CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

Advisory Circular
AC 00-2

Storage and Distribution of Aeronautical Supplies

24 July 2007

General

Civil Aviation Authority Advisory Circulars contain information about standards, practices, and procedures that the Director has found to be an **Acceptable Means of Compliance (AMC)** with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate Advisory Circular.

This Advisory Circular also includes **guidance material (GM)** to facilitate compliance with the rule requirements. Guidance material must not be regarded as an acceptable means of compliance.

Purpose

The Advisory Circular provides information on purchase, storage, and distribution of all types of aeronautical products that is acceptable to the Director for meeting the Civil Aviation Rule requirements.

Related Rules

This Advisory Circular relates specifically to Civil Aviation Rule Parts; 19 Subpart F – Supply Organisation Approvals, 43 – General Maintenance, 145 – Aircraft Maintenance Organisations, and 148 – Aircraft Manufacturing Organisations

Change Notice

This AC replaces AC 20-3 by re-numbering it to AC 00-2 as part of a project to standardise the numbering of all advisory circulars. The renumbering of this AC to a generic 00- series is intended to clarify that the AC has a general applicability to various rule Parts.

No other changes have been made to this document.

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Introduction

This advisory circular is a ready reference handbook for individuals and organisations involved in all aspects of the purchase, storage, and distribution of all types of aeronautical products. The material is derived from the older Civil Aviation Pamphlet, CAP41.

The advisory circular covers two areas—

- general and specific conditions of storage of a wide range of products
- a typical stores system and the procedures needed to ensure satisfactory control of the system

The advisory circular forms the basis for a system of storage of aeronautical products that will include factors to be considered during the establishment and operation of a reliable stores system. The advisory circular also provides guidance for all personnel engaged in stores activities.

Other advisory circulars readers should refer to include—

- AC00-1 Acceptability of parts
- AC43-1 Aircraft maintenance
- AC145-1 Aircraft maintenance organisations
- AC148-1 Aircraft manufacturing organisations

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Storage conditions for aeronautical supplies

The correct handling of materials, especially the high strength aluminium alloys, is of importance to the integrity of a stores system. Care is necessary during loading and unloading and storage at the consignee's facility to ensure that the material is not damaged by—

- chafing
- scratching
- bruising
- excessive strain by bending

Damage to material from the above may change the mechanical properties of the material. Heavy forgings, extrusions and castings should be carried and stored individually, ensuring that there is adequate support to maintain the material in Its intended shape without strain.

General storage conditions

Premises should be clean, well ventilated, and maintained at an even dry temperature to minimise the effects of condensation. In many instances the manufacturer will specify the temperature and relative humidity in which the products should be stored. To ensure that these conditions are maintained within the specified range, instruments are used which measure the temperature and relative humidity of the store room.

Temperature and relative humidity

When required, the temperature and humidity should be checked at regular intervals by means of a hygrometer which measures the amount of humidity in the atmosphere. The wall-type of hygrometer is normally used and consists of wet and dry bulbs. The dry bulb records the actual temperature, and a comparison between this reading and that registered by the wet bulb, when read in conjunction with a table, will indicate the percentage of relative humidity present in the atmosphere.

Protective materials for storage purposes

Vapour Phase Inhibitor (VPI).

This is a method of protection against corrosion often used for stored articles made of ferrous metals.

VPI protects by its vapour, which entirely covers any article in an enclosed space. Direct contact of the solid VPI with the metal is not required. Although moisture and oxygen are necessary for corrosion to take place, VPI does not react with, or remove, either of them, but operates by inhibiting their corrosive action.

The method most commonly used is treated paper or board, the article to be protected being wrapped in paper which has been treated with VPI or enclosed in a box made of, or lined with, VPI treated board.

Protection of parts by the VPI process should only be used where it is approved by the manufacturer of the part.

Protective oils, fluids, compounds.

Where oils, fluids, or compounds are used as a temporary protection on metal articles it should be ascertained that the material and the method of application is approved by the manufacturer of the article. Where protective oils, fluids, or compounds have been used, deterioration of such fluids or compounds by handling can be minimised by wrapping in a non-absorbent material such as polythene or waxed paper. The life of such temporary protective is increased by inhibiting drying out. When parts or components are stored for long periods they should be inspected at intervals to ensure that the condition of the coating is satisfactory.

Desiccants.

The desiccants most commonly used in the protection of stored parts or components are silica-gel and activated alumina. Because of their hygroscopic nature these desiccants are capable of absorbing moisture inside a packaging container or inside a component, thereby preventing corrosion.

Desiccants should be inspected and renewed at specified periods or when an air-tight container has been opened. It is important when inspecting or changing a desiccant that the prescribed method is used to avoid the entry of moisture into a dry container.

Tell-tale desiccant is an indicating type of desiccant that is prepared with a chemical which changes colour according to its moisture content. Table 1 gives guidance on the relative humidity of the surrounding air.

Colour	Surrounding relative humidity (%)	Moisture content of silica-gel (%)
Deep blue	0 - 5	0.2
Blue	10	5.5
Pale blue	20	7.5
Pinkish blue	30	12.0
Bluish pink	40	20.2
Pink	50	27.0

Table 1. Desiccant colourings

Silica-gel and activated alumina can be reactivated by a simple heat treatment process. The time and temperature required to effectively dry the desiccant should be verified with the manufacturer, but a general guide is—

- 135°C for at least two hours for silica-gel
- 250°C for four hours for activated alumina

The desiccant should then be placed in a sealed container until it has cooled, after which it should be completely reactivated.

Racks and bins

Open racks allow a free circulation of air and are preferable when the nature of the stock permits their use. The painted metal type of bins is more suitable than the wooden type, since with the latter there is a risk of corrosion due to mould or dampness. Polyethylene, rigid PVC, corrugated plastics,

or cardboard bins may also be used. Many moulded plastics bins can also be fitted with removable dividers which will allow for the segregation of small parts whilst making economic use of the space.

Rotation of issue

Methods of storage should be such that batches of materials or parts are issued in strict rotation. This ensures that old stock is issued before new stock. This is of particular importance for perishable goods, instruments, and other components that have definite storage limiting periods.

Storage limiting period

The manufacturers of certain aircraft components impose storage limiting periods after which time they will not guarantee the efficient functioning of the equipment. On expiry of the recommended storage periods the components should be withdrawn from stores for checking or overhaul as recommended by the manufacturer.

The effective storage limiting periods of some equipment may be considerably reduced if suitable conditions of storage are not provided. The storage limiting periods quoted by manufacturers are only acceptable if the prescribed conditions of storage are in operation.

Flammable materials

All materials of a flammable nature should be kept in a store isolated from the main buildings. The precautions to be taken vary with the quantity and volatility of the materials, and such stores should comply with the requirements of all New Zealand regulations, including those requirements of non-aviation authorities such as the Department of Labour and the Environmental Risk Management Authority.

Segregation of stock

Care should be taken to segregate materials which may have deleterious effects on other materials. For example—

- carboys of acid should not be placed in a store where escaping fumes may affect raw materials or finished parts;
- phenolic plastics should be segregated from cadmium-plated steel parts to prevent corrosion of the steel parts;
- magnesium alloys should not be stored in the vicinity of flammable materials.

Packaging of stock

Stock should normally be packaged using the following materials and methods—

Materials, including but not limited to—

- Plastic film
- Jiffy bags
- Lanolin grease impregnated cloth
- Plastic film lined paper envelopes

Methods, including but not limited to—

- oiling and placing in jars or plastic bags
- individual packaging

Magnesium fittings should not normally be kept in sacks, as the materials used in making the sacks may cause corrosion of the fittings.

Materials in long lengths

It is particularly important that long lengths of material, such as extrusions, tubes, and bars, should generally be stored vertically. Storing these items vertically reduces problems caused by bow and handling damage. Care should also be taken when placing the material in the storage racks to prevent indentations and scratches, especially when handling the high strength aluminium alloys.

Storage Conditions for Specific Materials and Parts

Ball and roller bearings

Ball and roller bearings should be stored in their original wrappings in dry, clean conditions with sufficient heating to prevent condensation caused by significant temperature changes.

