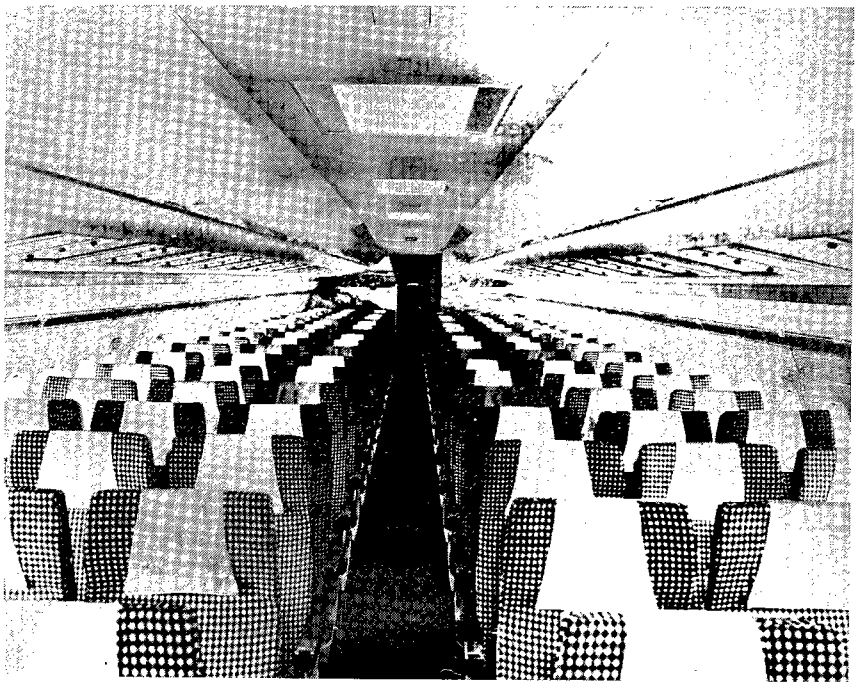
8. AIRCRAFT INTERIOR CLEANING

When an aircraft commences a flight, boarding passengers should see an attractive and immaculate cabin interior (Fig. 32). During flight conditions deteriorate, and therefore at each transit stop, or during quick turn-rounds at terminal airports, rapid tidying is necessary. Usually time will not permit a complete cleaning operation; nor is this possible when passengers remain on board. The extent of cleaning will be dependent on the amount of time available; at all events priority must be given to the removal of litter and dry waste and the cleaning of toilet compartments and galleys.

FIG. 32. AIRCRAFT INTERIOR CLEANED AND MADE READY FOR SERVICE



8.1 Cleaning schedules

The following are suggested minimum procedures:

Tidying during transit stops

Galley:
— Empty waste bin and clean.
— Clean sinks.
— Clean worktop.
— Remove any debris, wipe up spillages and clean floor.

Toilet compartments:
— Remove debris and empty waste bins.
— Wipe wash-hand-basin.
— Wipe and dry top and back of toilet seat and cover.
— Empty and clean ashtray.
— Wipe mirrors, surrounds and fittings as necessary.
— Replenish soap and toiletries.
— Clean floor.

Passenger cabins:
— Clear debris from seats, seat-back pockets and hat racks.
— Wipe clean all tables.
— Empty ashtrays.
— Sweep floor.
— Brush seats.

Flight deck:
— Clear debris.
— Empty waste containers and ashtrays.
— Clean exterior of windscreen.

If time does not permit completion of the above tasks, priority should be given to the removal of waste and the cleaning of galleys and toilets. The use of a detergent/disinfectant/odour-counteragent of the type described in chapter 6 (page 81) is suggested. To expedite cleaning procedures and to reduce the amount of equipment required, disposable swabs impregnated with this product can be prepared in advance, stored in polyethylene bags, and used for all wiping operations.

Intensive cleaning

A more thorough cleaning should be carried out once every 24 hours, either during a night stop (this will apply mostly to short-haul aircraft) or at any other operationally convenient time. Intensive cleaning, which will usually take four times as many man-hours as the transit clean, consists of the following operations:

Galley:
— Clear debris, wipe up spillages, clean floor.

— Empty, wash and disinfect waste bins.
— Clean all work surfaces, sinks, fittings and galley structures.
— Clean all cabin crew seats.
— Clean all container and trolley stowages, including the framework.
— Clean control panel, telephones, doors, panels, etc.

Toilet compartments:
— Clean wash-hand-basin, mirrors, surrounds and fittings.
— Polish mirrors and taps.
— Clear debris, empty waste containers and ashtrays.
— Wash and disinfect waste containers.
— Wash floor with detergent/disinfectant.
— Clean doors, panels, etc.
— Remove any waste and clean bin housing.
— Wash and dry surrounds of wash-hand-basin, ledges and light fittings.
— Replenish soap and toiletries.
— Clean and dry hinged panel below wash-hand-basin.
— Wash and dry toilet surrounds.
— Wash and dry top and back of toilet seat.

