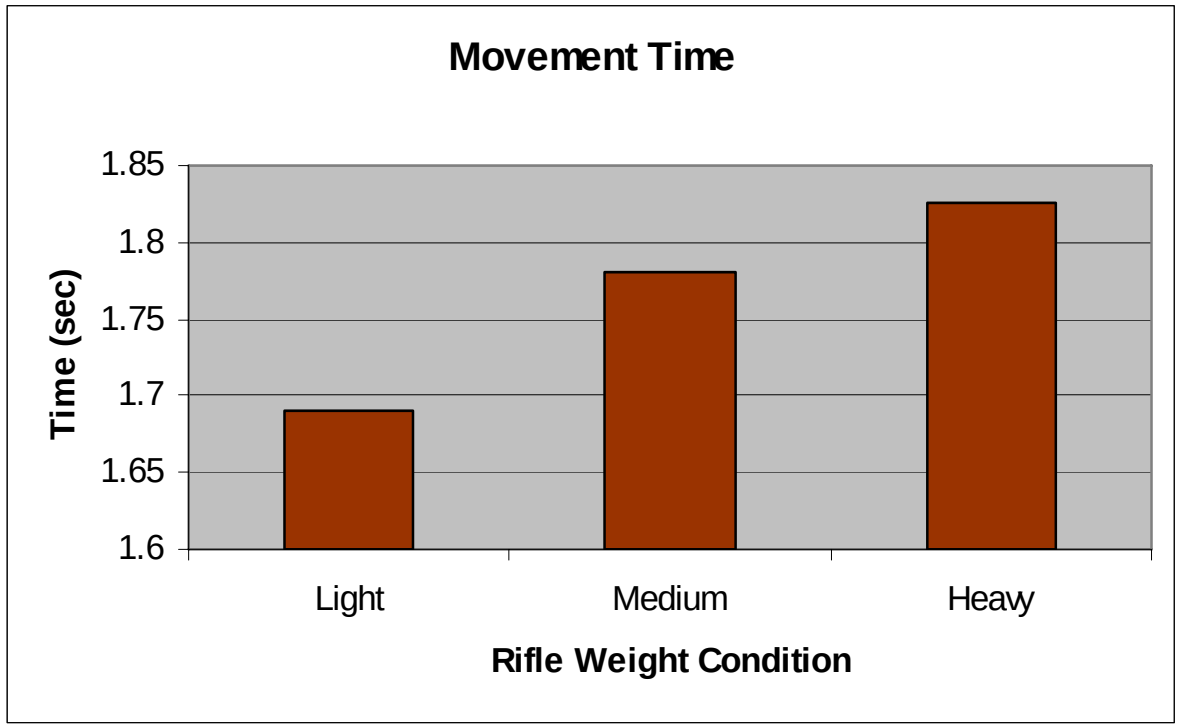
Heavy (8.31 kg): C7 assault rifle, 1 loaded (30 round) magazine, M203 Grenade Launcher, AN/PAS Thermal Weapon Sight, tactical flashlight, and bayonet

