The Challenge

Requirement:

Develop innovative technologies that can;

Access: access munitions, IEDs & bulk agent containers without relying on original access ports

Disable: prevent munitions, IEDs and bulk agent being used for their intended purpose temporarily or permanently

Destroy: permanently destroy munitions, IEDs and bulk agents

Target Set:

Munitions - 175mm diameter projectiles

Bulk Agent - 1 metric tonne containers

Conditions:

Man-portable - able to be transported in 2 standard military bergens by 2 people

Mobile - system should fit on a NATO standard 463L pallet

Proposed Project Design

Access:

Based on the Viper development from DBI Phase 1, Valent proposed enhancing the system to give;

○ Increased Stand Off - Up to 100m

○ Intelligent Drill Head & Control Unit to optimise drilling performance

○ 2 Baseplate configurations - to increase operator options on target

○ Increased Empty/Backflush flow rates
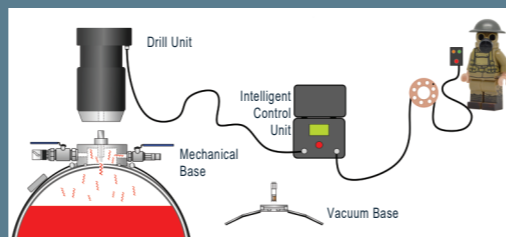
Plan to build 2 TRL 6 level Viper systems for testing & evaluation

Drill Unit · Intelligent Control Unit · Mechanical Base · Vacuum Base

Destruction:

2 streams of work based on 2 destruction technologies - both interfacing with the Viper Access system

POLYCAT UK PolyCatUK has developed a method for the formation and immobilisation of nanoparticle catalysts on polymeric substrates. This would be developed to provide a benign chemistry for the absorptio/catalysis of the agent which should immobilise and destroy it.

Sandia National Laboratories (USA) in collaboration with U.S. Army demonstrated a bi-component CA destruction chemistry comprising lithium nitride (Li3N) and water reacted with CW agent. The Li3N could be introduced to the agent as either a powder or a pressed tablet. For this project tablet form would be used.
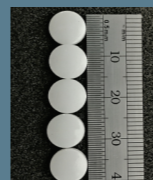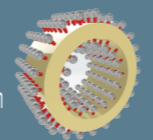
Covid Consequences

COVID & Lockdown struck just as the project was due to start at the end of March. Trying to execute a complex R&D project in the past 18 months has not been without challenges

Decreased Production Rate: This affected all elements internally and externally. New processes had to be developed and adapted as the situation changed. We found all processes were suddenly being done as though through 'treacle'
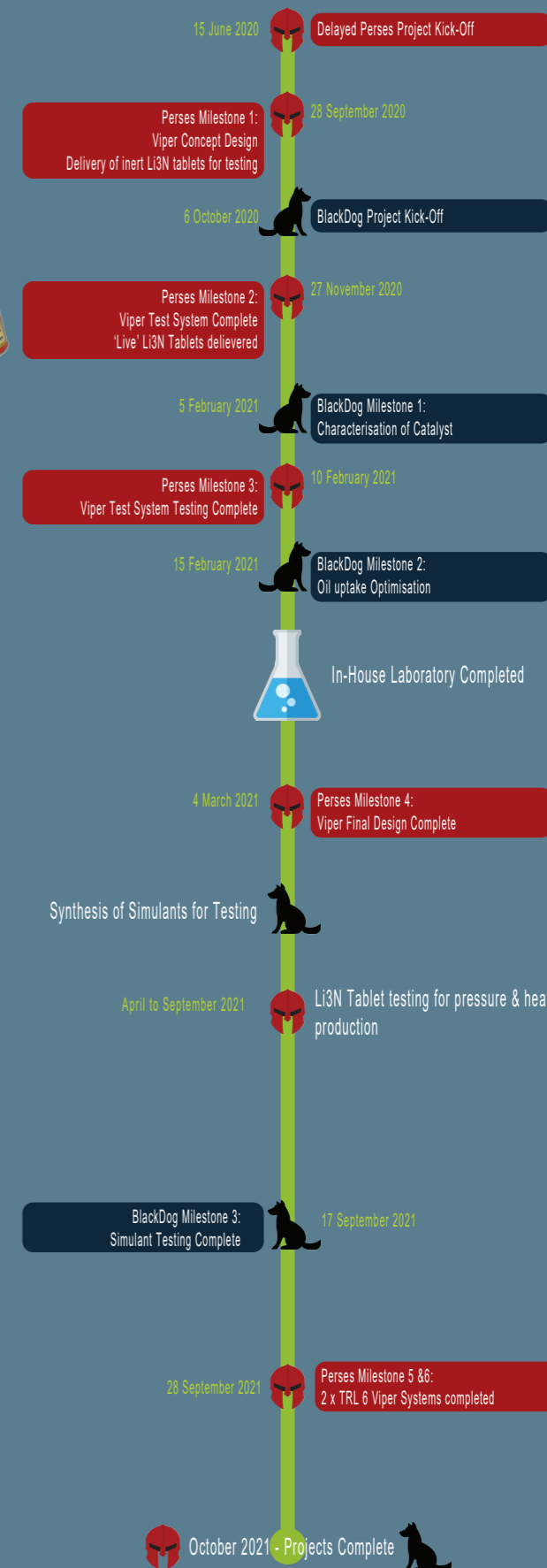
Reduced Access to Contractors: This led us to actually building our own in-house laboratory to conduct the simulant trials for each destruction project.