Miniature steel balls and special high precision balls are immersed in instrument oil contained in plastics phials with screw-on caps.

If the wrapping has become damaged, or if it is removed for inspection of the bearings, the bearing should be soaked and swilled in white spirit to remove storage grease and/or dirt.

Bearings with rubber seals should not be soaked.

It is permissible to oscillate or turn the races slowly to ensure thorough cleaning, but the bearing should not be spun in this unlubricated condition because the working surfaces may become damaged. A forced jet of white spirit may be used to advantage but an efficient filter should be provided in the cleaning system.

In certain cases it may be preferable to clean very small bearings with benzene, but if this fluid is used, consideration should be given to the fire hazard and possible toxic effects. There are certain light white spirits which are suitable for use with very small bearings and which eliminate some of the dangers associated with the use of benzene.

After cleaning, the bearings should be inspected for signs of corrosion and then re-protected with a compound of mineral oil and lanolin and wrapped in grease-proof paper. Many miniature bearings, especially those used in instruments, are susceptible to brinelling; when such bearings have become suspect or contaminated they should be discarded.

In many instances orders for bearings are endorsed with a requirements that special grease should be applied by the manufacturer. If this grease is removed for any reason, it is essential that grease of the correct specification is re-applied.

Aircraft Batteries

Lead–acid batteries.

A charged battery which is to be stored for any length of time should be in the fully charged condition. Before storing, the electrolyte levels should be checked and the battery bench-charged in accordance with manufacturer's instructions. When fully charged, the battery should be stored in a cool, dry, and well ventilated store on an acid-resistant tray. Batteries may also be stored in the dry, uncharged state. Additional points to note are as follows—

- Every four to six weeks, depending on manufacturer's instructions, the battery should be removed from storage and recharged until voltage and specific gravity readings cease to rise.

Damage to the battery will occur if it is allowed to stand idle beyond the period for charging specified by the manufacturer.

- Regardless of periodic check charges, the battery should be given a complete charge and capacity check immediately before being put into service.
- For new batteries a complete capacity test to the manufacturer's instructions should be made every six months.
- For a battery that has been in service a complete capacity test to the manufacturer's instructions should be made every three months.
- An insulation resistance test should be carried out to the manufacturer's instructions every 12 months or earlier if a leak is suspected.
- If the conditions mentioned in the previous paragraphs are observed a battery may remain in storage up to 18 months.
- A battery should not be allowed to stand in a discharged condition.
- Battery electrolyte temperatures should not exceed 48.8°C.
- Records of maintenance shall be maintained.

Trickle charging at low rates is not recommended as damage will occur if idle batteries are subjected to this form of charging

Silver–zinc batteries and silver–cadmium batteries.

These batteries should be stored in clean, dry, cool, and well ventilated surroundings, not exposed to direct sunlight or stored near radiators. Additional points to note are as follows—

- New batteries will normally be supplied in the dry condition with the electrolyte contained in polythene ampoules and should be stored in their original packaging together with the related ampoules of electrolyte. For storage periods of more than two years special instructions should be requested from the manufacturer.
- Filled and formed batteries required for use at very short notice may be stored in the charged condition. Manufacturers normally recommend that such batteries should be discharged and recharged every four to six weeks. The manufacturer's schedule of maintenance should be applied to batteries stored in the charged condition and all maintenance shall be recorded.
- Batteries to be stored out of use for protracted periods should be discharged at the 40-hour rate until the voltage level, measured while discharging, falls below the equivalent of 0.8 volt per cell.
- Before storing batteries, the electrolyte level should be adjusted to near the maximum specified by topping up, using a potassium hydroxide solution of 1.300 sp.gr.
- The need for care in handling potassium hydroxide, because of its caustic content, is stressed. After topping up or filling, the top of the batteries should be cleaned and the connections and terminals lightly smeared with white petroleum jelly. In no circumstances should sulphuric acid or acid contaminated utensils be used in close proximity to silver-zinc or silver-cadmium batteries.

Nickel–cadmium batteries.

This type of battery can be stored for long periods without damage, in any state of charge, provided the storage place is clean and dry and the battery is correctly filled. Additional points to note are as follows—

- For the battery to be ready for use in the shortest possible time, it should be fully charged, correctly topped up, and then discharged at normal rate for a period of one hour before storage.
- The battery should be cleaned and dried and the terminals and connectors lightly smeared with pure mineral jelly.
- The battery should be inspected at intervals of six to nine months and topped up if necessary.
- Before going into service the battery should be given a double charge and capacity check as recommended by the manufacturer of the particular type of battery.
- The battery should be stored on a shelf or rack, protected from dirt or dust, and where metallic objects such as bolts and hand-tools cannot drop onto the battery or touch the cell sides.

The above refers to pocket plate nickel-cadmium cells and not to sintered plate nickel-cadmium cells, for which reference should be made to the manufacturer's instructions.

Precautions

Sulphuric acid will destroy alkaline batteries and utensils which have been used for this acid should not be used with such batteries. It is also important to avoid any contamination from the fumes of lead-acid types of batteries.

Braided Rubber Cord

Braided rubber cord should be stored in a cool, dark place with an even temperature not exceeding 18°C with relative humidity of approximately 65 percent. The cord should not come in contact with any radiant heat, grease, oil, water, organic solvents or corrosive materials.

Storage at elevated temperatures may cause permanent deterioration of the rubber, and prolonged storage at low temperatures will cause temporary stiffening of the rubber.

Braided rubber cord has a storage limiting period of four years if stored in good conditions. A cord which has been issued from stores within the four year period from the date of manufacture may remain in service until the expiry of five years from that date.

The date of manufacture of cordage can be determined by the colour of the threads in the cotton outer casing, namely—

- light blue; 1966
- black; 1967
- mid-green; 1968
- heliotrope, purple; 1969
- yellow; 1970
- after 1970 the colours are repeated in the same sequence.

The number of coloured threads indicates the quarter of the year in which the cord was manufactured, namely—

- one thread indicates that the cord was made between 1 January and 31 March inclusive
- two threads indicates that the cord was made between 1 April and 30 June inclusive
- three threads indicates that the cord was made between 1 July and 30 September inclusive

- four threads indicates that the cord was made between 1 October and 31 December inclusive

Details are given in the British Standard Specification F51, Light Duty Braided Rubber Cord for Aeronautical Purposes.

Compressed Gas Cylinders

Stores which are used for storage of compressed gas cylinders should be well ventilated. The cylinders should not be exposed to the direct rays of the sun and no covering should be used which is in direct contact with the cylinders. Cylinders should not be laid on damp ground or exposed to any conditions liable to cause corrosion. Gas storage cylinders should normally be fitted with a transportation/storage cap over the shut-off valve to help prevent handling damage and contamination of parts which could cause a risk of explosion of fire. Portable gas cylinders should be stored on racks and, where appropriate, control heads and gauges should be protected against impact.

No heating is required in stores where compressed gas cylinders are kept unless specified by the manufacturer.

Lighting for stores containing combustible gas cylinders should be—

- flameproof

- installed outside the building and provide lighting through fixed windows

Store rooms should be constructed of fireproof materials and the cylinders placed so as to be easily removable in the event of fire. The store should be at a distance from corrosive influences such as battery charging rooms.

Full and empty cylinders should be stored in separate rooms and appropriate notices displayed to prevent confusion.

Oxygen and combustible gases such as acetylene should not be stored together. Acetylene cylinders should be stored in the upright position.

Oxygen cylinders and generally rounded at the bottom, thereby making it unsafe to store in an upright position without suitable support. If cylinders are stacked horizontally special wedges should be used to prevent the cylinders rolling, and the stack of cylinders should not be more than four high.

Breathing oxygen and welding oxygen should be segregated and properly labelled to avoid confusion. In some cases welding oxygen may be used for testing oxygen components not installed in aircraft, but welding oxygen should not be used in aircraft oxygen systems.