Angular Velocity

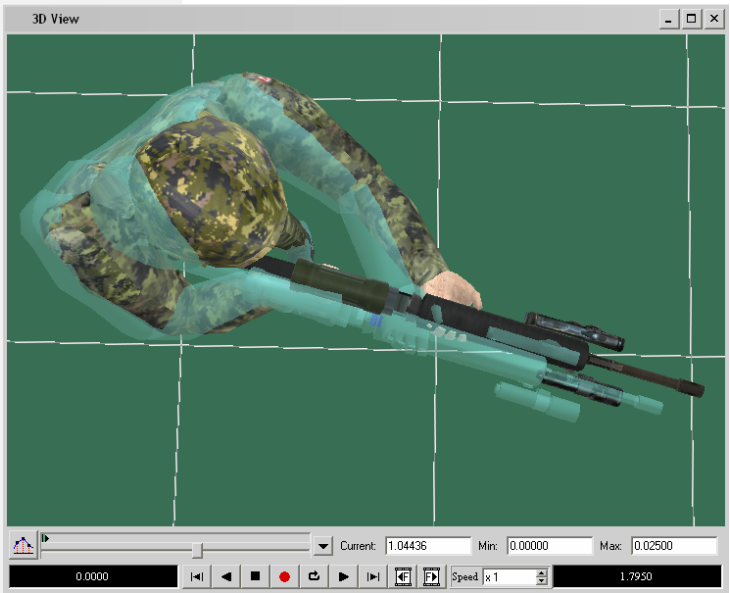


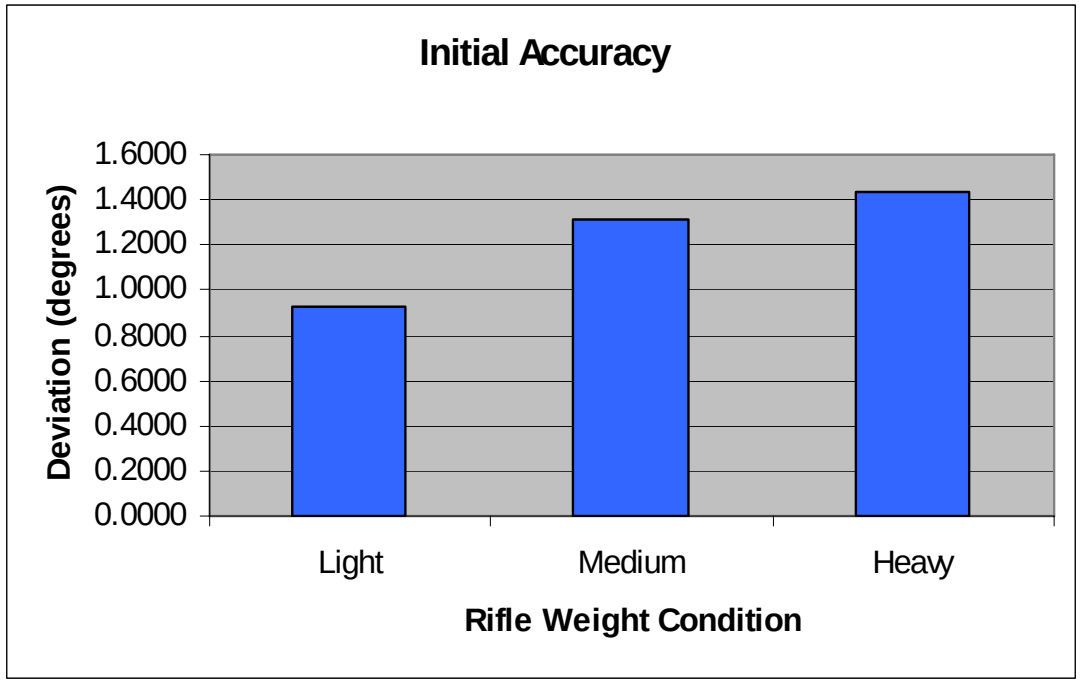


Movement Time



Movement Accuracy





