Standardization of Nerve Agent Protection Testing: A Successful Transition and Standardization Story

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RDECOM Chemical & Biological Center

10 July 2018

INTRODUCTION

Research Chemist specializing in chemical warfare protection

Started work for Army in 2003

Focus on transitioning S&T to T&E and standardization

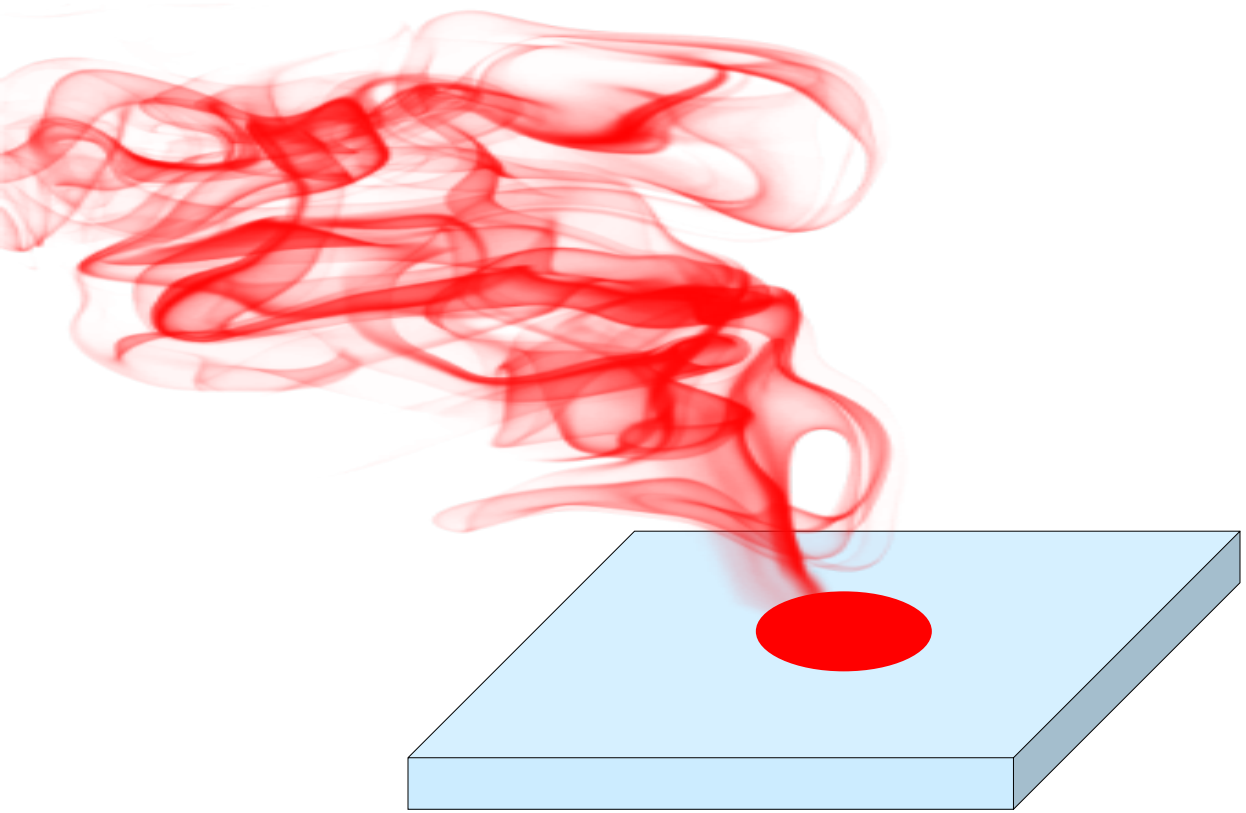
Recently completed 28 month ESEP assignment in UK