Precautions

The following precautions should be noted—

- If cylinders are exposed to heat the gas pressure will increase and the cylinder walls may be weakened. Cylinders should be stored at some distance from sources of heat such as furnaces, stoves, boilers, and radiators.

- Oil or grease will ignite in the presence of oxygen, and if the latter is under pressure an explosion may result. Cylinders should be kept away from sources of contamination, such as oil barrels, overhead shafting, hydraulic components, or any container or component that may contain oil or grease.

- Smoking, exposed lights, or fires should not be allowed in any room where compressed gases are stored, and oily or greasy clothes or hands should be avoided when handling the cylinders.

- Grit, dirt, oil, and water should be prevented from entering the cylinder valves.
- When returning any cylinder that may have been accidentally damaged or overheated, the supplier should be notified so that any necessary action may be taken before refilling.

Electrical Cables

Where electrical cables are stored in large reels it is necessary that the axis of the reels is in a horizontal position. If stored with the axis vertical there is a possibility that the cable in the lowest side of the reel will become crushed.

Fabric

Fabric and fabric covering materials should be stored in dry conditions at a temperature of about 21°C away from direct sunlight. Discoloration, such as iron mould, is sufficient to cause rejection of the material and this may be caused by unsuitable storage conditions. Most synthetic fibre fabrics should be stored away from heat sources. Rubber proofed fabrics should be stored away from plasticised materials such as PVC as in some cases plasticisers have leached from plastics and have an adverse affect on rubbers.

Forgings, castings, and extrusions

All large forgings, castings, and extrusions should be carefully and separately stored on racks to avoid superficial damage.

The high strength aluminium alloys are susceptible to stress corrosion when in the solution treated condition and it is important that parts so treated should be coated with a temporary protective such as lanolin.

Aluminium alloy forgings which are anodised normally need no protection in a heated store. Finished details should be protected in accordance with DEF STAN 03-2 or equivalent.

Aluminium alloy castings in store should not be contained in sacks or absorbent packages. It is not normally necessary to protect castings before machining, but finished details should be protected as for forgings.

Aluminium alloy extrusions should be protected in store with a lanolin and mineral oil solution in accordance with DEF STAN 80-34 and as finished details with DEF STAN 03-2.

Instruments

The smaller types of instruments are usually delivered in plastic envelopes and these should be used during storage to minimise the possible effects of condensation. The transit containers of the larger instruments contain bags of silica-gel to absorb moisture which may enter. The gel should be examined periodically, and if its colour has changed from blue to pink it should be removed, dried out and replaced, or renewed. It is essential that all instruments should be stored in a dry, even temperature, and that the storage limiting period recommended by the manufacturer is not exceeded.

Whenever possible instruments should be kept in transit or similar cushioned containers until required for installation on an aircraft.

In the absence of any specific recommendation by the manufacturer the storage limiting period for instruments should not exceed three years and on completion of this time the item should be re-certified in accordance with the relevant Overhaul Manual. Additionally, any equipment containing gyro assemblies should be exercised and gyro wheels run for a period of 24 hours at the completion of periods not exceeding each 12 months of storage.

Oil coolers and radiators

Oil coolers and radiators are normally filled with an inhibiting fluid during storage. The inhibiting fluid used should be in accordance with the manufacturer's instructions. The components should not be stored on the floor, but placed on raised wooden supports to permit a free circulation of air and minimise the possibility of damage to the matrices.

Paints and dopes

For the storage of paint and related low flash point materials it may be necessary to obtain a licence. Paints should be kept in a dry store at a controlled temperature between 7°C and 23°C.

Paint containers should be marked with the date of receipt so that the oldest batches may be used first, as pigments tend to settle out when paint is stored. A simple method of avoiding settlement is to invert containers once a month.

If paints are handled or mixed in a confined space it is important to ensure adequate ventilation during such operations as the fumes from volatile liquids are harmful if inhaled in sufficient concentration.

Note that in ventilating a paint store most solvents are heavier than air and therefore ventilation is more efficient downwards than upwards.

Provided paints and dopes are suitably stored in their original sealed containers, the storage limiting period is normally 12 months but this may vary in different environmental conditions. For example, in tropical conditions the storage limiting period is normally six months.

Pipes

Rigid pipes should be adequately supported during storage to prevent distortion. Flexible pipes should, unless otherwise stated by the manufacturer—

- be suitably wrapped
- be stored in a darkened room, maintained at a temperature of approximately 15°C.

In hot climates flexible pipes should be stored in cool places where air circulates freely as high temperatures tend to accelerate surface hardening of the outer cover.

Flexible pipes should be stored in a completely unstressed condition and, where possible, should be suspended vertically.

The ends of all pipes should be blanked, using a type of blank which cannot be left in position when the pipes are fitted. Rags or paper should not be used for this purpose. The blanks should not be removed until just prior to fitting the pipe.

Pyrotechnics

Pyrotechnics should be stored in a dry, well ventilated building and kept at constant room temperature. The building should conform to the local by-laws laid down by the, Department of Labour, Local Authority, Environmental Risk Management Authority or other similar requirements.

In the case of egress systems, if the system includes pyrotechnics the storage facilities must provide for the storage of the system components, including—

- canopies
- seats
- cartridges

At the periods specified by the manufacturer pyrotechnics should be examined for any signs of damp or other external damage.With paper-cased items, such as signal cartridges, the effect of damp is usually indicated by softening or bulging of the outer case and evidence of staining.

With metal-cased items, the effects of damp may often be indicated by traces of corrosion or tarnishing of the case and/or staining of the instructions label.

All pyrotechnics gradually deteriorate in time, although such deterioration will vary with factors such as quality or type of composition and degree of protection afforded by the containers. For this reason a proportion of the items should be proof-tested at regular intervals as specified by the manufacturer.

Pyrotechnics have several different lives that must be complied with, including—

- shelf life
- exposed life
- total life

The total life, regardless of proof testing, should not be exceeded.

For flares and similar equipment, the most likely effect of storage deterioration is a loss of brightness and range.

Rubber parts and components containing rubber

The following storage conditions are generally acceptable for a wide range of components containing rubber in their construction or parts made of rubber. In many cases manufacturers make special recommendations and these should also be observed. Further information can also be found in British Standard F68 and F69.

The storage temperature should be controlled between 10°C and 21°C and sources of heat should be at least one metre from the stored article, unless screened, to minimise exposure to radiant heat. Some special rubber materials may withstand a wider range of temperature satisfactorily but before any rubber part is exposed to these temperatures the manufacturer's recommendations should be verified. This particularly applies to any special precautions necessary when thawing parts which have been subjected to the lower temperatures.

The relative humidity in the store room should be about 75 percent. Very moist or very dry conditions should be avoided.

Rubber parts should not be exposed to direct daylight or sunlight. Unless the articles are packed in opaque containers, store room windows or skylights should be screened or covered with a suitable transparent red or amber coating. Store rooms should be kept as dark as practicable. Use of artificial light which has a high ultra-violet level should be avoided.

Isolation from atmospheric oxygen greatly increases the storage limiting period of rubber parts. Where possible, parts should be packed in airtight containers or wrappings using talc or chalk. Where parts are packed in airtight tins, the tins should be lined with wax paper or polythene to avoid direct contact with the metal.

Exposure to air containing ozone should be avoided. Storage rooms should not contain any apparatus liable to generate ozone, such as high voltage electrical equipment, electric motors, or other plant which may give rise to electrical sparks. Free access to outdoor air, which in temperate climates always contains ozone, should be avoided. Still, indoor air is normally ozone-free because wall and ceiling coverings and organic materials rapidly destroy ozone.

Rubber parts should be stored in a relaxed position free from compression or distortion, with the least possible deformation. Deformation greatly aggravates the action of ozone and also leads to permanent changes in shape and dimensions. Articles received pre-packed in a strain-free condition can be stored in their original packing as long as they are clearly identified and labelled.

Rubber parts should not come in contact with liquids or vapour concentrations during storage even though they may be subsequently used in contact with a similar fluid. Contact with copper, brass, or corroded iron or steel, or with any compounds of manganese, should be avoided.

