



**Civil Aviation
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Design and Maintenance of Containers: Transportation of Live Aquatic Animals using Oxygen

This publication is only advisory, but it gives the CASA preferred method for complying with the Civil Aviation Regulations.

It is not the only method, but experience has shown that if you follow this method you will comply with the Civil Aviation Regulations.

Always read this advice in conjunction with the appropriate regulations.

Contents ...

Introduction	2
ICAO requirements	2
Cylinders	3
Oxygen lines	4
Fittings	4
Shut-off valves	4
Regulators	4
Gauges	5
Transport container	5
Physical constraints	6
Certification	6
Marking	6
Placards	6
Maintenance	6
Documentation	7
Other systems	7

The relevant regulations and other references

- Regulation 35 of Civil Aviation Regulations 1988 (CAR 1988)
- Civil Aviation Advisory Publication 262A-1(0): Use of Compressed Oxygen in the Carriage of Live Aquatic Animals in Air Transport
- AS 4267 - 1995: Pressure Regulators for use with Industrial Compressed Gas Cylinders
- SAE AIR 1392: Oxygen System Maintenance Guide
- ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air
- AS/NZS 3840.1 - 1998 Regulators for use with medical gas cylinders
- AS2030.1 The approval, filling, inspection, testing and maintenance of cylinders for the storage and transport of compressed gases (known as the SAA Gas Cylinder Code).

Who this CAAP applies to

Persons responsible for the design of seafood containers for transporting live aquatic animals, using oxygen to aerate the water, for use on Australian registered aircraft.

Certificate of Registration or Certificate of Airworthiness holders of aircraft carrying containers with an oxygen aeration system installed.

Why this CAAP was written

This CAAP provides guidance on a range of matters that need to be considered to ensure that an oxygen system carried in an aircraft, for the purposes of carriage of live aquatic animals, will not be a threat to the safety of the aircraft while either on the ground or in flight. Note that the requirements of ICAO Technical Instructions Special Provision A202, (ICAO SP A202)

technical standards reproduced in this CAAP, have been agreed to and accepted by Australia.

Systems designed in accordance with the guidelines in this CAAP should satisfy the necessary airworthiness requirements for transportation of live aquatic animals under ICAO SP A202.

Status of this CAAP

This is the first issue of CAAP 35-4(0). The CAAP will remain current until it is either cancelled or suspended.

For further information

Contact the CASA Airworthiness District Office closest to you.

Introduction

Live aquatic animals can be transported at relatively high fish to water ratios by bubbling oxygen from a compressed gas cylinder through the water in which they are being transported. This technique makes long distance air transport feasible and reduces the mortality rates. Currently there is no information or guidance available for the design and construction of oxygen systems that are to be fitted, or carried, on aircraft other than for supplemental oxygen use.

The purpose of this CAAP is to provide guidance for the design of a system that provides life support for aquatic animals during transportation, which satisfies the requirements of ICAO SP A202.

The design requirements of this CAAP have been evaluated during flight trials and demonstrated to meet the requirements of the ICAO documents in a safe and practical manner.

Note: Oxygen is neither explosive nor flammable. However, given the right circumstances oxygen can assist combustion of materials that might otherwise be considered non-flammable. Extreme care must be taken with cleanliness of the system and that no oils or grease are used.

ICAO Requirements

All containers designed to transport live aquatic animals must meet the requirements of ICAO SP A202. The following requirements are mandatory and must all be satisfied:

- The oxygen cylinder or cylinder valve must be fitted with a self-sealing device to prevent the uncontrolled release of oxygen should the regulator be broken, damaged or malfunction in such a way to cause a direct release of oxygen.

- The water container with the attached oxygen cylinder (transportation unit) must be engineered and constructed to withstand all anticipated loads.
- The water container must be tilt tested to an angle of 45 degrees in four major directions from the upright for 10 minutes duration in each direction, with the oxygen supply operating, without leakage of water.
- The oxygen cylinder and regulator must be restrained and protected within the equipment.
- The oxygen regulator must have a maximum flow rate of not more than 5 litres per minute.
- The oxygen flow rate to the container shall be limited to that sufficient to provide life support to the aquatic animals.
- The quantity of oxygen provided must not exceed 150% of the oxygen required for the normal duration of air transport.
- Only one cylinder may be carried for each 15 cubic metres of gross cargo hold volume, and in no circumstances shall the regulator be set to release more than 1 litre/minute for each 5 cubic metres of gross cargo hold volume.

Note: The airlines will usually apply additional requirements. (See under "Transport Container" section)

Cylinders

Non-aviation oxygen cylinders to AS2030.1 or equivalent specification may be used for this type of installation. All cylinders must be clearly marked, in accordance with AS 2030.1. This includes a date that shows when the last hydrostatic test of the cylinder was performed. It is not acceptable to use a cylinder beyond the date when the next hydrostatic test is due as detailed by AS 2030.1. For industrial steel and aluminium cylinders this is ten years, for fibre wrapped aluminium cylinders three years, and for aviation cylinders five years.

Oxygen cylinders are to meet the requirements of ICAO SP A202. Cylinders should be properly restrained and protected from all spillage and condensation of water and should not to be exposed to continuous or prolonged dampness.

Note: For safe operation no oxygen cylinder should to be recharged beyond the maximum designed working pressure of the bottle or be used at a

pressure exceeding the maximum working pressure of the regulator.

Oxygen Lines

High Pressure. No high pressure lines or manifolds should be used in this type of application.

Low Pressure. Low pressure flexible hoses should be of a type that is compatible with oxygen and should be of a type that is not interchangeable with systems that use other gases.