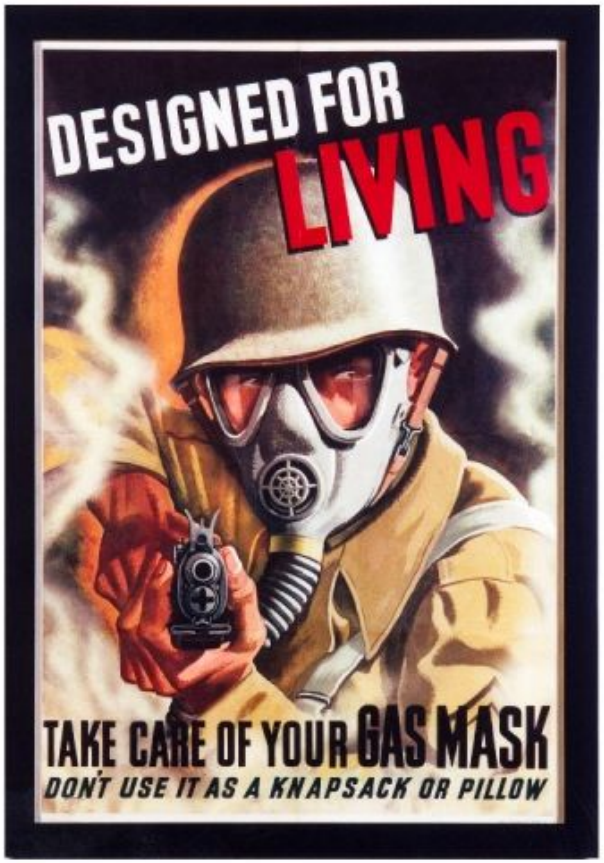
IMPORTANT CAVEATS

All testing for the standardization was performed with materials that are known to be permeable to VX. At no time was military PPE found deficient outside the specifications. No inference of vulnerability is intended or implied.

Chemical warfare agents are dangerous
Please do not try this at home

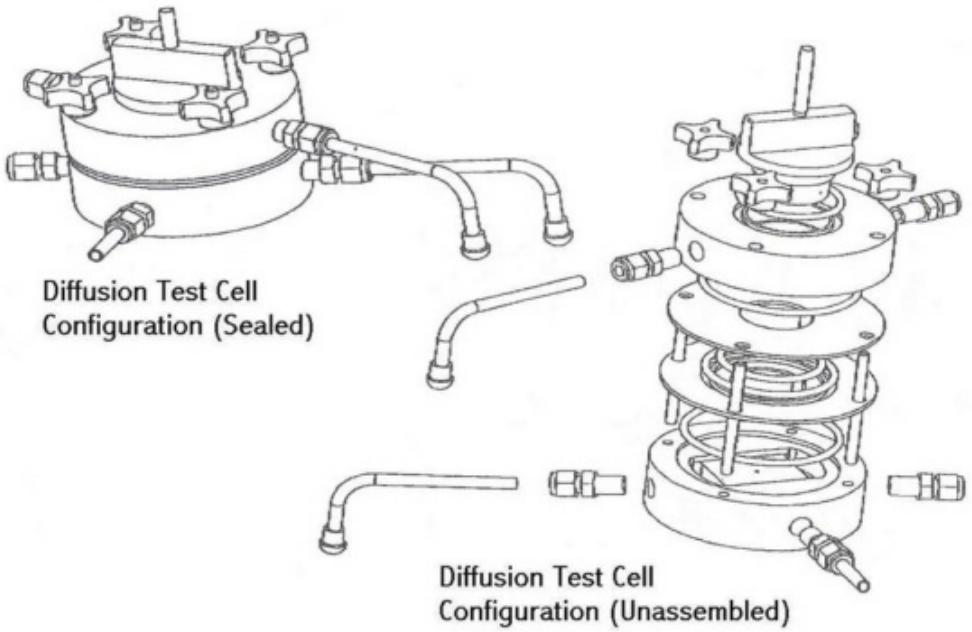
TWO CHEMICAL WARFARE SCENARIOS: VAPOR AND CONTACT