If deterioration of seals is suspected, it can usually be verified by stretching the seals to 20 percent of their internal diameter. If cracks are visible under x10 magnification, the seals should be rejected.

Any cleaning of rubber parts and components containing rubber after storage should be done with water, soap solution, or methylated spirits. If synthetic detergents are used care should be taken to select those that are not harmful to rubber. Petrol, benzene, and turpentine should not be used.

Cleaning should not be carried out with sharp abrasive objects such as wire brushes or emery cloth. Disinfectants should not be used. After cleaning, articles should be rinsed in water and dried at a distance from any direct heat.

Rubber hose and hose assemblies

Unless otherwise specified by the manufacturer, rubber hoses should be inspected and tested—

- every two years
- immediately prior to installation

Hose and hose assemblies should be stored uncoiled and supported to relieve stresses. Air should circulate freely about the hoses unless they are contained in plastic envelopes.

Care should be taken to ensure that the plastic envelopes selected are compatible with the hose material, since some, including PVC, can have a deleterious effect on rubber.

The correct sealing blanks should always be fitted to items in store. Plugs and caps conforming with AGS specifications are suitable but, where standard blanks cannot be fitted, the blanks used must be so designed that they cannot enter the pipe or be left in position when the assembly is coupled up. It is also important that the material used for blanking purposes will not pick-up or leave small particles inside a coupling after long periods of storage. Tape, rag or paper should not be used.

To prevent deterioration of the bore or inner lining, the hose may have to be stored filled with the liquid which it is intended to contain in service and instructions concerning this procedure are normally attached to the assembly. If a hose assembly is enclosed in an airtight plastic envelope, this should not be removed until the hose assembly is to be fitted. If the envelope becomes damaged during handling it should be resealed or renewed after any desiccant inside has been checked for condition.

Various methods are employed to mark the date of manufacture on hoses. It can be stencilled on the external surface or impressed on a tab or band secured to the hose. In instances where the external surface is of cotton braid, some of the picks are woven in black and some in colour which indicates the month and year of manufacture, as required by the appropriate specification.

Hydraulic and pneumatic system components

Hydraulic and pneumatic components generally have a nominal seven year self life which may usually be extended for periods of two years by inspections.

The maximum service life of seals is usually to be found in the Maintenance Schedule.

In many instances, hydraulic components are stored filled with hydraulic fluid which may leak slightly from the component; it is therefore important to ensure that fluid will not come into contact with other stored items.

If the stored component is filled with a fluid other than that used in the aircraft system, such as DTD 5540, the component should be clearly labelled to ensure the removal of all traces of storage fluid prior to installation in the hydraulic system.

To avoid adhesion and to exercise the seals, in some cases it is recommended that the component should be operated several times at three month intervals. If the seals are square or rectangular, special care should be used in the initial operation as there is a tendency for seal stiction on its bearing surface and if the part incorporating the seal is moved rapidly the seal may tend to rotate and be damaged. This applies also where spring-loaded seals are concerned. Growth of the rubber may result in damage to the sealing lip.

Tyres

Tyres should be stored vertically in special racks embodying support tubes, so that each tyre is supported at two points. Two-thirds of the tyre should be above the support tubes and one-third below. By this method the weight of the tyre is taken by the tread and distortion is reduced to a minimum. The tyres should be turned to a new position every two or three months. Where tyres are delivered in bituminised hessian wrappers, the wrappers should be left on during storage.

Inner tubes

Inner tubes should be stored in the cartons in which they were received, but where this is not possible the tubes should be lightly inflated and stored inside covers of appropriate sizes to prevent damage. Tubes should not be secured in a fixed position, such as a tight roll, by rubber bands or tapes as this may cause the rubber to crack.

Sheet, bar, and tube metal

It is recommended that sheet material should be stored on edge in racks ensuring that bending of single sheets is avoided. Flat stacking is not recommended, when sheets are slid from the stack detrimental scratches can occur on the sheet removed and on the adjacent sheet. Where vertical storage is employed the material should be kept clear of the floor to prevent possible damage by scraping, splashing from disinfectants used for floor cleaning, and the possibility of edge corrosion which can occur with light alloy materials when in contact with composition floors. Temporary protectives, such as grease, paper, or plastics coating should be left in position until the material is required for use. If the temporary protective becomes damaged or partially removed, it should be restored without delay and a periodic inspection of stock should be made.

Sheet material may be stored in the transit cases. After the initial checking of the sheets the case should be closed to eliminate the ingress of dust and dirt which can cause surface scratching during handling operations.

Metal bars should be stored in racks either horizontally or vertically and well supported along the length when stored horizontally to prevent bending under weight. Metal tubing is normally stored in racks, well supported, the smaller diameter tubing being wired along the length in bundles to prevent damage.

Floor cleaning fluids containing chlorides should not be allowed to contact metallic materials, particularly austenitic steel as a brittle fracture may eventually result.

Sparking Plugs

The plugs should be treated with light oil or other suitable corrosion inhibitor. The inhibitor should not come into contact with the plug screen, but the electrode end of the plug may be filled with oil and then emptied prior to fitting the caps. Plugs receiving this treatment should be washed out with a suitable degreaser before use. Protector caps should be screwed on both ends of the plugs to prevent the ingress of moisture or foreign matter. The plugs should be stored in a warm dry place, preferably in a heated cupboard, as an additional precaution against the ingress of moisture.

Survival Equipment

Survival equipment should be stored in a room which can be maintained at a temperature between 15°C and 21°C and which is free from strong light and any concentration of ozone. Normal precautions for rubber products apply. Particular conditions should be found by consulting the manufacturer's recommendations.

The manufacturer's instructions should be carefully followed when preparing survival equipment for storage. These instructions normally include—

- ensuring that the component is completely deflated
- removing easily detachable components
- fitting protection blanks or pads to inflation valves and other connections
- dusting the component with chalk and folding it loosely
- wrapping in waterproof paper
- placing the equipment on a shelf above the floor

A tie-on label should be attached to the wrapping stating—

- the type, serial number, and part number of the equipment
- date of inspection and inflation tests
- date of overhaul
- date of component overhaul
- date of next inspection or test

The components should be stored with the equipment but it is preferable that any CO_2 cylinders be fitted with a transit cap and stored separately.

Under no circumstances should life preservers or liferafts be stored one on top of the other without a separation of corrugated paper or similar shock absorbing material. Specifically—

- in the case of life preservers, up to ten may be stored on top of each other
- in the case of liferafts, not more than three should be stored on top of each other

Because of the light texture of life preservers it is important that they should be handled with care to avoid damage.

The storage limiting period is normally six months if packed and stored in accordance with the manufacturer's instructions. At the end of this period survival equipment should normally be—

- opened up and inspected before further storage

- inspected, tested, and overhauled prior to being operationally packed for stowage in aircraft

Liferafts and life preservers not operationally packed and placed in storage for more than ten days after the last test should be re-tested before installation in an aircraft.

Tanks – flexible

The precautions to be taken during storage will depend on the type of tank and the packaging method used. Some manufacturers of flexible tanks specify that the tanks should be coated with a special preparation if they are to remain empty for more than two or three days, and that this preparation should be removed before the tanks are put into service.

Manufacturers also specify a long term or a short term storage procedure contingent upon special requirements.

Short term storage is the period between transport of the tanks from the manufacturer's works and delivery for immediate installation on the aircraft.

Long term storage covers the period during which the tanks are held following receipt by an organisation before installation, or shipment to locations at home or abroad, involving an extended period of storage prior to installation.

Flexible tanks can be divided into two categories for packaging and storage purposes—

- tanks that can be folded including those not fitted with:
    - rigid internal members
    - heavy coverings
    - fittings
    - anti-surge valves
    - gauge units
- tanks that cannot be folded

When packing a tank for storage purposes it is important to fold it in such a way that no strain or creasing is imposed on the folded areas. In many cases folding diagrams are provided by the manufacturer. All openings should be sealed with the specified blanks and corrugated cardboard interposed between the folds.

After folding the tank should be encased in an airtight wrapping, such as a polythene bag, and sealed. The tank in its airtight envelope should then be placed in a cardboard box which should also be sealed.