Fittings

Fittings should be compatible with both oxygen and any corrosive influence resulting from the water used in the container. Fittings used in oxygen systems should not be made of mild steel or materials that are corrosive when in contact with another material. Fittings for metallic low pressure lines may be flared or flareless, similar to high pressure lines.

Shut-off Valves

Each cylinder must have a shut-off valve in accordance with AS 2030.1.

Regulators

The regulators should be mounted directly on the cylinder and must meet AS 4267-1995 or equivalent. The regulator must be capable of controlling the full working pressure of the oxygen cylinder to which it is connected in accordance with ICAO SP A202. Also under ICAO SP A202, the oxygen cylinder or cylinder valve must be fitted with a self-sealing device to prevent the uncontrolled release of oxygen if the regulator is broken, damaged or malfunctions in such a way as to cause a direct release of oxygen.

Note: A multi stage regulator should be considered as its function of reducing cylinder pressure to the desired outlet flow (relative) pressure via two seats and diaphragm mechanisms is of added value with regard to safety and performance.

In accordance with ICAO SP A202 the oxygen regulator must have a maximum flow rate of not more than 5 litres per minute. This should be identified on the regulator or in the accompanying documentation.

Note: Each regulator should be serialised to enable tracking for maintenance requirements.

Gauges

The oxygen gauges should be robust and strongly mounted directly on the regulator. They must be

adequately protected from impact or damage by the design in accordance with ICAO SP A202. The gauges should have an appropriate full scale graduation (especially the flow indication) so that the required reading precision can be easily achieved. Glass flow meters may not be acceptable.

The gauges should be included in the system of maintenance for the container. They should be checked and maintained at appropriate intervals.

Transport Container

Transport containers used to contain live aquatic animals may be constructed in the following manner, although not limited to this type of construction:

- Large rigid walled plastic tank modified with watertight barriers and restraints for the oxygen cylinder. A secondary water tight barrier, that does not require the main lid to stop leakage, is to be installed at least 150 mm below the rim.
- A frame or box construction containing a bladder made of tough, flexible material. The bladder is then surrounded by a waterproof envelope to prevent spillage in the event of a leak.

Note: Flammability of materials should be considered in selecting materials to use in an oxygen enriched environment.

A small breather vent in the centre of the lid is acceptable to allow the escape of excess gas. This vent should not allow any water leakage or escape of water mist even under adverse conditions of tilt or turbulence.

Note: One technique of controlling mist is by integrating a mist coalescing chamber at least 50% filled with non-combustible material with a large surface area. The chamber should be designed such that any water flows back into the main tank and gases are vented outside of any lids to the transport container.

Containers should be designed so that there is suitable ventilation to prevent the accumulation of more than 10 litres of oxygen under lids or seals. This does not include the quantity of oxygen between the water and top of the tank. Hoses and pipes should be protected from chafing on any part of the container.

Note: For full details on the airline requirements in Australia for live fish transport containers consult the airline's Seafood Air Transport Regulations (especially packing instruction No.9 for Live Fish in Water) and consult with the airlines.

Physical Constraints

The container's total mass, when fully loaded, and dimensions, should be compatible with load and size limits of cargo handling equipment and aircraft cargo space. Consult with the airlines for their capabilities.

Certification

The design and construction of the transport container, together with the oxygen system, should be approved by a person with appropriate qualifications for the design of this type of container. The approval of the design should also include the requirements for maintenance of the container and oxygen equipment.

The airlines may insist that the person provide certification that the system satisfies this CAAP.

Marking

Each transport container should be marked with:

- Manufacturer and name of owner.
- Approval number assigned by CASA for the type design.
- Unique serial number.

Placards

Appropriate and durable placards should be provided with any system warning of the dangers associated with the use of oxygen. Precautions such as "no smoking" and "use no oils or greases" should be emphasised.

Maintenance

A system of maintenance compiled by the manufacturer and agreed to by CASA or a CASA authorised person should apply to the transport tank, liners, cylinders, regulator, gauges and oxygen lines to ensure ongoing safety.

The maintenance system should include daily maintenance and the changing of the oxygen bottle and who may perform and certify the work.

All regulators and gauges should be maintained in accordance with manufacturers instructions by personnel qualified to maintain oxygen equipment. Regulators used in aquatic transportation should be tested every 3 months and overhauled every six

months. Continuous records of each service should be maintained, and supplied, with the transport container. This record should include when the regulator was last tested or overhauled and when the regulator went into service.

Oxygen supply companies that have appropriate quality controls are suitable for maintaining and refilling of oxygen cylinders used in this application.

Documentation

Each transport container should be supplied with an operators manual with details of maintenance intervals and a list of part numbers and serial numbers of the major components of the container, including the regulator and the specification (with the working pressure) of the oxygen cylinder.

Maintenance records for all parts of the oxygen system should accompany the container.

Each shipment containing an oxygen cylinder, whether alone or installed in a transport tank, must be accompanied by a Dangerous Goods Transport Document (Shipper's Declaration of Dangerous Goods) in accordance with the Technical Instructions.

Other Systems

The guidance contained in this CAAP is for transportation of all live aquatic animals and is intended to satisfy ICAO standards for international transport. While it is recognised that this CAAP may be restrictive to some operators with systems not used in conjunction with passenger carrying or international cargo flights, alternate systems may be approved by suitable qualified CAR 35 authorised person. This include systems that are not a single unit incorporating oxygen systems and tanks.

All designs should meet the minimum requirements in relation to regulators, cylinders, hoses and fittings. They should also have documentation and serial number listings of the major components.