Weapon Sighting

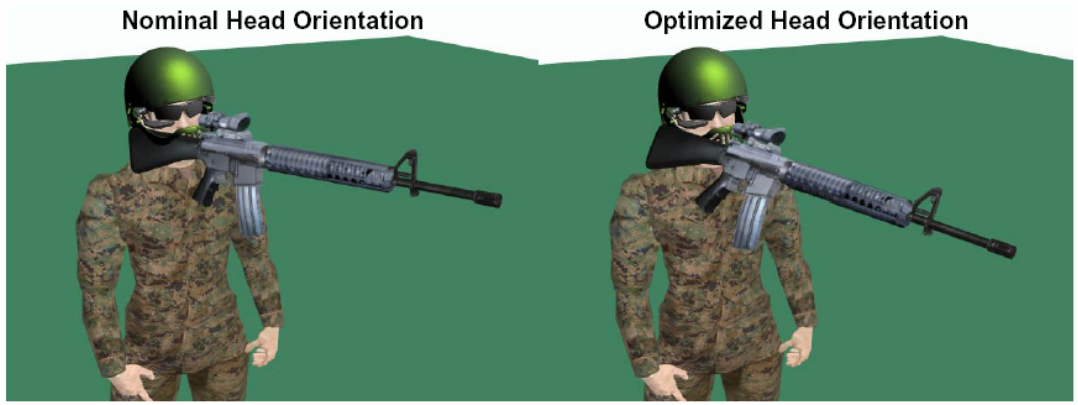
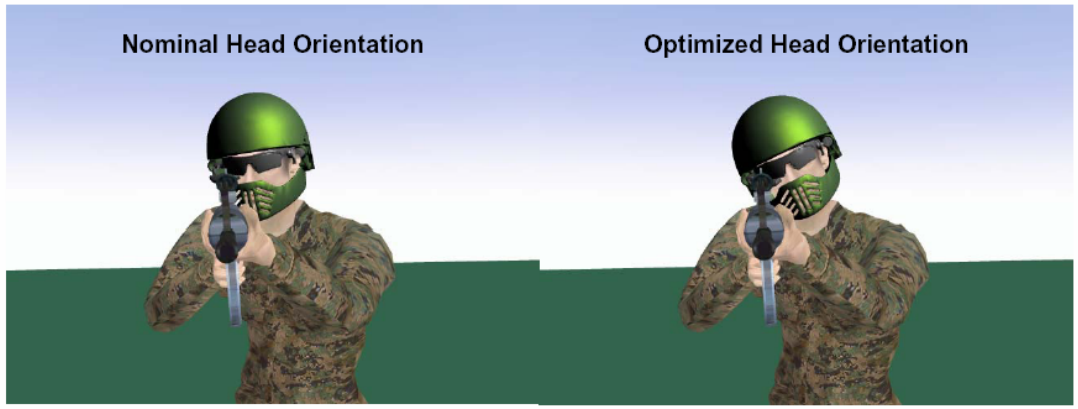
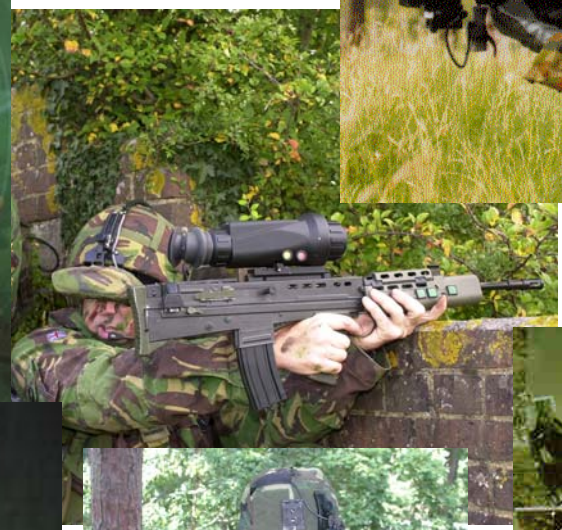