High-volatility

SWATCH TEST SCHEMATIC



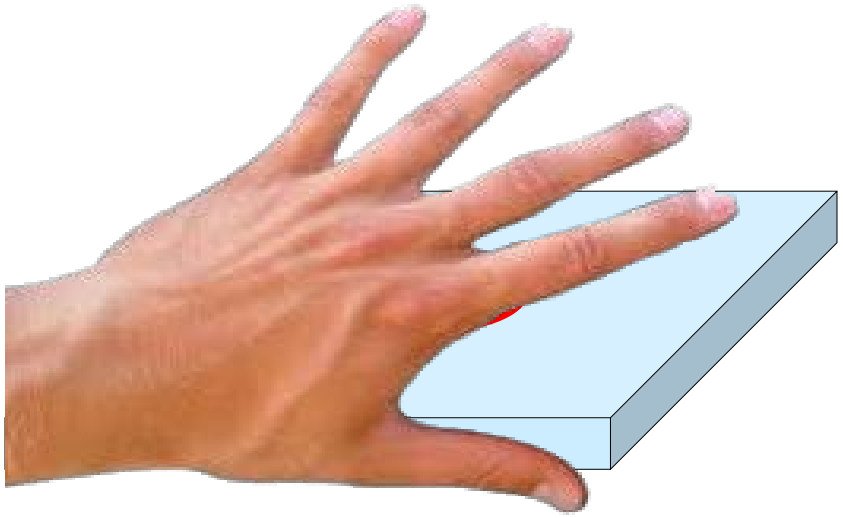
Permeation

Vapor detection

TOP 8-2-501
Same cell required by NFPA 1994

PERMEATION RACK SYSTEM IS LARGE

TWO CHEMICAL WARFARE SCENARIOS: VAPOR AND CONTACT



Low-volatility

Contact hazards are dangerous if you touch them

VX CHARACTERISTICS

- **Low-volatility**
- **Nerve agent**
- **Odorless and colorless**
- **Persistent**
- **Extraordinarily toxic**

Lethal dose of VX

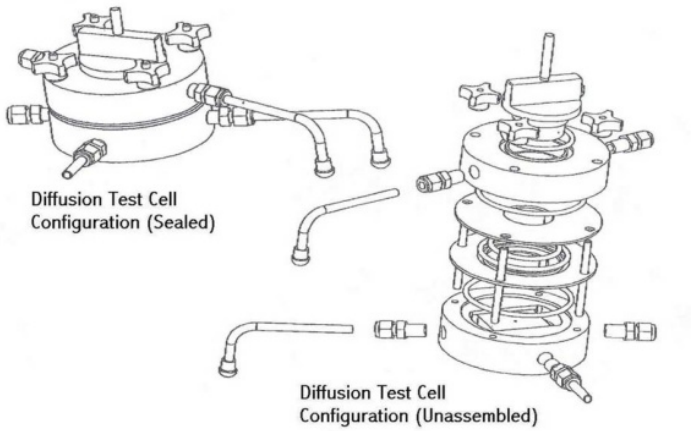
Standard challenge level: 10 g·m² or ~20 mL per suit

~5000 person lethality

VAPOR VS CONTACT PERMEATION TEST METHODS

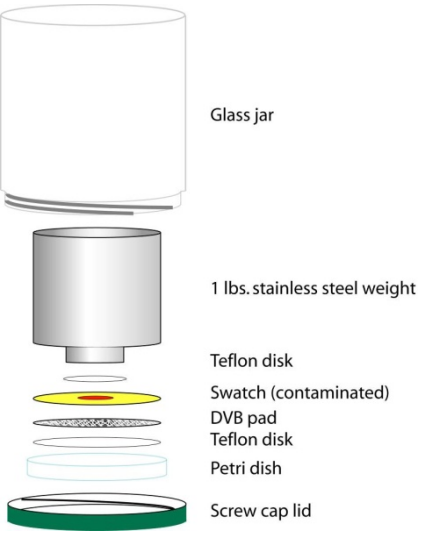
10 µL VX on 10 mil latex sheeting: 4 hr @ 37.1 ºC

