Virtual Reality in Land Training (VRLT)

Rusty Orwin - david.orwin@bisimulations.com
Project Director - VRLT
Scope - ‘BISim narration of VRLT 1’

- VRLT - Overview and Background
- Purpose and Objectives
- Approach - when, how, who and where
  - the sprints - ‘crawl, walk, run’
- ‘Innovation as a Service’
- Results and lessons learned
- Conclusions
- Questions
Bohemia Interactive Simulations

- **BISim** is a leading software developer in virtual simulation
  - 270+ staff in seven offices internationally
  - 18-year heritage in game-based simulation development
  - Own our Game Engine and have total control of it

- **Flagship training product called VBS3 (Virtual Battlespace 3)**
  - Trains hundreds of thousands of soldiers every year in 59 countries
  - Tens of millions of dollars of investment from militaries
  - Integrated into many Military Simulators across the globe with numerous leading OEM customers

- **BISim** is focused on the military/paramilitary marketplace.
  Enterprise sales with tens of thousands of licences and support services to
  - U.S. Army Game For Training (GFT) program of record
  - USMC DVTE training software program of record
  - UK MOD Defence Virtual Simulation (DVS) platform
  - French MinArm SOCLE Virtual Simulation platform
Overview

• Bohemia Interactive Simulations (UK) Ltd selected to lead Training Capability Branch, HQ British Army Virtual Reality in Land Training (VRLT) pilot study:

  • Aim: ‘to identify the opportunities that VR offers the Future Collective Training System (FCTS)...to investigate the opportunities of VR, the Army approach seeks to conduct a VR in Land training (termed VRLT) Pilot, which explores the strengths, weaknesses, opportunities, threats and benefits of the technology and its employment. The pilot would consider the effectiveness, fidelity, practicality/ constraints, architecture, scale, interoperability, infrastructure and mobility of useable VR capabilities. Insights would be harvested for the FCTS.’

• Caveat: Army report being finalised, was a **pilot study** and NOT an experiment - delivered training.
• Funding: Defence Innovation fund.
Industry Delivery Team

Data and exercise management

https://www.cervusdefence.com/

Prime - Project Management, Commercial lead, Sprint design, technology supplier and systems integrator

Project Management and Exploitation
Background - BISim view

- Exploit COTS technology
  - pace of technology development rapid
- Other industries using VR for training e.g. construction, aviation, F1
  - Construction - crane operator training
- Mission rehearsal, mission repeat (MR2)
- Affordability and accessibility to low availability but highly capable systems
  - access to assets
- Immersiveness - Virtual Simulation vs Virtual Reality
- Soldiers more technologically aware through gaming industry - the PEOPLE!
• Younger operational staff actively want to use simulation
  • Take advantage of enthusiastic ‘gamers’ - you will find plenty of them
  • (In militaries, experience is that young soldiers actively volunteer to get involved and lead)
  • Utilise those staff who ‘get it’ as instructors and SMEs
  • Offer career development opportunities to learn and grow for instructors and ensure consistency in trainers and participants alike
‘Generation Z’

- Digital natives with huge dependency on communications
- Greater reliance upon technology and with a different approach to problem solving
- Individualistic, impatient and with differing levels of attention span
- See greater value in work experience than education
- Approach risks differently

Sparks and Honey Report, June 2017:
Meet Generation Z, Forget Everything You Learned about Millennials
Purpose and Objectives

• Investigate the strengths, weaknesses, opportunities and threats (SWOT) of Virtual Reality (VR) technology and its application to support British Army Collective Training (CT) focusing on the flexibility and reconfigurability of VR to meet changing demands.

