



# SPEECH

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## **Speech by Minister for Defence Teo Chee Hean at the Official Commissioning of the Underground Ammunition Facility**

07 Mar 2008

Good morning, distinguished guests, ladies and gentlemen.

It gives me great pleasure to be here this morning in the old Mandai Quarry, to commission the Underground Ammunition Facility, or the UAF.

### **Land use and savings for Singapore**

Scarcity of land is a serious challenge for Singapore. Given our small size, our housing, economic and defence needs will always compete for land.

Efficient land use and space management are therefore key considerations when MINDEF plans for any new military installation.

When the Seletar East Ammunition Depot, left to us by the British, was identified for redevelopment by the Urban Redevelopment Authority (URA), we recognised that replacing it the traditional above-ground ammunition depot would not be optimal from the land use perspective.

This is because traditional aboveground ammunition storage facilities require that large tracts of land surrounding the ammunition depot be "sterilised" - meaning that they cannot be used for any other purpose - in order to ensure a safe distance from the depot to public access areas.

To overcome this challenge, our engineers proposed to develop an underground ammunition depot at this disused Mandai Quarry.

It was a bold and innovative idea that would require them to overcome many engineering challenges.

However, the case was compelling because if they succeeded, we would be able to meet our requirements, minimise the use of land and create more space for Singapore. MINDEF therefore agreed to the idea.

The facility we are standing in today is a reality because we dared to pursue a bold new solution to overcome one of our perennial constraints.

The UAF requires 90 per cent less land to be sterilised when compared with a traditional above-ground ammunition depot of similar capabilities.

This is because the inherent strength of the granite formation here at the Mandai Quarry provides natural fortification and its hard granite walls contain the risks associated with ammunition storage.

Furthermore, as the depot is built underground, the land above and the forested areas surrounding the UAF have been left intact and continue to be used as training grounds for the SAF. And with the completion of the UAF, we have finally decommissioned the Seletar East Ammunition Depot.

This has freed up about 300 hectares of land, equivalent to half of Pasir Ris New Town or 400 football fields, which MINDEF has returned to the URA for future development.

### **The UAF - A 3rd Generation SAF facility**

The UAF is a 3rd Generation SAF facility. Equipped with the latest in ammunition storage technology and systems, it serves as a one-stop operations centre for storage and supply of ammunition in the SAF.

In the past, we used to manually strap ammunition pallets onto transporters to move ammunition out of a depot. When these ammunition pallets arrived in the field, they were then re-configured into mission loads before distribution to troops.

With the UAF, we are now able to move more ammunition to the troops in a much shorter time, and in the exact configuration required for the mission. This is done by storing ammunition loads for specific missions in ready-to-move standard containers.

Mechanised for easy retrieval and processing, these containers can be easily loaded onto even commercial trailers which can then be driven straight to the field and upon arrival, the ammunition can be given out immediately to the troops.

### **Engineering the UAF**

The UAF is the world's most modern underground ammunition facility and the first large-scale underground containerised facility to be designed and developed within such a densely developed and urbanised area like Singapore.

It is an engineering achievement which took more than 10 years to complete.

As it is the first of its kind in the world, the UAF team could not rely on industrial norms. In many areas, solutions to enhance the safety and efficiency of the facility had to be engineered from scratch.

Until we embarked on this project, available information on structural responses to a blast were all based on earthquakes or mine blastings.

Our engineers therefore carried out extensive simulation studies and scale-testing of shock waves in a mixed media of soil and rock to validate key design aspects.

As a result, the team set new international standards in underground storage safety, and their research findings have been presented at international conferences and published in leading scientific journals.

With the SAF defining the operational requirements, the UAF was designed as a series of large caverns to house a containerised storage system where the containers can be stacked up to optimise storage and enable efficient retrieval.

Good systems engineering has also meant efficiencies beyond land use. With the Ammunition Depot Management System, which plans and monitors ammunition storage and retrieval operations as well as scheduling of the new mechanised handling processes, the UAF requires 20% less manpower to operate than a conventional facility. The engineers also made use of the natural insulation provided by the granite caverns to achieve a 50% reduction in the energy required for cooling compared to a conventional depot.

## **Conclusion**

In concluding, I would like to acknowledge the Nanyang Technological University and the National University of Singapore, as well as overseas technology research centres like Sandia National Laboratories in the United States, FOI (the Swedish Defence Research Establishment) and the Norwegian Defence Estate Agency who have collaborated with our engineers on this project.

Finally, let me congratulate the team from the SAF, the Defence Science and Technology Agency (DSTA) and SembCorp, for their imagination, hard work and dedication in seeing this project through from conception to completion. Because they dared to dream, think deep and break new ground, we have created more space for our defence, while freeing up more precious land for Singapore.

Thank you.

National Archives of Singapore

## **News Release:**

- Official Commissioning of the Underground Ammunition Facility (MINDEF\_20080307001.pdf)