Vapor



53.1 µg
0.5% breakthrough

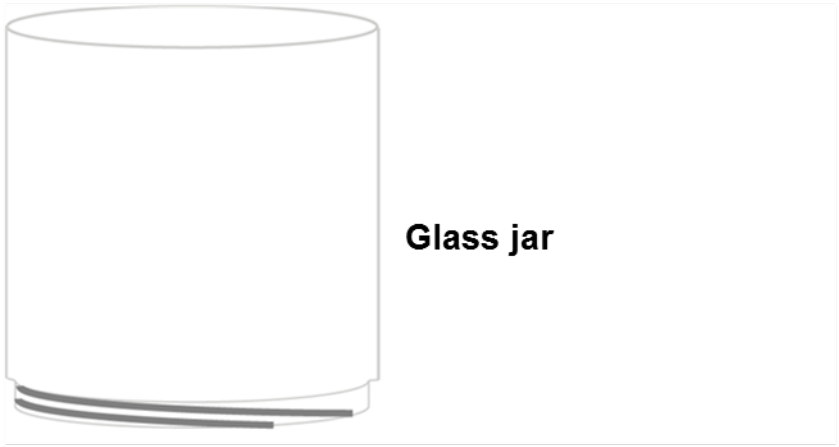
Contact

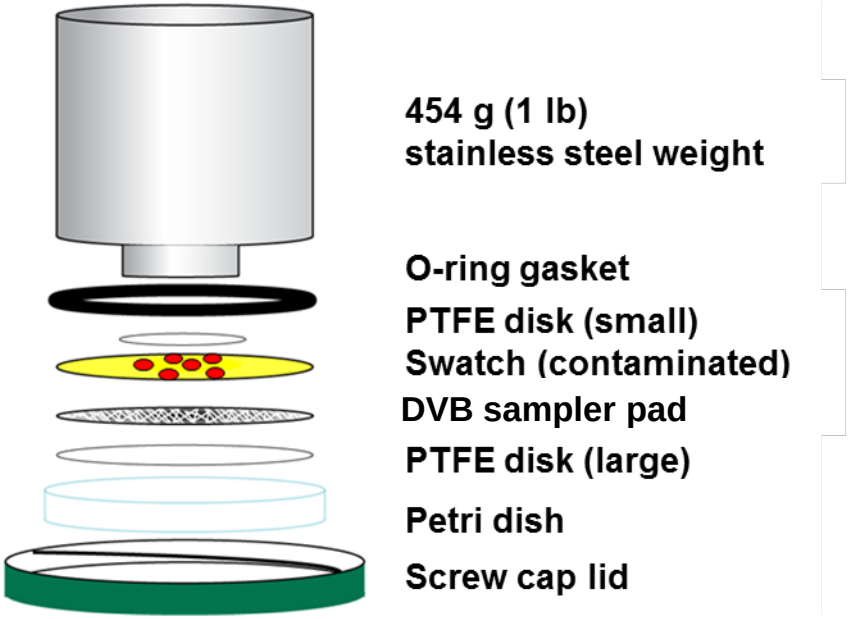


8,316 µg
83.2% breakthrough

Standard vapor test under predicts the potential contact hazard

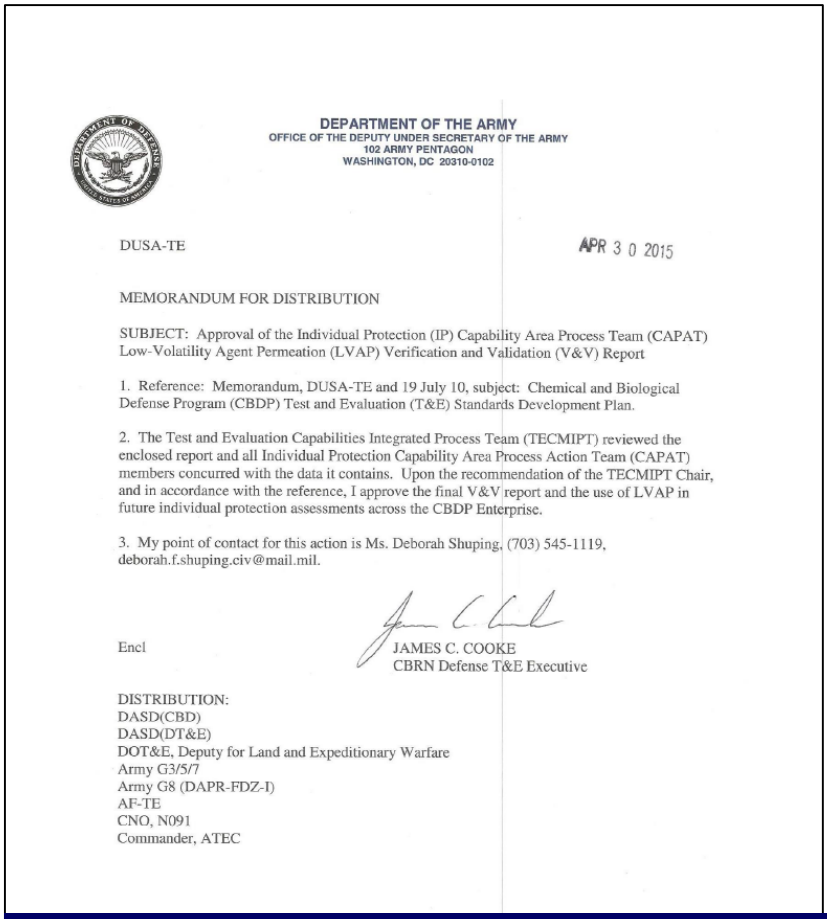
LVAP – NEW DOD STANDARD: MATERIAL TESTING AGAINST VX