Figure 2-4 Formulating Desired Orientation Euler Angles



Future Soldier Systems

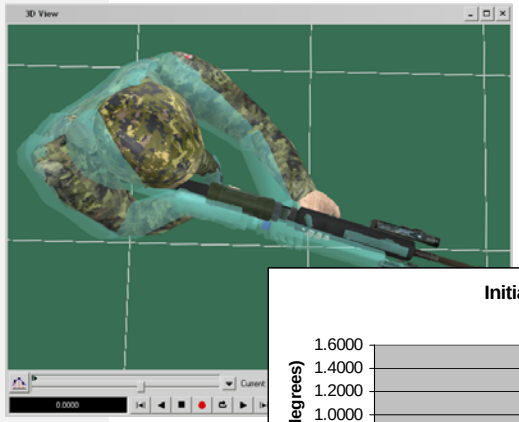


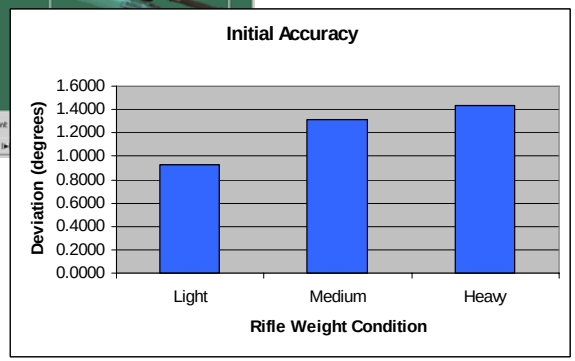



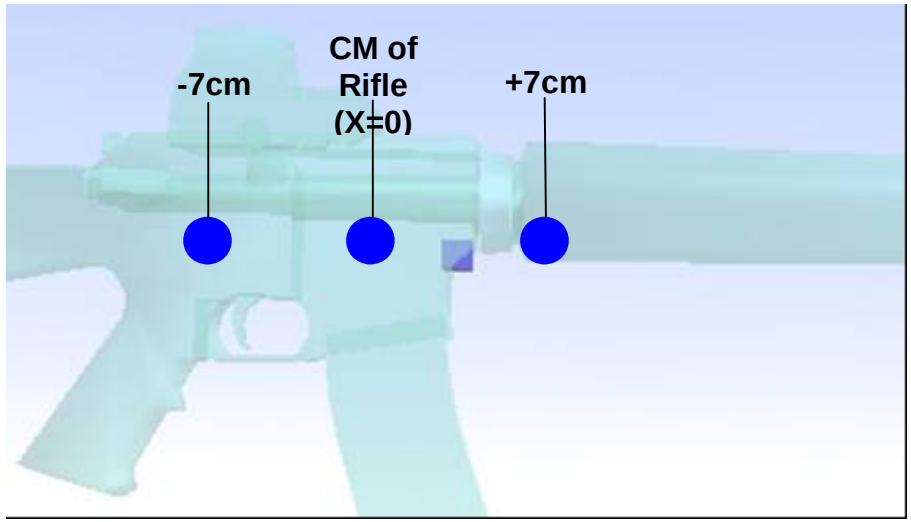

Testing Evolutions

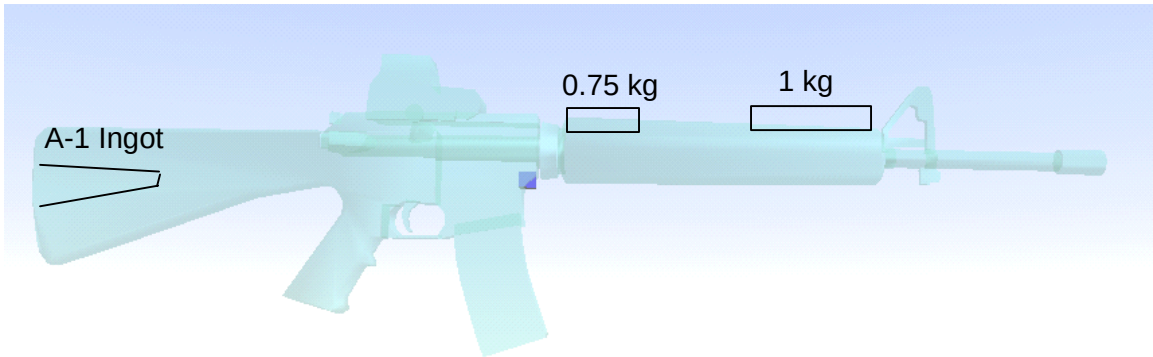
- Rifle Weight Study
  - Range Firing
    - Engagement Performance
    - High Speed Camera Data
  - Extended Hold
  - Obstacle Course Traverse
- Sight Offset Study
- Butt Stock Integration Study