Flexible tanks which are unsuitable for folding because of internal or external fittings are often packed in an air-inflated state suitably supported in sealed cases. This method of packing is used only for short term storage. For long term storage of this type of tank the manufacturer's instructions should be followed and these will vary with the shape and type of tank concerned.

Generally, flexible tanks should be stored in the original airtight containers supplied by the manufacturer and if this is not possible a similar airtight storage container should be used. The manufacturer's instructions should be observed closely. The tanks should be stored in cool, dry, draught-proof conditions, at a temperature not exceeding 25°C and preferably below 15°C.

Tanks – Rigid

Rigid tanks should be carefully cleaned and any moisture dried out before storage. All apertures should be sealed with close-fitting blanks. A silica-gel cartridge attached to a blank and placed inside the tank assists in preventing internal condensation and subsequent corrosion.

Timber

Plywood panels should be stored flat, away from all sources of heat or damp. Other timber sections should be stacked with spacers between each section to permit the free circulation of air. The timber should be checked periodically for moisture content.

Transparent acrylic panels

Acrylic sheets should be stored on edge, with the protective paper left in position as this will help to prevent particles of grit becoming embedded in the surfaces of the sheets. When this is not possible the sheets should be stored on solid shelves with soft packing such as cotton wool placed between each sheet. The pile of sheets should be kept to a minimum and not exceed 12 sheets.

Curved panels should be stored singly with their edges supported by stops to prevent spreading.

There are several proprietary lacquers available for the protection of acrylic panels and shapings during handling and storage, including those complying with specifications DTD 900/5592. Protective paper may also be used and, to prevent deterioration of the adhesive between the protective paper and the sheet, store rooms should be well ventilated, cool, and dry. The material should not be placed near steam pipes or radiators as hot conditions will cause the adhesive to harden and make the subsequent removal of the paper difficult.

Material in storage should not be exposed to strong sunlight, particularly when the light shines through a glass window as this could cause a lens formation resulting in local heating of the material.

Acrylic materials should not be stored with certain other materials because of the effects of the vapours given off these materials, including—

- Acetone
- Ammonia Vapour
- Amyl Acetate
- Aviation Gasoline
- Aviation Turbine Fuel
- Benzene
- Butyl Acetate
- Carbon Tetrachloride
- Cellulose Paints
- Cresol
- Deoxidine Materials
- Dopes
- Ethyl Alcohol

- Glacial Acetic Acid
- Methyl Alcohol
- Nicotine
- Rust Remover
- Skydrol 500, and similar fluids
- Synthetic Finishes
- Thinners
- Trichlorethylene

When sheets are handled or moved they should be lifted off, not drawn from, the adjacent sheet. The vulnerability of transparent plastics to surface damage by scratching and bruising should be noted by personnel handling the material.

Windscreen assemblies

All types of windscreen panels should be carefully protected from scratches, abrasions or other damage as small scratches or abrasions may considerably weaken the panels and impair their optical qualities. The manufacturer's recommendations relating to packaging or protective wrapping for storage purposes should be carefully followed.

Glass panels and windscreen assemblies.

All types of glass panels should be carefully protected from scratches, abrasions, or other external damage.

Sandwich type windows.

Sandwich type windows should be stored vertically in dry conditions, each window having its own desiccant cartridge attached. Desiccant cartridges should be inspected and renewed at specified periods. Spare windows are usually despatched with desiccant cartridges attached and these should not be removed until the window is to be connected to the aircraft desiccation system.

Windows in transit should be allowed to breathe, particularly when windows are transported by air as considerable atmospheric pressure variations may be encountered.

In addition to desiccant breathing cartridges, some manufacturers build into each window airspace another desiccator which consists of small discs of activated alumina strung on wire and encased in a cylindrical fabric stocking. Normally the desiccator does not require renewing.

Electrically heated windscreens.

Extreme care is necessary in handling and storing windscreens. It is generally recommended that windscreens are stored in the manufacturer's packing. Packing normally consists of protection for both surfaces using adhesive polythene, acid-free paper, and cellulose wadding and storing in reinforced cartons.

The panels should be stored separately in their cartons on racks, away from any strong light, and at a controlled temperature of approximately 10°C to 21°C in well ventilated conditions.

It is important that during handling or storage the thick glass laminate is kept uppermost to prevent delamination and that the polythene film is not removed until the panel is fitted to the aircraft.

Wire rope

Wire rope should be stored in dry, well ventilated, temperature controlled conditions to prevent condensation. Wire ropes should not be stored where they might be exposed to the corrosive influence of acid fumes, steam, or other corrosive agents, and should never be placed on a stone or concrete floor.

Wire rope in store should be inspected periodically for signs of corrosion or other damage. Where a wire rope dressing has been used this should be renewed when necessary.

Wire rope should be wound on a reel, the diameter of which will be specified by the manufacturer according to the size and type of rope. Reel diameters are usually 40 to 50 times the diameter of the rope.

If reels are made locally, it is important that oak, chestnut, or western red cedar are not used in their construction as these timbers may corrode the wire rope. The inside of the reel should be lined with waterproof paper.

When unwinding wire rope a spindle should be placed through the centre of the reel and fixed so that the free end of the cable can be pulled out in direct line with the reel. The cable should not be unwound by paying off loose coils, or by pulling the wire away from a stationary reel laid on its side. When cut-off lengths of wire rope are hand coiled, the coils should be of a diameter not less than 50 times the diameter of the wire rope concerned, with a minimum of 152 mm diameter. When hand coils are unwound the coil should be rotated so that the wire rope is paid out in a straight line. If the wire rope forms a loop on itself, this indicates a localisation of turn and should be eliminated by taking the turn out and not by pulling straight.

Before cutting a cable to length, the cable should be bound either side of the proposed cut to prevent loss of tension from the woven strands.

Storage conditions for aircraft engines

Under normal operating conditions the interior parts of an engine are protected against corrosion by the continuous application of lubricating oil and operating temperatures that are sufficient to dispel any moisture which may tend to form. After shutdown the residual film of oil gives protection for a short period.

When not in regular service parts which have been exposed to the products of combustion, and internal parts in contact with acidic oil, are prone to corrosion. If engines are expected to be out of use for an extended period they should be ground run periodically or some form of anti-corrosive treatment applied internally and externally to prevent deterioration.

The type of protection applied to an engine depends on—

- how long it is expected to be out of service
- if it is installed in an aircraft
- if it can be turned

In all cases the manufacturer's recommendations should be followed.

The maximum storage times quoted in this advisory circular are generally applicable to storage under cover in temperate climates. The times will vary considerably for different storage conditions. Times may also vary between different engines and reference must be made to the appropriate Maintenance Manual for details.

Appropriate entries must be made in the engine log book giving particulars of inhibiting procedures or periodic ground running. Such entries must be signed and dated by an appropriately licensed engineer or authorised person.

Installed piston engines – Short term storage

If it is possible to run a piston engine which is installed in an aircraft and expected to be out of service for a period of up to one month, sufficient protection will be provided by running the engine every seven days.

If the period of inactivity is subsequently extended, continued periodic ground running would result in excessive wear and the engine should be placed in long term storage. The periodic engine run should—

- be carried out at low engine speed; 1000 to 1200 rpm
- exercise the engine and propeller controls as necessary to ensure complete circulation of oil until normal working temperatures are obtained

If the engine cannot be run for any reason the manufacturer may recommend that the engine be turned by hand or motored by means of an external power supply. Generally in cases where an engine cannot be run it will be necessary to inhibit the engine.

Installed piston engines – Long term storage

When a piston engine is likely to be out of service for a period in excess of one month it must be treated internally and externally with a corrosion inhibitor. The treatments described below are normally considered satisfactory for six months but this may be extended to twelve months in ideal storage conditions. At the end of this period the engine should be—

- prepared for service and given a thorough ground run and re-protected
- removed from the aircraft and stored as an un-installed engine

Internal protection – American method

Drain the oil sump and tank and refill with storage oil as prescribed by the manufacturer.