D'Onofrio et al. "Low-Volatility Agent Permeation (LVAP) Verification and Validation Report" ECBC-TR-1274, 2015

CONCURRENCE AND ENDORSEMENT



DEPARTMENT OF THE ARMY
OFFICE OF THE DEPUTY UNDER SECRETARY OF THE ARMY
102 ARMY PENTAGON
WASHINGTON, DC 20310-0102

DUSA-TE

APR 3 0 2015

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Approval of the Individual Protection (IP) Capability Area Process Team (CAPAT) Low-Volatility Agent Permeation (LVAP) Verification and Validation (V&V) Report

1. Reference: Memorandum, DUSA-TE and 19 July 10, subject: Chemical and Biological Defense Program (CBDP) Test and Evaluation (T&E) Standards Development Plan.

2. The Test and Evaluation Capabilities Integrated Process Team (TECMIPT) reviewed the enclosed report and all Individual Protection Capability Area Process Action Team (CAPAT) members concurred with the data it contains. Upon the recommendation of the TECMIPT Chair, and in accordance with the reference, I approve the final V&V report and the use of LVAP in future individual protection assessments across the CBDP Enterprise.

3. My point of contact for this action is Ms. Deborah Shuping, (703) 545-1119, deborah.f.shuping.civ@mail.mil.

Encl

JAMES C. COOKE
CBRN Defense T&E Executive

DISTRIBUTION:
DASD(CBD)
DASD(DT&E)
DOT&E, Deputy for Land and Expeditionary Warfare
Army G3/5/7
Army G8 (DAPR-FDZ-I)
AF-TE
CNO, N091
Commander, ATEC

Established a strong relationship as SME with T&E community

11 O-6+ level concurrences:

IP CAPAT co-chairs (Individual Protection Capability Area Process Action Team)

OTAs (Operational Test Agencies)

- **Army**
- **Navy**
- **Air Force**
- **Marines**

JSTO (Joint Science Technical Office)

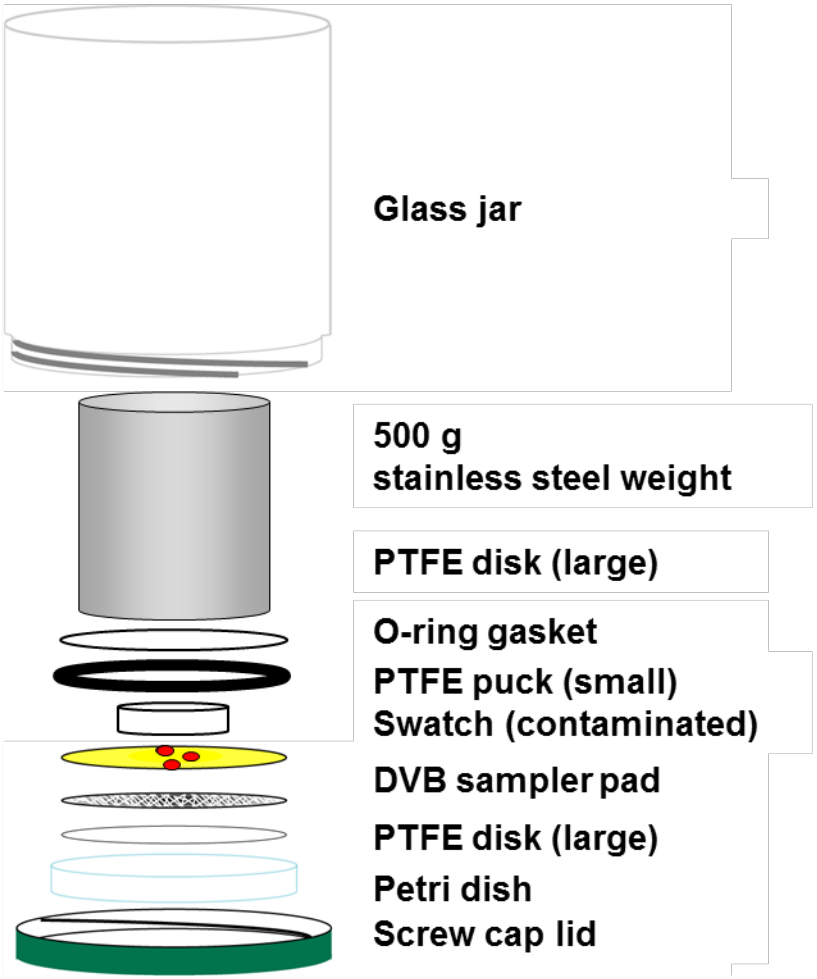
JRO (Joint Requirements Office)

