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Defence Technology Prize 2021 Team (Engineering) Award Winner

A330 MULTI-ROLE TANKER TRANSPORT HANGAR TEAM

Defence Science and Technology Agency, Republic of Singapore Air Force

CITATION

The A330 Multi-Role Tanker Transport (MRTT) hangar is the Singapore Armed Forces (SAF)'s first integrated facility for wide-body aircraft maintenance, and its largest hangar to date. Conceptualised and developed by the Defence Science and Technology Agency (DSTA) in close partnership with the Republic of Singapore Air Force (RSAF), the A330 MRTT hangar's seamless workflow design improved work efficiency and reduced aircraft maintenance downtime. Going beyond operational requirements, the hangar is also the SAF's first net positive energy building with an integrated solar energy harvesting system. The team implemented an environmentally sustainable design to achieve a best-in-class energy performing building that generates 30 per cent more electricity than it consumes. In recognition of its outstanding achievements and contributions, the team is awarded the DTP2021 Team (Engineering) Award.

ABOUT THE A330 MRTT HANGAR TEAM

The multidisciplinary team from DSTA and the RSAF comprised architects, system engineers, building engineers, quantity surveyors, technical officers and Air Force engineers. The team's areas of expertise included civil, electrical and mechanical engineering. DSTA led the design, development and delivery of the hangar, which included the implementation of environmentally sustainable initiatives as well as innovative solutions for building and infrastructure. The RSAF provided key operational insights that guided the design and facilitated the integration of novel technologies and sustainable features into the hangar.

TECHNICAL INNOVATION AND OPERATIONAL IMPACT

Located in Changi Air Base (East), the hangar was developed to provide high operational payoff to the RSAF by addressing the A330 MRTT's maintenance requirements fully. Going beyond operational requirements, the team strategised and implemented an environmentally

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sustainable design to achieve a best-in-class energy performing building. Completed in March 2020, the A330 MRTT hangar represents a significant green engineering milestone for MINDEF and the SAF. The integration of the solar energy harvesting system into the building design, coupled with good passive and active design strategies, enabled it to become the SAF's first Green Mark Platinum (Positive Energy) building certified by the Building and Construction Authority.

The design innovations include:

a) All-in-One Complex for Enhanced Readiness

The hangar was designed as an integrated facility for aircraft maintenance. It brings together workspaces under one roof, enabling maintenance processes to be carried out seamlessly. Aircraft parts and maintenance equipment can be stored in the facility to minimise transportation between the hangar and warehouses, reducing the downtime required for maintenance.

b) Solar Energy Harvesting System

More than 2,000 solar panels were installed on top of the hangar. The solar panels will generate 1,225 megawatt hour (MWh) of clean solar energy a year, enough to power 273 4-room HDB households. Additional electricity generated from the solar panels will also be used to supplement other energy demands within Changi Air Base (East).

c) Water Conservation

The use of water efficient fittings is projected to save 5,460 cubic metres of water per year, equivalent to the consumption of 28 4-room HDB units annually. The hangar also harvests and recycles rainwater for non-potable uses such as general washing, auto-irrigation of the hangar's green roof and toilet flushing.

d) Sustainable Building Materials

Sustainable and eco-friendly products were used for the building construction, such as low-VOC (volatile organic compounds) paint, green concrete¹ and other Singapore Green Building Product-certified² materials.

e) Reduced Solar Heat Gain

Besides serving as a rest and recreation area, the hangar's green roof also acts as an insulation layer to reduce solar heat gain in the building.

f) Naturally Ventilated Space

The hangar space is designed to optimise airflow, with large-span louvres for natural ventilation. A panelled fabric door and high-volume low-speed fans further augment thermal comfort.

¹ Green concrete is concrete that contains recycled materials such as recycled concrete aggregate and washed copper slag.

² Presented by the Singapore Green Building Council.

PROFILE OF TEAM LEADER

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