

AEROSPACE INFORMATION REPORT

AIR806™

REV. B

Issued 1965-04
Revised 1997-10
Reaffirmed 2020-05

Superseding AIR806A

Air Conditioning of Aircraft Cargo

RATIONALE

AIR806B has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

The report presents air conditioning data for aircraft cargo which is affected by temperature, humidity, ventilation rate and atmospheric pressure. The major emphasis is on conditioning of perishable products and warm-blooded animals. The report also covers topics peculiar to cargo aircraft or which are related to the handling of cargo.

1.1 Purpose:

The purpose of this Aerospace Information Report (AIR) is to provide design information related to the air conditioning of cargo transported by commercial and military aircraft. Affected cargo includes perishable products, live animals and hazardous materials.

2. REFERENCES:

1. SAE ARP85 - Air Conditioning Equipment, General Requirements for Subsonic Airplanes.
2. SAE ARP89 - Temperature Control Equipment, Automatic, Airplane Cabins.
3. SAE ARP367 - Airplane Cabin Pressurization.
4. SAE ARP699 - High Temperature Pneumatic Duct Systems for Aircraft.
5. SAE AIR795 - Air Conditioning of Subsonic Aircraft at High Altitude.
6. SAE ARP1270 - Cabin Pressure Control Criteria.
7. SAE ARP1395 - Minimum Requirements for Future Wide-Body Aircraft Cargo Systems and Compartments.
8. Unit Load Devices Manual - International Air Transport Assoc., P.O. Box 160, 1212 Cointrin, Geneva, Switzerland.
9. ASHRAE Handbook and Product Directory and ASHRAE Handbook of Fundamentals - American Society of Heating, Refrigerating and Air Conditioning Engineers.
10. Part 25, Federal Aviation Regulations - Airworthiness Standards, Transport Category Airplanes.
11. Part 121, Para. 288 of the Federal Air Regulations.
12. FAA Advisory Circular 103-4, Hazards Associated with Sublimation of Solid Carbon Dioxide Aboard Aircraft.

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2. (Continued):

13. U.S. Air Force Manual 71-4, Packing and Handling of Dangerous Materials and Transport by Military Aircraft.
14. U.S. Dept. of Agriculture, APHIS 91-21 - Environmental Considerations for Shipment of Livestock by Air Freight.

3. PUBLICATIONS:

1. University of California Agriculture Extension Service Publication No. 36, Why Perishables are Cooled, August 1974
2. University of California Manual No. 43 - Commercial Cooling of Fruits and Vegetables
3. USDA MRR 421 - Factors Influencing heat loss in cantaloupes during hydrocooling
4. USDA MRR 600 - Vacuum precooling, a comparison of the cooling of different vegetables
5. USDA MRR 636 - Hydrocooling vegetables
6. USDA ARS 52-12 - Hydrocooling stacked crates of celery and sweet corn
7. USDA ARS 52-70 - Forced-air precooling of citrus fruit on a moving conveyor
8. USDA AMS 469 - Vacuum Cooling lettuce in commercial plants
9. USDA Technical Bulletin No. 1292 - Thermal characteristics of peaches as related to hydrocooling
10. American Society of Agricultural Engineers Paper No. 875 - Forced-air cooling of palletized fresh fruit
11. American Society of Agricultural Engineers Special Publication S-01-72: 38-41 - Forced-air cooling of fruit in bulk bins
12. University of California Agricultural Extension Service Miscellaneous Publication - Precooling cantaloupes, a guide for shippers
13. University of California, Cooperative Extension OSA 674 - Forced-air unit to rapidly cool small lots of produce
14. Cornell Extension Bulletin No. 1012 - Vacuum cooling vegetables
15. Western Grower and Shipper 42 (8): 19, 27 - Progress in mechanicals, new top-icing method for melons solves problems
16. Western Grower and Shipper 43 (3): 29-20 - Improved method, window top-icing cools celery faster
17. Western Grower and Shipper 45 (2) L10, 27 - Hydrocooler damage, answer found for vegetable water beating
18. International Journal of Biometeorology, Vol. 20, No. 2, pp 139-156: The Significance of Meteorology in Animal Production

All USDA publications may be obtained from the Office of Information, U.S. Department of Agriculture, Washington, DC 20250. All University of California publications may be obtained from the Public Service Office, University of California, Davis, California 95616. Other publications should be obtained directly from the source.

4. TYPES OF AIRCRAFT:

4.1 Cargo or Freighter:

These aircraft are designed specifically to transport cargo, and include features such as large doors, cargo loading and handling devices, heavy duty floors and hardboard interior liners. See ARP1395 for information on future cargo aircraft.

4.2 Passenger:

These aircraft carry cargo in compartments below the cabin floor. Large aircraft are fitted with special cargo handling devices.

4.3 Mixed:

These aircraft are capable of transporting a mixed load of cargo and passengers within the main cabin.

4.4 Convertible:

These aircraft can be converted from a passenger configuration to a cargo configuration by removing seats and other passenger equipment.

5. CARGO CATEGORIES:

5.1 Perishables:

Includes food, meat, fish, fruits, vegetables, flowers and frozen products.

5.2 Live:

Covers all kinds of animals, fowl, fish, reptiles, etc.

5.3 Hazardous:

Covers explosives, combustibles, chemicals and radioactive material.

5.4 General:

Includes all other types of cargo transported by air.

6. GENERAL INFORMATION:

6.1 Passenger Ventilation:

Fresh air ventilation requirements for passengers and flight crew are given in SAE ARP85.

- 6.1.1 Cargo Ventilation: In general, the minimum ventilation rate for cargo will depend upon that needed for proper temperature control. The quantity of ventilating air may have to be adjusted in special cases to control odors, prevent a hazardous concentration of contaminants, or to prevent dehydration of fresh produce. Compartments in which warm-blooded animals are carried should be adequately ventilated. The ventilation openings in animal containers should not be obstructed due to initial loading or by the shirting of other cargo after loading.

6.2 Heating and Cooling:

Heating and cooling requirements for the crew and passengers are given in SAE ARP85.

6.3 Temperature Control:

Design information on various types of aircraft temperature control systems is presented in SAE ARP89.

- 6.3.1 Cargo Temperature Control: As a minimum, cargo compartment temperature should be maintained at a level sufficient to prevent freezing of the contents. Special temperature control provisions are applicable to perishables, as indicated in Table 1. Temperature-controlled containers, with integral refrigeration equipment, are generally used to transport perishables. Data on these containers are presented in the IATA Unit Load Devices Manual.

Some warm-blooded animals require special temperature control. For example, the temperature environment for Rhesus monkeys should be controlled within a 70° to 74 °F (21.1° to 23.3 °C) band. Baby chicks and tropical fish are other examples of live cargo which must be maintained within a limited temperature range. Further information on temperature control requirements for animals may be found in the Air Transport Chapter of the Applications Volume of the ASHRAE Handbook and Product Directory.