JPEO-CBD (Joint Program Executive Office for Chemical & Biological Defense)

DUSA TE (Deputy Under Secretary of the Army for Test and Evaluation)

Endorsement by DUSA TE Executive completed the transition as an official DoD method

LVAP IMPLEMENTED AT DSTL



UK OFFICIAL

[dstl]

Implementation and Validation of the Low-Volatility Agent Permeation (LVAP) Fixture and Method at Dstl

D'Onofrio, TG, Pritchard, SJ

DSTL/TR100250 1.0
1 March 2017

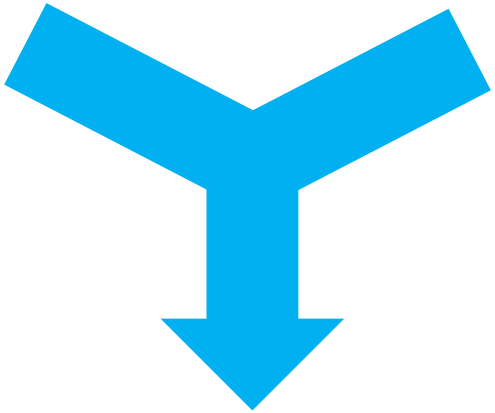
CBR Division
Porton Down
Salisbury
Wilts
SP4 0JQ

UK OFFICIAL

LVAP now used for UK Acquisition programs

D'Onofrio and Prichard, "Implementation and Validation of the LVAP Fixture and Method at Dstl" DSTL/TR100250, 2017

NEXT STEPS…

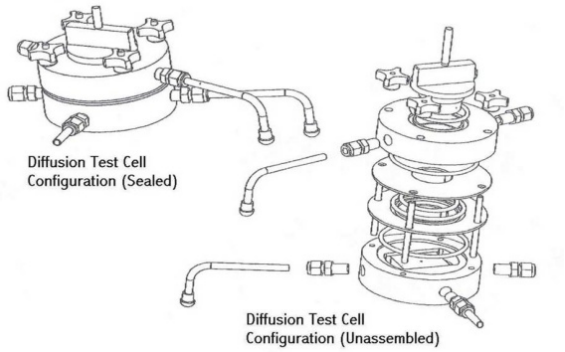


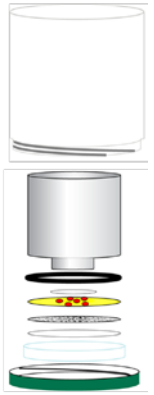
Nov 2017 - Briefed NATO Jt CBRN Physical Protection Panel

Committee to incorporate LVAP into updated NATO standards

Promoting test standardization and inter-operability

ECONOMIC BENEFITS





Hardware Cost	**$400K**	**$30K**
Throughput	**27**	**40**
Precision	**±80%**	**±8%**
Size	24 ft^2	4 ft^2

LVAP RECOGNIZED FOR EXCELLENCE

2017 Mid-Atlantic Region Excellence in Technology Transfer
Federal Laboratory Consortium

2016 Maj. Gen. Harold J. Greene Award for Innovation (runner-up)
Army Materiel Command

2015 Defense Standardization Program Distinguished Achievement Award

2015 Defense Standardization Program Outstanding Performance Award
Deputy Assistant Secretary of Defense for Systems Engineering and the Defense Standardization Executive