Run the engine at low speed, 1000 to 1200 rpm, until normal operating temperatures are obtained.

Spray cylinder protective into the induction system until white smoke issues from the exhaust then switch off the engine but continue spraying until rotation has ceased.

Drain the oil sump and remove the filters.

Remove the sparking plugs and spray a fixed quantity of cylinder protective into each cylinder while the engine is turned by hand. A further quantity should then be sprayed into the cylinders with the engine stationary.

Fit dehydrator plugs in each cylinder and replace oil filters.

Place a quantity of desiccant in the intake and exhaust and blank off all openings.

Fit NO TURN placard.

Internal protection – British method

Drain the oil sump and tank and refill with storage oil as prescribed by the manufacturer.

Run the engine at low speed, 1000 to 1200 rpm, until normal operating temperatures are obtained.

Drain all oil from the system and remove the filters.

Remove sparking plugs and spray the specified quantity of cylinder protective—

- into each cylinder while the piston is at the bottom of its stroke
- on the valve springs and stems with the valves closed
- on the valve heads and ports with the valves open
- on the valve rocker gear

Turn the engine at least six revolutions by hand then spray half the previously used quantity of cylinder protective into each cylinder with the engine stationary.

Replace oil filters and fit dehydrator plugs.

Blank off all openings into the engine.

Replenish oil tank to normal level with storage oil as specified.

Fit NO TURN placard.

Internal protection – Special requirements

Coolant systems should be drained and thoroughly flushed unless an inhibited coolant is used.

Fuel system components such as fuel pumps, injectors, carburettors, or boost control units also require inhibiting by—

- draining all fuel and oil as appropriate
- refilling with storage or mineral oil as recommended by the manufacturer
- fitting blanking caps and plugs to retain the oil

Auxiliary gearboxes should be inhibited by draining the normal lubricating oil and refilling the gearbox with storage oil.

If the propeller is removed the propeller shaft should be sprayed internally and externally with cylinder protective and current blanks fitted.

External Protection.

Exterior surfaces of the engine should be thoroughly cleaned with an approved solvent such as white spirit and dried with compressed air. Any corrosion should be removed, the area re-treated in accordance with the manufacturer's instructions. Chipped or damaged paint work should be renewed. The following actions should then be taken—

- all control rods should be liberally coated with a general purpose grease
- magneto vents should be covered
- sparking plug lead ends should be fitted with approved transport blanks, exposed electrical connections masked, and rubber components covered with waxed paper or mouldable wrap
- spray holes in fire extinguisher pipes should be blanked off using polythene sleeving or waxed paper suitably secured

- a preservative such as lanolin or external air drying varnish, should be sprayed over the whole engine in a thin even film

General precautions.

It is most important that an installed stored engine should not be turned, since this would lead to removal of cylinder protective from the cylinder walls and possibly result in the formation of corrosion at those positions. Physical restraint is seldom practicable, particularly when a propeller is fitted, but warning notices should be fixed on the propeller and in the cockpit to prevent inadvertent rotation of the engine.

Installed turbine engines – Short term storage

Installed turbine engines which are to be out of use for a period of up to seven days require no protection apart from fitting covers or blanks to the intake, exhaust, and any other apertures. A turbine engine should not normally be ground run solely for the purpose of preservation since the number of temperature cycles to which it is subjected is a factor in limiting its life. For storage periods in excess of seven days additional precautions may be necessary to prevent corrosion.

The following procedure will normally be satisfactory for a storage period of up to one month.

Fuel system.

The fuel lines and components mounted on the engine must be protected from the corrosion which may result from water held in suspension in the fuel. The methods used to inhibit the fuel system depend on the condition of the engine and whether it is installed in an aircraft or not, and are fully described in the appropriate Maintenance Manual. On completion of inhibiting, the fuel cocks must be turned off.

Lubrication systems.

Some manufacturers recommend that all lubrication systems of an installed engine should be drained and any filters removed and cleaned. Other manufacturer’s recommend that the systems should be filled to the normal level with clean system oil or storage oil. The method recommended for a particular engine should be ascertained from the appropriate Maintenance Manual.

External treatment.

Exterior surfaces should be cleaned as necessary to detect corrosion and dried with compressed air. Any corrosion should be removed, affected areas re-treated, and any damaged paint work repaired in accordance with the manufacturer's instructions. Desiccant or vapour phase inhibitor should be inserted in the intake and exhaust and all apertures should be fitted with approved covers or blanks.

Installed turbine engines –Long term storage

For the protection of turbine engines which may be in storage for up to six months—

- the short-term preservation should be applied
- grease all control rods and fittings
- blank-off all vents and apertures on the engine
- wrap grease proof paper round all rubber parts which may be affected by the preservative
- spray a thin coat of external protective over the whole engine forward of the exhaust unit

At the end of each successive six months storage period an installed engine should be re-preserved for a further period of storage. Alternatively, the engine may be removed from the aircraft and preserved in a moisture vapour proof envelope.

Un-installed engines

Un-installed engines, piston and turbine, which have been removed from aircraft for storage, or which are being returned for repair or overhaul, should be protected internally, and sealed in moisture vapour proof (MVP) envelopes. This is the most satisfactory method of preventing corrosion and is essential when engines are to be transported overseas.

A piston engine should be—

- drained of all oil
- the cylinders inhibited as described for short term storage
- drives and inside of crankcase sprayed with cylinder protective
- all openings sealed

A turbine engine should be—

- drained of all oil
- have its fuel system inhibited
- oil system treated as recommended by the manufacturer
- blanks fitted to all openings

Particular care should be taken to ensure that no fluids are leaking from the engine and that all sharp projections, such as locking wire ends, are suitably padded to prevent damage to the envelope.

The MVP envelope should be inspected to ensure that it is undamaged, and placed in position in the engine stand or around the engine, as appropriate. The engine should then be placed in the stand, care being taken not to damage the envelope at the points where the material is trapped between the engine attachment points and the stand bearers.

Vapour phase inhibitor or desiccant should be installed in the quantities and at the positions specified in the relevant Maintenance Manual and a humidity indicator should be located in an easily visible position in the envelope. The envelope should then be sealed as soon as possible after exposure of the desiccant or vapour phase inhibitor.

The humidity indicator should be inspected after 24 hours to ensure that the humidity is within limits. An unsafe reading would necessitate replacement of the desiccant and an examination of the MVP envelope for damage or deterioration.

After a period of three years storage in an envelope the engine should be inspected for corrosion and re-preserved.

Engines in storage should be inspected periodically to ensure that no deterioration has taken place.

Engines that are not preserved in a sealed envelope should be inspected at approximately two-weekly intervals. Any corrosion patches should be removed and the protective treatment re-applied. If external corrosion is extensive a thorough inspection may be necessary.

Envelopes on sealed engines should be inspected at approximately monthly intervals to ensure that humidity within the envelope is satisfactory. If the humidity indicator has turned pink the envelope should be unsealed, the desiccant renewed, and the envelope resealed.

The inhibiting spray equipment should be of a type approved by the engine manufacturer and should be operated in accordance with the instructions issued by the manufacturer of the equipment. For inhibiting cylinders a special nozzle is required and this nozzle should be checked immediately before use to ensure that the spray holes are unblocked. Correct operation of the spray gun may be checked by spraying a dummy cylinder and inspecting the resultant distribution of fluid.

Care is necessary to ensure that the revolving spray nozzle remains securely in place following each penetration of a cavity. Loss of the nozzle may require a complete engine strip down.

Only the types of storage and inhibiting oil recommended by the manufacturer should be used for preserving an engine—

American manufacturers recommend oils and compounds to American specifications

British manufacturers recommend—

- storage oil to DEF 2181
- wax-thickened cylinder protective to DTD 791
- turbine fuel system inhibiting oil to DEng. R.D. 2490
- external air drying varnish approved under a DTD 900 specification.

Only approved alternatives should be used, and any instructions supplied by the manufacturer in respect of thinning or mixing of oils should be carefully followed.

