



FACT SHEET

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Date of issue: 26 Oct 2021

Defence Technology Prize 2021 Team (Engineering) Award Winner

MINDEF FORWARD DEPLOYMENT LABORATORY (FDL) TEAM

DSO National Laboratories, Defence Science and Technology Agency, Future Systems and Technology Directorate, and Defence Technology Collaboration Office.

CITATION

The MINDEF Forward Deployment Laboratory (FDL) is the first-of-its-kind containerised laboratory solution to increase diagnostic capacity during a pandemic. Set up and operationalised in just 4 months, the FDL provides an additional 10,000 COVID-19 tests a day. Designed to be scalable and mobile, the capability sprang into action to help contain the foreign worker dormitory outbreak in 2020. The team took on frontline roles from setting-up, licensing, and operations management to recruitment of manpower and training. The team also leveraged digitalisation and automation to maximise throughput and ensure accuracy of the test results. In recognition of their outstanding achievements and contributions, the team is awarded the DTP2021 Team (Engineering) Award.

ABOUT THE FDL TEAM

The team comprises members across the Defence Technology Community. DSO National Laboratories (DSO) developed the concept with the Defence Science and Technology Agency (DSTA), and designed the laboratory layout and clinical test workflow for the FDL. DSTA identified the potential deployment sites, made the site assessment and developed the infrastructure support solution. An operations team, made up of volunteers from across DSO, managed the operations including licensing, manpower training and enhancements through digitalisation for the FDL, while the MINDEF Future Systems and Technology Directorate and Defence Technology Collaboration Office worked out the policy and finance issues.

TECHNICAL INNOVATION AND OPERATIONAL IMPACT

Drawn from the concept of the Singapore Armed Forces' Mobile Laboratory for chem-bio testing in the field, the layout and workflow for these containerised laboratories were modified from the

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Clinical Diagnostic Services Laboratory (CDSL) in DSO's Defence Medical and Environmental Research Institute (DMERI), and is designed to be mobile and easily scalable as compared to brick and mortar facility.

The FDL at Changi Exhibition Centre was conceptualised and operationally ready within three months during the start of the pandemic in June 2020. The second FDL at Army Museum of Singapore began its operations in August. Both the FDLs played a crucial role in supporting the rising dormitory cases and expanded Singapore's testing capacity, with each FDL contributing an added test capacity of 2,500 samples per day. These FDLs have since been consolidated and is operating from Changi Airport Terminal 4 together with two other FDLs.

The intent of the FDL is to scale up COVID-19 testing capacity for MINDEF/SAF and the nation and have the following key features:

a) Modular Design

The modular containerised laboratory design allows flexibility in both test capacity (number of FDLs deployed) and mobility (deployment locations). As a result, the FDL can be purposefully deployed and scaled to meet the required testing capacity. The two initial FDLs at Changi Exhibition Centre and Army Museum of Singapore have since been redeployed as part of a cluster of four FDLs at Changi Airport, to support our nation's effort against COVID-19.

b) Digitalisation and Automation

The FDL's processes were digitalised as mobile applications for convenient, decentralised management and tracking of laboratory operations. A consolidated dashboard used by the FDL operations centre provided complete end-to-end traceability of swab testing operations – from receiving of electronic swab orders from agencies, receiving of physical samples, to testing and submission of electronic results.

An AI system for Polymerase Chain Reaction (PCR) analysis named RAPID: ResoluteIT Analyser for PCR with Intelligent Decision-making, was also developed to assist the testers in interpreting the test results. This enhances the accuracy especially during long-drawn operations. The FDL also incorporated the use of automated liquid handling equipment to replace part of the sample preparation process for testing. This increases productivity by streamlining workflows and maximising throughput, while reducing the risk of exposure to the testers.

c) Quickly Raising Tester Manpower

The strategy in meeting the manpower requirement for the FDL was to simplify and minimise the technical steps required in conventional PCR tests. The use of the RESOLUTE direct PCR test kits, jointly developed by DSO and the Agency for Science, Technology and Research (A*STAR), eliminated the need for sample extraction, a step which requires advanced laboratory technicians to carry out. With the streamlined workflow and the use of automation, testers without biomedical background can be quickly recruited, trained and qualified within one-month to conduct the tests safely and confidently.

As a result, the FDLs were able to support the nation's effort against COVID-19 testing, especially during the outbreak in our foreign worker dormitories in 2020. The four operational FDLs will contribute an additional 10,000 tests per day, up from the previous 2,900 tests per day in 2019.

Beyond COVID-19, the experience in setting up and managing the FDL will be an important capability for Singapore in managing future pandemics.

PROFILE OF TEAM LEADER

Name	Associate Professor Mahesh Uttamchandani
Appointment	Founding Lab Director, MINDEF Forward Deployment Laboratory, 创始实验室署长, 前端派遣实验室 Director (Combat Protection and Performance Programme) 署长 (战斗保护和性能项目) Defence Medical & Environmental Research Institute (DMERI) 国防医药及环境性研究学院
Organisation	DSO National Laboratories
Age	41

AWARDS

- National Young Scientist Award, 2011

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