Supply Chain Issues: Everything from chemicals to black plastic has been affected meaning some comprimises were made in the final design.

Reduced Client Input: Virtual meetings cannot replace face to face meetings when discussing this type of project

Don't Blow It

Project's Perses & BlackDog

Project Tasks & Timeline

15 June 2020 — Delayed Perses Project Kick-Off

Perses Milestone 1: Viper Concept Design Delivery of inert Li3N tablets for testing — 28 September 2020

6 October 2020 — BlackDog Project Kick-Off

Perses Milestone 2: Viper Test System Complete 'Live' Li3N Tablets delivered — 27 November 2020

5 February 2021 — BlackDog Milestone 1: Characterisation of Catalyst

Perses Milestone 3: Viper Test System Testing Complete — 10 February 2021

15 February 2021 — BlackDog Milestone 2: Oil uptake Optimisation

In-House Laboratory Completed

4 March 2021 — Perses Milestone 4: Viper Final Design Complete

Synthesis of Simulants for Testing

April to September 2021 — Li3N Tablet testing for pressure & heat production

BlackDog Milestone 3: Simulant Testing Complete — 17 September 2021

28 September 2021 — Perses Milestone 5 &6: 2 x TRL 6 Viper Systems completed

October 2021 - Projects Complete

Conclusions & Next Steps

Conclusion:

All Project Elements were, in the main, successfully completed and the project objectives met

Full conclusions to be presented at CWD 2022...

Next Steps:

Valent, PolyCat and Sandia all have a vision for the project and a clear idea on the next development steps

Project Results

Access:

2 x Viper Systems successfully designed & built along with accompanying emptying and destruction equipment
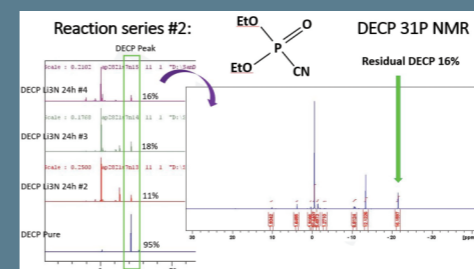
Full equipment capability to be presented at CWD 2022...

Destruction

Li3N Tablets:

These proved very effective and were integrated with the Viper system.

Reaction series #2: DECP Peak · DECP 31P NMR · Residual DECP 16% · DECP Li3N 24h #4 16% · DECP Li3N 24h #3 18% · DECP Li3N 24h #2 11% · DECP Pure 95%

PolyCat Nanoparticles;

These proved very effective and were integrated with the Viper system.

Objective was not a "fire and fury" breakdown, but gentle destruction to put agent out of use

Study Stage			
Best result at end of Phase 1		29 hours	c. 70 days
Best result at end of Phase 2		29 hours	c. 10 days
Target result for next project		1 hour	8 hours

Full results to be discussed at CWD 2022

VALENT CBRN | HAZMAT | EOD

POLYCAT UK