Blanks or seals recommended by the manufacturer should be used whenever possible. These are normally supplied with a new or reconditioned engine and should be retained for future use. Pipe connections are usually sealed by means of a screw-type plug or cap such as AGS 3802 to 3807, and plain holes are sealed with plugs such as AGS 2108. Pipe caps are usually coloured for visual identification. Large openings such as air intakes are usually fitted with a specially designed blanking plate secured by the normal attachment nuts with the contact areas smeared with grease before fitting. Adhesive tape may be used to secure waxed paper where no other protection is provided but should never be used as a means of blanking by itself since it may promote corrosion and clog small holes or threads.

Removal from Storage

For an engine which was not installed in an aircraft during storage the installation procedure described in the appropriate Maintenance Manual should be carried out, followed by a thorough ground run and check of associated systems. For an engine which was installed in an aircraft during storage the following actions should be taken—

Remove all masking, blanks, and desiccant

Clean the engine as necessary

Ensure fire extinguisher spray pipe holes are clear

Replace any components which were removed for individual storage, de-inhibiting as necessary

Drain out all storage oil, clean oil filters, and refill with normal operating oil

Piston engines

Remove sparking plug blanks and turn engine slowly to drain excess oil from the cylinders, then fit plugs and connect leads

Turbine engines

Prime the fuel system in accordance with the manufacturer's requirements

Prime the engine lubricating oil system

Start the engine and carry out a check of the engine and associated systems

Storage of propellers

Corrosion during the inactive life of many components can cost as much to rectify as normal wear and tear. The following recommendations are made to reduce the possibility of corrosion occurring during storage, long or short term.

Propellers in storage should be constantly monitored for changes in storage conditions. The presence of chemical fumes, damp, humidity/condensation are all likely to cause corrosion.

Propellers which have been in storage for 18 months or more must be disassembled to a degree sufficient to permit internal inspection for corrosion or deterioration of seals. If any such defects are found, they must be rectified or the items replaced before returning the propeller to storage.

Short term storage – propeller fully assembled.

All parts which are not plated, anodised, or effectively painted should be protected with a corrosion preventative compound such as AMS 3078.

Clean the propeller prior to preservation using white spirit or methyl alcohol but not unleaded gasoline. All parts to be thoroughly dried prior to application of corrosion preventative compound.

Wrap the dome or operating cylinder assembly and barrel together with attachments with grease proof paper followed by a layer of foil backed paper.

On returning the propeller to service, the preservative may be removed by wiping with a cloth soaked in white spirit or Stoddard solvent, but not unleaded gasoline.

Long term storage or transportation of partially disassembled propellers.

Clean and degrease the barrel and dome assemblies and dip in corrosion preventative compound.

Clean and degrease the blades using a lint free cloth and white spirit or Stoddard solvent. Pay special attention to the blade root bearing assemblies. Ensure the areas are clean and dry, renew any grease in the bearings rotating them to ensure complete coverage of all surfaces. Dip or swab the complete blade and bearings with corrosion preventative compound such as AMS 3079 or similar. Wrap the butt end and approximately six inches up the blade shank with grease proof paper followed by a layer of foil backed moisture barrier paper.

Any components that have been removed during disassembly are to be cleaned, covered with corrosion preventative compound, and wrapped in grease proof paper.

O rings and other seals must be protected from the effects of ozone and sunlight. Replacement parts are to be left in their packages. If not packaged, the items are to be dusted with talc and wrapped in grease proof paper. Store flat and undistorted.

Dome, barrel, and other wrapped or packaged parts are to be placed in a fibreboard container ensuring that O rings and seals will stay flat and undistorted. The parts should then be placed in a wooden container to prevent handling and storage damage.

Blades are to be stored in a wooden container provided with suitable blocks and restraints to prevent movement of the blades within the container.

When returning the propeller to service corrosion preventative is to be removed using white spirit or Stoddard solvent and clean, lint free cloths. Bearings to be cleaned and repacked with grease as specified in the manufacturer's Maintenance Manual or Service Instructions.

Short term storage on propeller stand or wall arbour.

Great care should be taken to ensure that the propeller is well protected particularly in the area of the splined bore or mounting flange. A thorough cleaning followed by a liberal application of grease will give short term protection. The choice of arbour materials should also be considered as certain woods are corrosive and felt and other packing materials can harbour moisture. Blades must be covered to avoid bird droppings, incidental spills and roof leaks.

Propellers stored in manufacturers' packing cases.

Generally, these comply with long term storage requirements, and may be left sealed until required for service. If any doubt exists as to the suitability of a packing case for long term storage the manufacturer should be contacted for advice.

A typical stores system

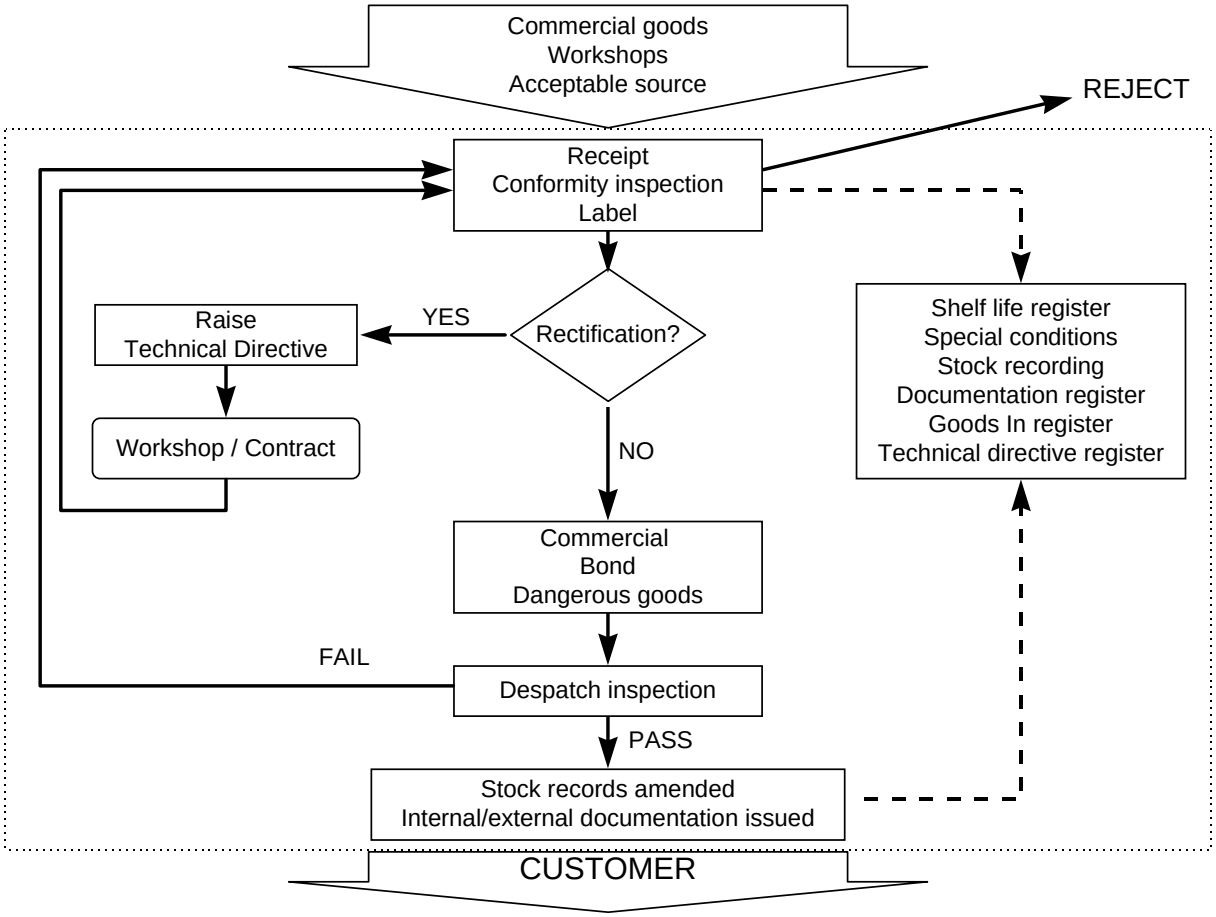

Figure 1. Stores system

The system approach includes the methods and procedures used to control goods, as well as the documentation and the physical arrangements necessary, to ensure that all stored goods are fit for their intended end use. The following paragraphs should be read in conjunction with Figure 1 which illustrates a typical system. Other systems or variations may be devised to suit local conditions.

