AIRTECHNOLOGY / AMETEK®

# AEROSPACE
# VAPOUR CYCLE SYSTEMS



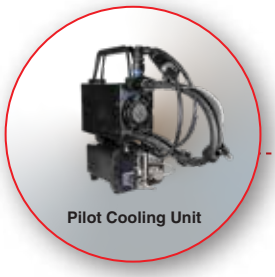
WHEN
**EXCEPTIONAL PERFORMANCE**
MATTERS

## General Overview

AMETEK Airtechnology has an extensive portfolio of custom VCS solutions for defence applications.
These systems combine our own components such as fans, heaters, and compressors, which are also designed and developed in-house.
As a thermal management solutions provider, we work on challenging projects requiring cutting-edge solutions.
Through our work, we recognise that the future is “More Electric,” involving HVDC and architectures which necessitate cooling solutions with significant heat rejection.

## Our Products & Applications

### Pilot Cooling Unit (PCU)

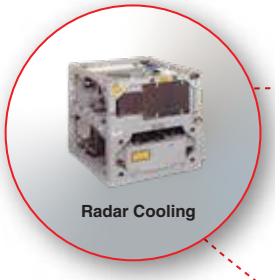

Pilot Cooling Unit



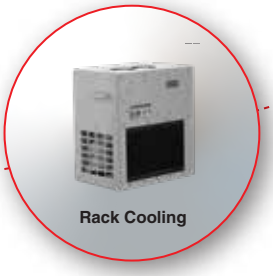

Targeting Pod Cooling



### Electronics Pod Cooling

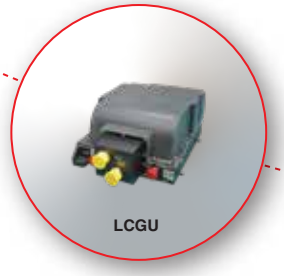

Radar Cooling




Rack Cooling

### Radar Cooling System




LCGU



### Liquid Conditioning Generation Unit (LCGU)

## Pilot Cooling Unit

The Pilot Cooling Unit (PCU) provides personal cooling when aircrew are wearing a Liquid Cooling Vest (LCV). It provides a continuous supply temperature controlled liquid that is circulated through the LCV, thereby maintaining the pilot's body core temperature.
The PCU contains a miniature vapour cycle liquid cooling system and is capable of operation in both ground and flight conditions. Components have been optimised to minimise size and weight. The unit operates from a 28V DC electrical supply. For ground operation, an optional Lithium Polymer rechargeable battery pack is available.

| AC195A30-H | |
|---|---|
| Cooling capacity | 190W |
| Dimensions | 200mm (L) x 94mm (W) x 221mm (H) |



AC195A30-H



## Electronics Pod Cooling

This Environmental Control Unit (ECU) has a cooling capacity of 2.4kW and is specifically designed to be mounted externally on a fast-jet electronics pod. The ECU module, which is located at the rear of the pod, regulates the temperature of the internal electronic equipment by providing a steady flow of conditioned air.
The ECU uses an environmentally friendly refrigerant, ozone-benign R236FA, to absorb and remove heat through its vapour cycle refrigeration system. During flight, the ECU's condenser receives airflow through a variable ram air inlet. While stationary on the ground, supplementary fans cool the condenser.
An onboard heater is also available to provide heating in low-temperature ambient conditions. The ECU is designed to operate in various environmental conditions, including the typical supersonic fast jet flight envelope.

| AC203A1 | |
|---|---|
| Cooling capacity | 2400W |
| Dimensions | 426mm (L) x 578mm (H) x 430 (dia) |



AC203A1



## Rack Cooling System

This Racking Cooling System (RCS) is an airborne Vapour Cycle System (VCS) capable of removing 1.5kW of heat from an electronics rack system that is mounted inside a fixed-wing airframe. The RCS comprises the following major components: Evaporator Heat exchanger and Evaporator Fans, Condenser Heat Exchanger and Condenser Fans, Control Box, and User Interface. Cooling is achieved by using a refrigeration vapour cycle principle that is designed to operate with environmentally friendly refrigerant R513a. The RCS will maintain the electronics racing at temperatures below 32°C at nominal cabin temperatures and continue to operate at elevated temperatures of +50°C.

| AT1626A1 | |
|---|---|
| Cooling capacity | 1500W |
| Dimensions | 475mm (L) x 304mm (W) x 500mm (H) |



AT1626A1



## Radar & Crew Cooling System

This cooling unit has been developed specifically for cooling the radar equipment and operators within a helicopter based airborne early warning platform. The unit is configured as a single package with all system components contained within an aluminium alloy space frame.

The cooling unit is based upon a conventional vapour cycle refrigeration system employing refrigerant R134a. The system incorporates twin evaporator circuits to provide two independent cooling functions. The radar evaporator operates within a closed loop air circuit providing cooling to the radar equipment.

| AC158A1 | |
|---|---|
| Cooling capacity | 1.5kW (Radar circuit) |
| | 1.2kW (Crew circuit) |
| Dimensions | 618mm (L) x 682mm (W) x 712mm (H) |



AC203A1



## Liquid Conditioning Generation Unit (LCGU)

The Liquid Conditioning Generation Unit (LCGU) houses the main components of the system, providing fluid flow and temperature regulation. Cooling is derived from a liquid/air heat exchanger located within the aircraft's environmental control system. An integral heater supplies heating. A temperature-regulating valve mixes the hot and cold fluids to control the conditioning fluid's temperature, which is selected on each crew member's Garment Temperature Selector (GTS). The system monitors the fluid to ensure that it is circulated to the crew members within safe limits. A motorized, positive displacement pump provides the motive power to push the conditioned fluid through the system. Conditioning fluid temperature stabilization, plus compensation for fluid pressure loss and fluid loss, is achieved by the use of an 'in-line' reservoir, which maintains a positive pressure on the pump.

| DAC156-A6 | |
|---|---|
| Cooling capacity | 300W |
| Heating Capacity | 960W |
| Dimensions (LCGU) | 289mm (L) x 200mm (W) x 110mm (H) |
| Dimensions (LSCA) | 221mm (L) x 45mm (W) |



DAC156-A6



The interface between the LCGU and the crew member is the Liquid Suit Connector Assembly (LSCA). This is mounted on the seat and enables the separation of the crew member from the seat on ejection. The LSCA comprises a crew/pilot Portion, a Seat Portion, and an Aircraft Portion. The crew/pilot Portion is a self-sealing plug with hose attachments connected to the LCGU. It allows single-handed connection to the Seat Portion and locks on correct engagement. It can be detached manually or remotely as part of the aircrew ejection sequence. The Seat Portion accepts the mating section of the crew/pilot Portion and is mounted on each crew member's seat. It embodies a solenoidoperated, flow directing valve and fluid filter. It also incorporates twin temperature sensors and the crew/pilot Portion engagement mechanism and sensor. The Aircraft Portion connects the LCGU to the Seat Portion and permits the separation of the liquid hoses and electrical receptacle from it as part of the aircrew ejection sequence. Self-sealing connectors are used throughout the LSCA to minimize fluid loss and air ingress during connection and disconnection.

# Contact Us


Aerospace & Defence Applications

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