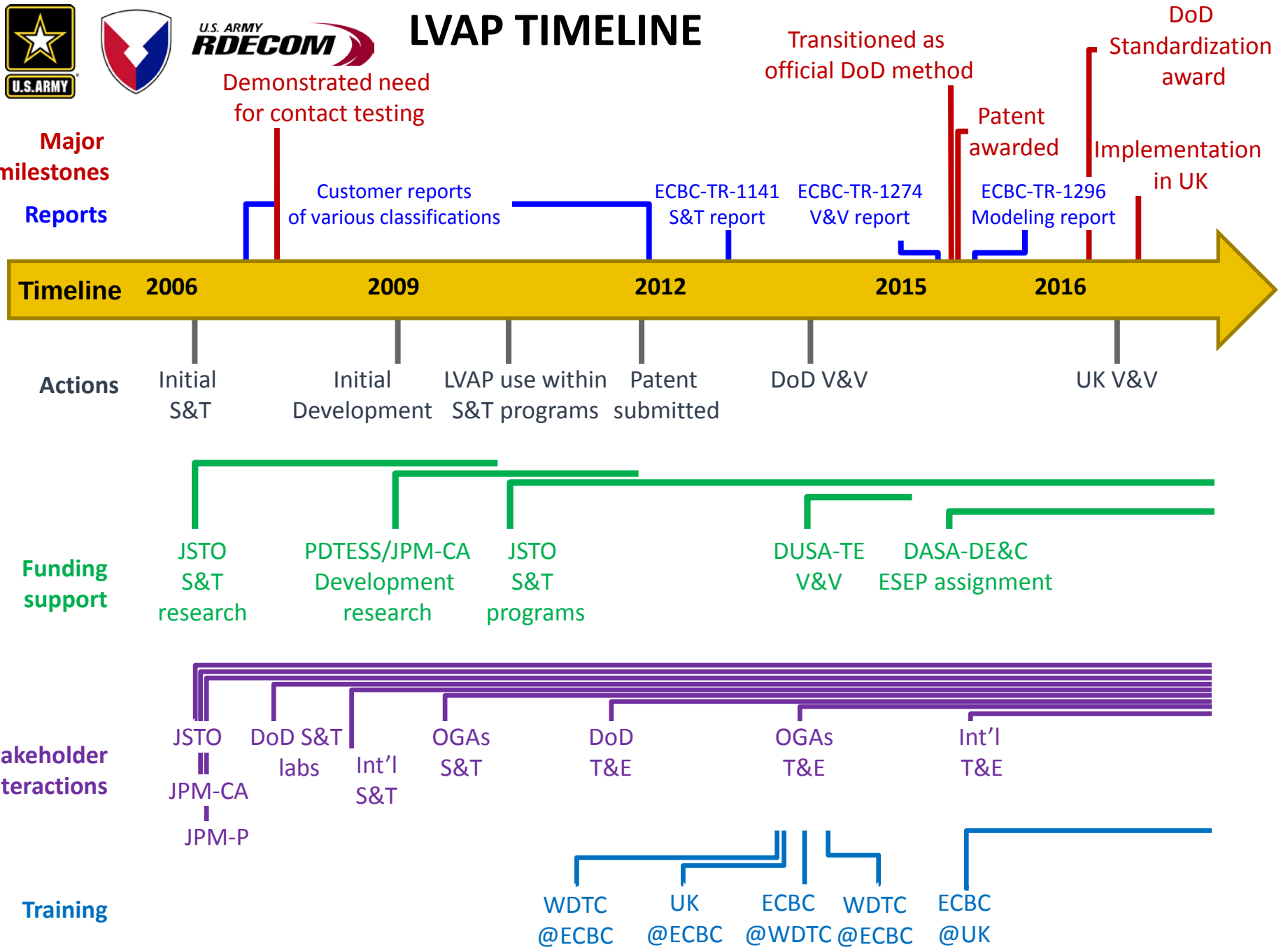
2015 Department of the Army Achievement Medal for Civilian Service
CBRN Defense Test & Evaluation Executive

2015 U.S. Patent 9,021,865

Kristen Baldwin, DASD(SE)

International implementation and universal standardization part of award recognition

LVAP TIMELINE



ACKNOWLEDGEMENTS

Funding

Technical

Validation for U.S. Acquisition Programs