Rifle Weight & CoM

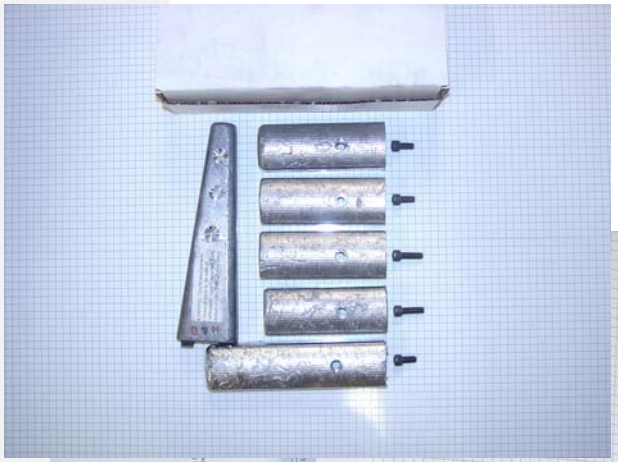




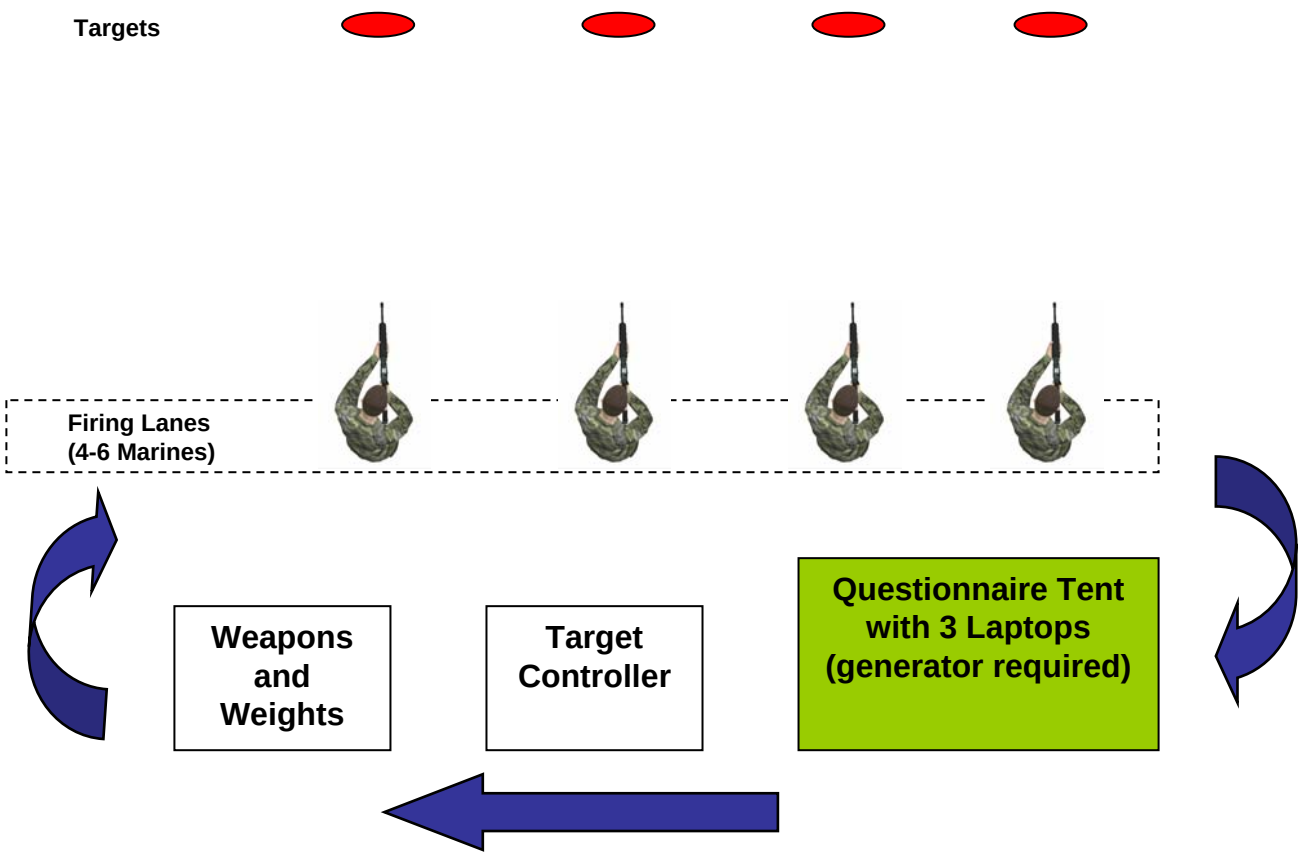




Rifle Weight System



Range Setup and Flow

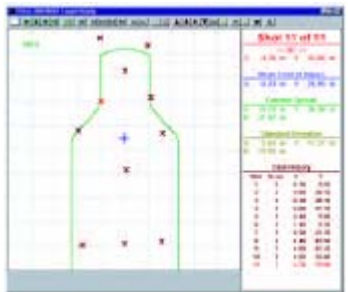


Range Serials

- Pivot and Fire
  - 90^{o} from right and left (controlled pairs)
  - 180^{o} from right and left (controlled pairs)
- Mozambique “failure to stop” Drill
  - 90^{o} pivot from right and left
  - Hammer pair chest and single shot to head
- Extended Hold and Fire
  - 20 second hold on aim point
  - 5 rds aimed shot grouping

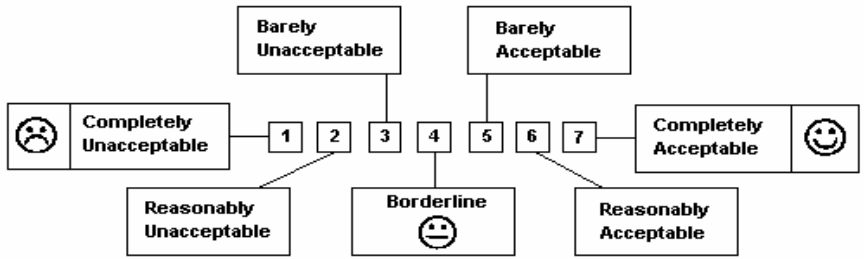
Automatic Target Scoring

- Accuracy of shot
- Shot grouping
- Time to Engage



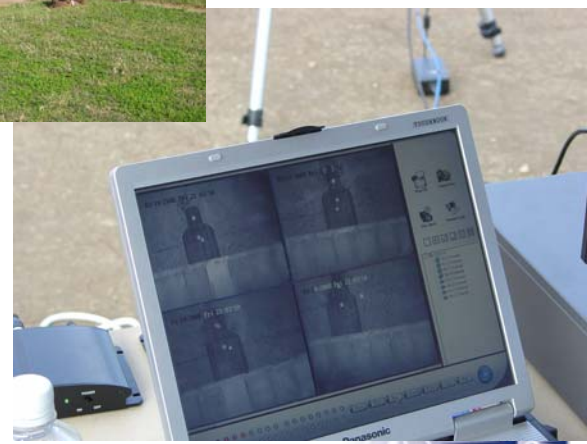
Subjective Measures

- Shooting
- Handling
- Obstacle Traverse
- Computer Kiosk



Video Recordings

- Muzzle Rise
- Slew
- Rifle Control



Extended Hold

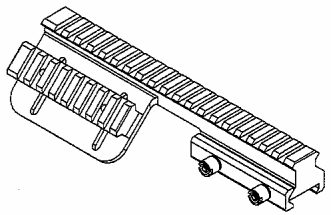
- 50 sec hold on target point.
- Baseline, 4 kg front, and 4 kg back.
- Video sight imagery.
- Time for hold.
- RPE.