Sources of parts vary considerably. Providers of materials, parts, and appliances may be certificated manufacturers, maintenance organisations, or supply organisations.

Because the stores system is intended to control all parts and material for use on aircraft the organisation should ensure that all non-approved items are specifically controlled to prevent inadvertent use on aircraft. As a means of reinforcing the unapproved condition these items are required to be kept separate from all other approved stocks.

Acceptable items include items—

- supplied by the aircraft or component manufacturer
- specified in an approved modification or repair design
- conforming to an approved specification

Advisory circular AC 00-1 details the considerations on the acceptability of parts.

Any special storage conditions or shelf life limitations applicable must be strictly observed.

The CAA Form Two should be used to identify and track parts. A certificated organisation may have other forms for internal use and these should be prescribed in the exposition.

Parts and components may enter the store system from workshops and hangars. All such items should be properly identified by suitable labels and tags. No item should be accepted into the system without proper identification.

All items in transit through the stores system and in workshops and hangars should carry appropriate identification labels at all times. Personnel at all levels of the organisation are responsible for ensuring that labels and tags are properly attached to items and that when attaching a label all relevant data is added to the label as required.

Quarantine store

The quarantine store is a separate and secure location under the control of authorised personnel. The store is used to store aircraft parts, components, and materials which are unserviceable for any reason. The unserviceability may be due to a defect requiring rectification, faulty storage, incorrect or lack of identification, expiry of normal service life, or that the part is awaiting conformity inspection.

It is usual to maintain a register of items in the quarantine store and to require a signature to account for any item removed from the store. The register should contain sufficient information to identify the item and show its origin, condition and final disposition.

Inspection

Before any item is received into the store it should undergo an inspection by an authorised person to verify that the item—

- is identified as being to an approved specification or drawing
- has been properly inhibited, packed, and previously stored
- is properly identified in accompanying documentation
- has the correct accompanying documentation
- is free from obvious damage or defects

The depth of inspection should be sufficient to ensure that the item is airworthy and fit for its intended use. The inspection may include, but is not limited to—

- mechanical testing of the item or a representative batch sample
- non-destructive testing
- comparison with the drawing or specification
- confirmations of the incorporation of modifications or airworthiness directives

Any item which fails inspection should be subject to a rejection procedure.

Responsibility and authority for accomplishing the conformity inspection should be clear to personnel in the organisation.

A record of each inspection should be maintained which will show who did the inspection and what was done to achieve a satisfactory result.

Rejection

Any item which fails the conformity inspection or which is un-airworthy due to finite life expiry should be permanently withdrawn from use and disposed of.

Some items may be recoverable by repair or overhaul, in which case arrangements should be made to raise a technical directive for the required work. Items which are not recoverable must be made unfit for further aircraft use and disposed of to prevent further use.

Technical directives

Whenever items enter the stores system which are recoverable after repair or overhaul, the conformity inspector should raise a technical directive in duplicate to accompany the item out of the quarantine store. It is important that the completed job will meet all airworthiness requirements. The technical directive should include such details as—

- heat treatment
- temperatures
- welding techniques
- inspection tolerances and frequency
- test and inspection specifications
- relevant history of the item such as—
    - time since overhaul
    - cycles completed
    - damage and defects known to exist
    - modifications and airworthiness directives to be incorporated

When an item is received in the Quarantine store after being actioned on the technical directive the conformity inspector must ensure that all relevant parts of the technical directive have been completed and that a release to service has been given for the work involved.

Bond store

The bond store provides physical storage for all items which have passed conformity inspection and which are capable of being released for aircraft use. The store is under the personal control of an authorised person as defined by the organisation.

Identified items in stock must be placed in appropriate bins, racks, or stands and be properly blanked, inhibited, and packed as described previously in this advisory circular.

Stock items which are subject to shelf life limitations should be annotated to indicate the limits and appropriate records should be kept to ensure that no stock item is permitted to exceed its limitations.

All stock requiring special conditions of storage should be appropriately stored and any periodic inspection of the conditions must be made and recorded.

All forward stock holding areas, even though located outside the main store, are to be considered as part of the main store for the purpose of control.

Goods which are in the dangerous or hazardous category shall be stored in accordance with the requirements of the appropriate requirements.

Records

The following records should be maintained and kept.

Shelf life register

A record system is to be maintained whereby all parts and materials held in store which are subject to self life limitation are individually recorded, including—

Part number

Serial number

Description

Quantity

Internal release reference

Goods received reference

Special storage conditions

Records of the stored aeronautical supplies which require special storage conditions should be maintained as should the records relating to any inspections required to ensure these conditions are maintained.

Stock recording

Records of components and materials used in the maintenance of aircraft should not be destroyed during the term that items are held in stock and the total stock records shall be such as to permit a complete stock holding check to be taken at periodic intervals.

Issue documentation register

The issue documentation should enable associated supply and work records and consignee to be identified and should be recorded in a register that may be in the form of sequential copies of issued documents.

Goods-in register

A register should be maintained of all material or parts received in the store and that register should—

- be periodically checked against the stock records held to prevent long term storage of old stocks
- show part number, description, reason for quarantine, and any other pertinent details that may apply
- include a signature column for the signature of the persons removing the goods from the store

Technical directive register

Copies of all technical directives issued should be retained

Dispatch inspection

Before any item is dispatched from storage it should undergo an inspection which shall cover the following areas—

- shelf life limitation period within limits
- current Airworthiness Directives and Service Bulletins status
- general condition
- correct labelling attached
- conformity inspection performed and recorded
- release documentation issued
- records amended as required

Release documentation

Each item released from stores should be accompanied with evidence that that material, part, or appliance supplied—

- conforms to the acceptable standards
- work has been performed in accordance with acceptable standards, specifications, or drawings
- can be traced back through stages of manufacture, distribution, or maintenance

All incoming and outgoing serviceable stock to or from the main bonded store must be accompanied by appropriate documentation. The document would normally be signed by a person authorised by the organisation.

Note that although an item may have been removed from an aircraft and overhauled or repaired by the one organisation, the flow chart shows that the item should be—

- labelled and placed into quarantine
- after failing a conformity inspection, have a technical directive raised for repair
- been routed to a workshop for repair
- after completion of any repair, returned to quarantine prior to another conformity inspection and issue via the bond store and dispatch inspection

In practise the item may well go direct from workshop bench to an aircraft, but the system requires all the other steps to be followed if the integrity of the system is to be maintained. This does not apply to items removed and refitted to the same aircraft undergoing inspection where all the work done will be detailed and certified either in job records or logbook entry.

Personnel responsibilities

In order to control and operate the stores system personnel should have clearly defined responsibilities and instructions. As a guide the following positions should be considered—

A store person directly responsible for—

- supply services
- the efficient operation of the stores system
- the training of personnel on supply procedures
- the implementation of any procedures relating to the stores system
- the supervision of stock recording and invoice pricing procedures
- ensuring that all necessary inspection and certification is accomplished

Additional store persons responsible for—

- the receipt, storage, rotation, and issue of all items in the store(s)
- the security and maintenance of stores areas
- the satisfactory storage of the different classes of parts
- the issue of release documentation
- stocktaking
- ensuring that dispatch inspection is performed and recorded on all items issued from the store(s)
- ensuring that appropriate records are maintained
- operation of the rejection system for disposal of redundant and scrap items
- ensuring that all items leaving the store for repair or rework are accompanied by a technical directive
- maintaining the appropriate registers for stock held in the store(s)
- maintaining appropriate storage conditions for all stock in the quarantine store.
- reviewing stock records and the ensuring adequate stock levels are maintained
- the raising of purchase orders
- ensuring that all stock held in the supply system is appropriately labelled, packaged, and stored