• Explore the ability of VR to meet fidelity requirements focusing specifically on limitations in scalability and interoperability and to define a technical architecture and requirements for the future delivery of VR, to help inform future procurement.
Method

- BISim delivered 3 Sprints, ‘crawl, walk, run’ with VR, as ‘Innovation as a Service’
- Each Sprint was a Platoon in a Company Context executing a Combined Arms Armoured Infantry Company attack - Taken from DATE - Lovella scenario, SE Europe
- Increase in complexity through the sprints - assets and scenario
**Lovella Scenario:** Conflict in Southern Protectorate – SE Europe Theatre

- Civil war between ethnic groups backed by professional military and militia in historically volatile region (war in mid 90s)
- Widespread violence
- NATO Intervention to create safe and secure environment, UN deadline not met resulting in NATO military action to clear UWS forces from occupied EKDE region
- 90 days into NATO operation, UK have cleared BADAQ town (*Bath*) and are static preparing to clear LOVELLA up to National Boundary Line (NBL)
Delivery - video (YouTube)

- Sprint 1 (Jan 19) - the baseline - 17 players
- Sprint 2 (Feb 19) - 37 players, high fidelity model, avatar customisation, crew trainer, cloud architecture, AAR and data
- Sprint 3 - (Mar/Apr 19) 54 players, (37 in VR), mixed reality, face/voice analysis, instrumented live gun, briefings in VR

My point here is that it was RAPID DELIVERY!
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 18</td>
<td>Contract Award</td>
<td></td>
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<tr>
<td>Jan 19</td>
<td>Sprint 1</td>
<td>18 Soldiers in VR</td>
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<tr>
<td></td>
<td></td>
<td>Oculus Rift, Vive, DVS/VBS3</td>
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<tr>
<td>Feb 19</td>
<td>Sprint 2</td>
<td>37 Soldiers in VR</td>
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<tr>
<td></td>
<td></td>
<td>Oculus Rift, Haptics, Polystream Cloud, Training Data Cloud Capture, Unity, DVS/VBS3</td>
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<tr>
<td>Mar 19</td>
<td>Sprint 3</td>
<td>37 Soldiers in VR</td>
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<tr>
<td></td>
<td></td>
<td>OR, Vive, Mixed Reality, 105mm Gun Integration, Haptics, Unity, Polystream Cloud, Training Data Cloud, Machine Learning, DVS/VBS3</td>
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</tbody>
</table>
Who

1 YORKS (AI Bn)
- 3 x WR Crew and Dismounts
- Provide feedback on VRLT pilot training experience

Armour Centre
- Challenger 2 Crew
- Provide feedback on VRLT pilot training experience

1 R WELSH (AI Bn) & Land Warfare Centre
- Observer Mentors

Royal School of Artillery
- Fire Support Team
- 105mm Lt Gun Crew
Where - the set up

- Tank shed, Warminster, Wiltshire, UK
- Power and temperature!
Garage Plan for Sprint 3

- W1 - Crew
- W2 - Crew
- W3 - Crew
- W1 - Dismounts
- W2 - Dismounts
- W3 - Dismounts
- FST
- EXCON
- AAR
- Light Gun
- CR2
- UAVs
- Office Area
- Rest Area
Player Preparation

• It is normal training
• Get the soldiers familiar with the technology
• It was a pilot study - require feedback and ideas
• Data - collect for training improvement
• Opportunity to shape what the Army gets in the future
<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Location</th>
<th>Team</th>
<th>Notes</th>
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<tbody>
<tr>
<td>0800-0830</td>
<td>System run up</td>
<td>Garage</td>
<td>JD</td>
<td>Technical Team</td>
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<tr>
<td>0830-0900</td>
<td>Morning Brief</td>
<td>Garage</td>
<td>AR</td>
<td>Project Team</td>
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<td>0900-1030</td>
<td><strong>Vignette 2-ADVANCE TO CONTACT</strong></td>
<td>Garage</td>
<td>AR</td>
<td>Participants, Observers, Project and Technical Team</td>
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<tr>
<td>1030-1100</td>
<td>Data Capture</td>
<td>Garage</td>
<td>AR/CR</td>
<td>Participants, Observers, Project and Technical Team</td>
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<td>1100-1130</td>
<td><strong>BREAK</strong></td>
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<tr>
<td>1130-1200</td>
<td>AAR</td>
<td>Garage</td>
<td>Observer 1/AR</td>
<td>Participants, Observers</td>
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<tr>
<td>1200-1300</td>
<td><strong>LUNCH</strong></td>
<td>Cookhouse</td>
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<td>1300-1500</td>
<td><strong>Vignette 3-CLEAR RURAL</strong></td>
<td>Garage</td>
<td>AR</td>
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<td>Garage</td>
<td>AR/CR</td>
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<td>1545-1615</td>
<td><strong>BREAK</strong></td>
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<tr>
<td>1615-1645</td>
<td>AAR</td>
<td>Garage</td>
<td>Observer 1/AR</td>
<td>Participants, Observers</td>
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<tr>
<td>1645-1700</td>
<td>Close down brief and look forward</td>
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<td>AR</td>
<td>Participants, Observers</td>
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<tr>
<td>1645-1700</td>
<td>Project Team Brief</td>
<td></td>
<td>AF</td>
<td>Project Team</td>
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Results and Lessons Learned - Sprint 1