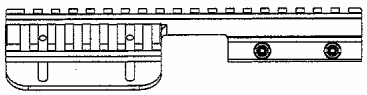
O-course Mobility

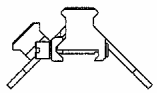
- 15 Marine Participants
- Time to complete
- RPE
- Questionnaire Kiosk

O-course Mobility

Sight Offset Study

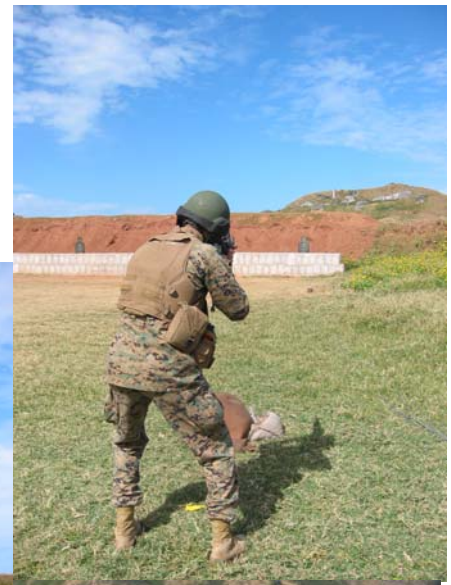






Sight Off-set Study

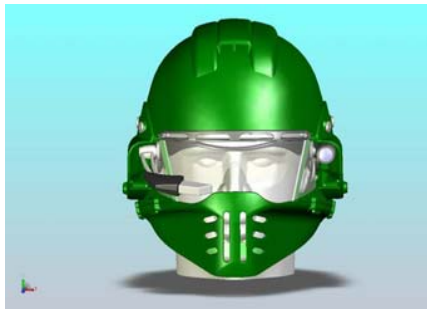
- Pilot study with seven Marines
- CG634 Add-on System
- In-line and lateral off-set sights.
- Time to engage and accuracy data.

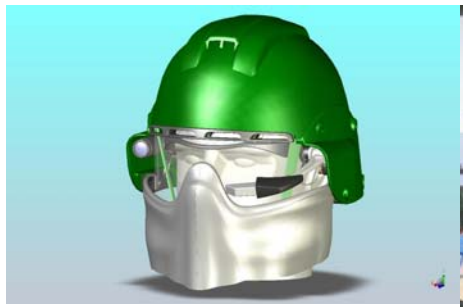


Butt Stock Integration

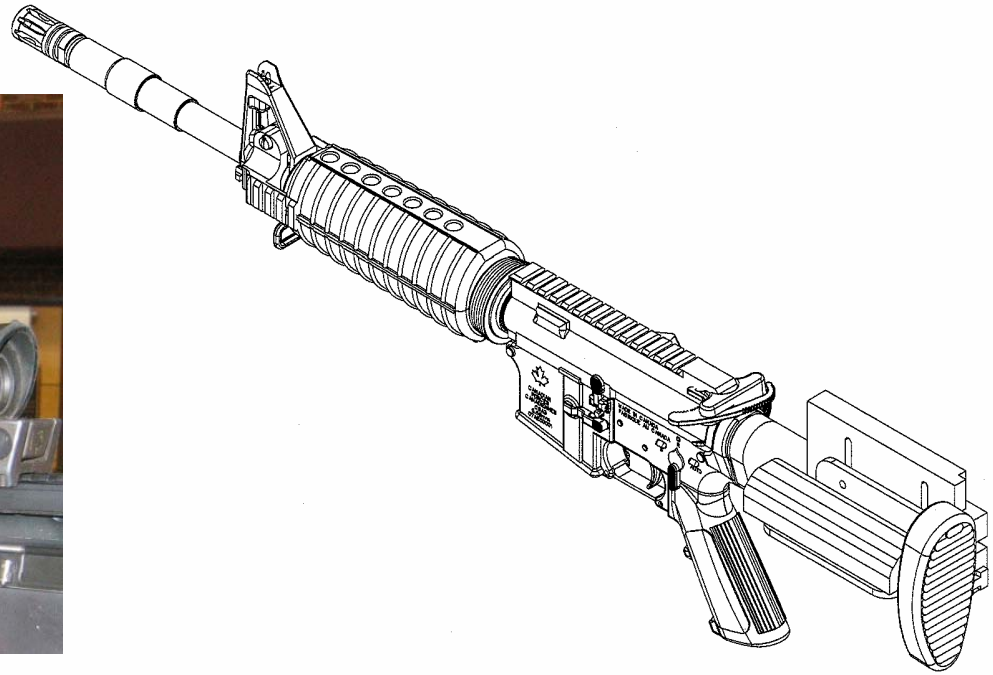
- Protection Issues
- Target Engagement Issues

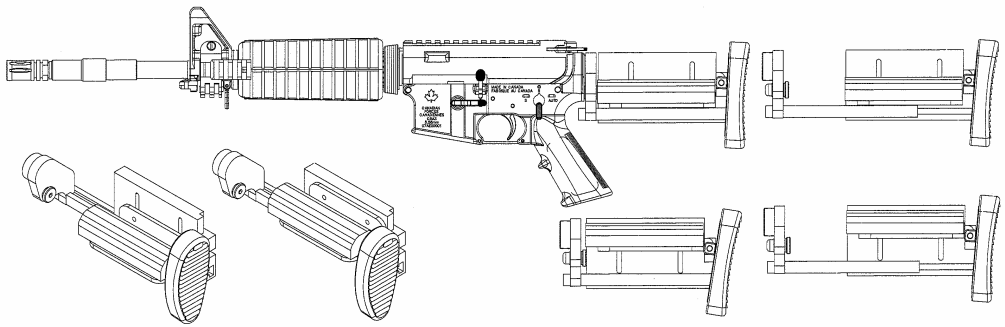







Butt Stock Integration





Buttstock and HBS Integration

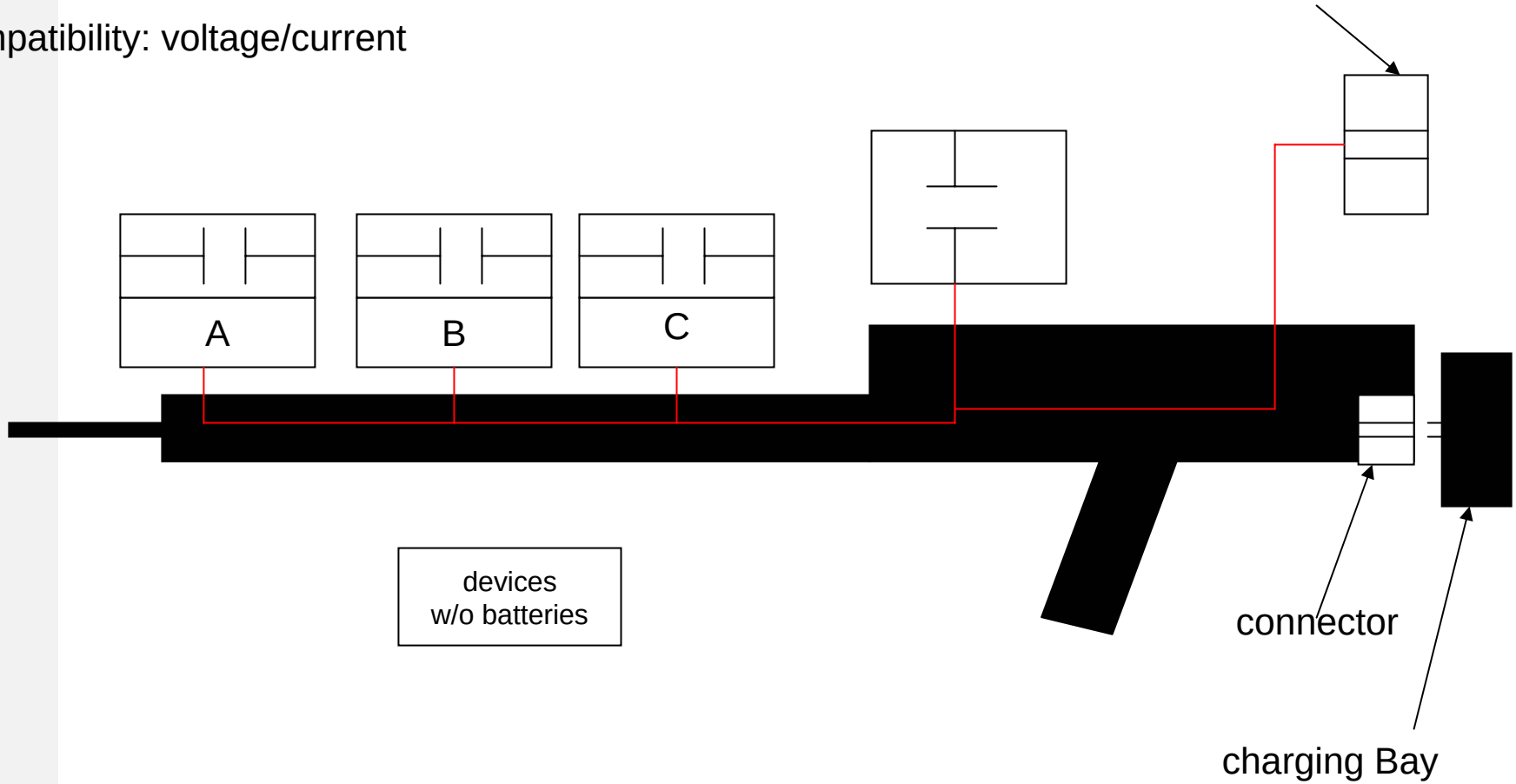
Power Issues

Interoperability and Standardization

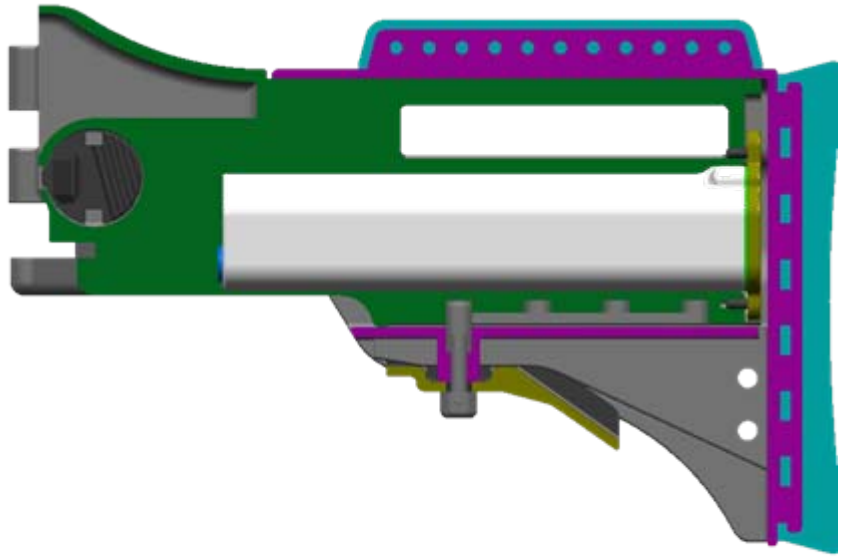
- Difficult to standardize on one battery type - "family" of batteries need to be explored (part of report)
- Consult with HF and Interface
  - "maximum" room on weapon (size, weight and location) could be recommended for future weapons concepts
- Common connection to outside – LCG1 has overarching document on C4I architecture

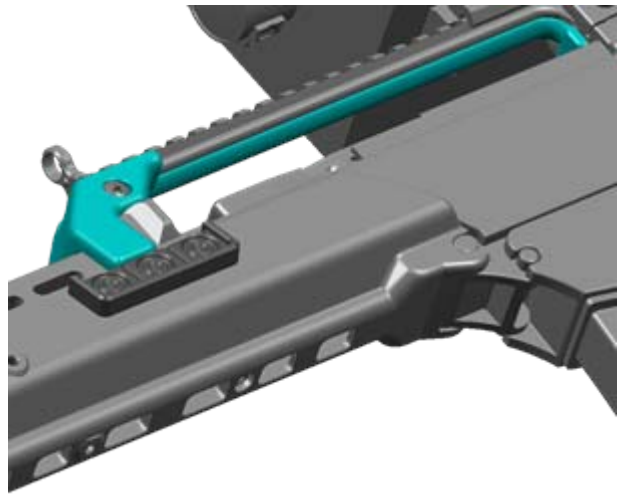
Power requirement schematic
No data connection

Compatibility: voltage/current



Batteries in Butt stock G36





2008 Remaining Work

- Additional Human Factors trials with Swedish soldiers in June 2008
- Live fire trials with Italian soldiers in September 2008
- National data collection by participating countries
- Finish analysis of data and complete reports.
- STANAG submission on NATO standard rail.
- Remain on schedule

2009 Scope of Work (Additional Year)

- Technical Interfaces – recommendation for a powered NATO rail annex to the delivered NATO rail STANAG.
- Human Factors – additional scope of work to include weapon information display characterization, standardization of control devices. The additional year also allows for additional data collection through more live fire trials of the weapon weight characteristics. Lessons learned from recent live fire trials and newly acquired data collection equipment has increased the scope of issues associated with integration of emerging technologies.
- Power – finalize experimentation and trials to determine the tactical benefits of power rails and implications with implementation of centralized power source. During this additional year, the technical interface sub group will merge with the power group and power will be the overall focus of effort.

Industry Participation

- Participation of Industry encouraged to assist in the success of this Task Group.
- Provide support to the sub groups areas of expertise.
- Sponsorship by a participating nation or information presentation or work.
- Intellectual Property; preference for open source
- Solicitations provided by participating countries
- On schedule to finish current tasks. Awaiting one year extension. 2009 we will combine the Interface and Power sub team into one group.

SCI-178 RTG-043
Points of Contact

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