- Established the baseline with 17 players in VR
- Established could probably support ~100 players in VR
- Power resolved - generators
- VBS3 engine good enough for VR
- Frame rate and variation fine and minimal nausea
  - 30-60 mins in VR
- Identified need for high-fidelity 3D model
- VR experience better than desktop 2D
- Targeted fidelity grips difficult (impossible) to use
Sprint 2

- 3D high-fidelity model introduced
  - more immersive
- Scaled to 37 players in VR
- UAV and Fire Support introduced
- Observer Mentors immersed in the game - AAR from VBS to Cervus HIVE
- DIS inter-operability with Challenger 2 tank and Cloud enabled thin clients
- Customised avatars
- Performance measurement
Sprint 3 - ‘Innovation as a Service’

• ‘Innovation as a Service’ - the whole system
  ▪ Novel technology - voice and face analysis to assess challenge
• Mixed Reality (MR) to view the Battlefield Management System
• Review of Concept in VR
• Out of the hatch tank commander view
• Instrumented live simulation light gun
Initial findings (SWOT)

- **S** - Takes you closer to the real platform than traditional desktop - aural and 3D
- **S** - Less investment compared to vehicle specific simulators
- **S** - Better cognitive competencies - situational awareness, decision making, communication and coordination compared to desktop training
- **S** - More pressure
- **W** - Limited physical skills eg buttons and weapons and full motion on untethered
- **O** - Can deploy to point of need with varying scale
- **O** - MR
- **O** - wider use eg in game briefings, rehearsals, in and after action review
- **T** - power and building conditions
- **T** - VR sickness

Strength, Weaknesses, Opportunities and Threat - VR not perfect but better than traditional desktop virtual simulation and will get better
Recommendations

• VR can be used in the collective training environment - further investigations required
• Targeted grips in VR are challenging
• Simulation application control schemas need re-designed
• Certain compromises need to be made in the simulation due to lack of control inputs and resolution
• Choose a suitable level of fidelity for immersion and training benefit
• VR greatly enhanced by MR
• Simulation standards need to evolve beyond DIS/HLA and embrace APIs to exploit commercial sector
• Use novel performance measurement tools regularly used in other industries
Next Steps

- British Army, Commander Field Army 3*, 9 April 2019, Warminster, VRLT Visitor Day -
  
  ‘more risk waiting for the findings of ‘VR in training’, than putting VR in the hands of soldiers for training, now’

- VRLT3 - 2 years + 1 year option
- 26 Collective Training events
  - 40-85 players
- Deliver Jan 20 - Jul 21
Conclusions

- VR is not the solution for everything!...but it has its place - better than desktop.
- AR/MR has more training applicability.
- Targeted levels of fidelity for immersion
- Exploit the commercial sector; military standards can hinder ie use open APIs vs DIS/HLA
- Performance measurement tools for Training, Management and Evaluation
- This is all based on experiential learning - more investigations required ie VRLT3!
About me:

David ‘Rusty’ Orwin was the Project Director for VRLT. Rusty spent 14 years in the British Army, retiring as a Major, in operational and training roles and has worked in the live and virtual simulation domains in industry. He has a BSc in Communications and Media Studies and an MSc in Information Management and Technology.