Passenger cabins:
— Clean all ashtrays and seat-back pockets.
— Brush seat backs, cushions and armrests.
— Clean chair frames under seat cushion.
— Clean all tables and hat racks.
— Vacuum-clean all carpets.
— Clean interior of cabin windows, surrounds and blinds.
— Clean all cabin fittings, service panels, bulkheads and head linings.
— Vacuum-clean all ventilation grilles.
— Change all soiled headrest covers.
— Sweep steps and clean handrails of airstairs where applicable.
— Replace all used blankets with freshly laundered ones.

Flight deck:
— Clean all ashtrays and empty waste bins.
— Clean crew seats and harnesses.
— Vacuum-clean floor.
— Wipe clean sides of consoles, ledges, etc.
— Clean interior and exterior of windows.

Galleys

Aircraft galleys or pantries vary in size, shape and construction according to the type of aircraft. Some parts of the galley are semi-permanent fixtures and only normally removed during an aircraft maintenance check. Other parts are mobile—i.e., modules, food containers, trolleys, some types of oven, and beverage containers.

Galleys are extremely difficult to clean satisfactorily at times other than during maintenance checks, since they have many almost inaccessible areas in which foods and beverages—particularly the latter—can penetrate. The introduction of modules in wide-bodied aircraft is an improvement, but much more could be done to design a galley that would be easier to clean than the present type.

Problem areas

Aircraft cleaners need to pay particular attention to the following dirt traps and make sure that they are thoroughly cleaned out:

— Catering equipment runners.
— Bar box recesses.
— Floor of catering container compartments.
— Sink drain pipes (frequently blocked).
— Drinking-fountain wastes and bottle top remover recesses.
— Toilet compartment cupboards.
— First-aid stowage holds.

8.2 Air-sickness containers

Used containers should be stored during flight in the toilet compartment. They should not be put down the toilet, and a notice to this effect should be placed in the toilet compartment. They should be removed from the aircraft by the toilet servicing team and disposed of along with the aircraft toilet wastes. If any receptacle is used on the aircraft for storage of used sickness containers, it should be thoroughly cleaned, washed and disinfected after each use, and treated in the same manner as portable toilet containers.

8.3 Disinfection of aircraft

The airport health authorities should be consulted when a case of infectious disease has been carried aboard an aircraft. On the rare occasions when this occurs, the notification may arrive several days after the infected person has travelled—by which time the aircraft will probably have departed and carried several hundreds of passengers on a number of flights. Under these circumstances disinfection may not be practicable or useful.

It is because of this eventuality that the regular use of an efficient bactericide (as already mentioned) in the daily cleaning routine of aircraft interiors and the incorporation of a bactericide in the chemicals added to aircraft toilets are important procedures, ensuring that the aircraft has at least received some form of disinfection. Should an infectious disease be diagnosed either during the flight or immediately on arrival, and before the aircraft departs again, disinfection may be of value.

The method and materials used will depend on the nature of the infectious disease, as well as on the recommendations of the health authority that is responsible for requesting the disinfection. The disinfectants most commonly employed are sodium hypochlorite diluted to a strength of 100 mg/l and a 5% solution of formalin, which itself is a 40% solution of formaldehyde gas in water.

Sodium hypochlorite is often used when disinfecting aircraft after the carriage of a person infected with a food- or waterborne disease such as cholera. Personnel (wearing waterproof gloves) should swab the following areas with the sodium hypochlorite solution, which should remain in contact with these surfaces for 30 minutes before they are rinsed with warm water and dried to remove any residual chlorine:

(1) All surfaces in the toilet compartment.
(2) All surfaces and food containers in the galley.
(3) All meal tables, seat armrests and ashtrays in the cabin.

The aircraft water system should be completely drained into a specially allocated toilet cart and discharged into the sewerage system. The aircraft water system should then be treated with hypochlorite as described in chapter 5 (page 70).

The toilet system should be drained and flushed in the normal way, but before servicing in the usual manner, chemical fluid containing a bactericide should be allowed to stand in the toilet system for at least 2 hours.

The fabric covers of the seat in which the infected person sat, and those of the seats in the row in front and the row behind should be removed, soaked in the disinfectant solution for 1 hour and, after air drying, sent for dry cleaning, suitably marked. As this situation occurs so rarely, and the resulting cost is insignificant, it would be a sensible alternative simply to destroy the covers by incineration. The remaining seats and carpets should be vacuum-cleaned and the dust incinerated.

All hard surfaces, including those mentioned above (already treated with sodium hypochorite), should be swabbed with the formalin solution, which, after 30 minutes' contact, should then be rinsed away with warm water. (The personnel engaged in this work should wear not only waterproof gloves but face masks in addition.)

NOTE: Where corrosion of the contaminated surface by disinfectants is a significant consideration, reference should be made to the list of Accepted and Non-Accepted Chemicals appearing in the *IATA Medical Manual* (*40*).

8.4 Special needs

There are occasions when special action is needed during flight—for example, when seats or carpets are soiled by a sick passenger. This sickness might be the result of an infection, and—apart from the nuisance caused to other passengers—there might be a health

hazard. Since a major cleaning, involving the replacement of soiled seat covers, cannot be undertaken until arrival at the next airport, the cabin crew should be supplied with material for use in such an emergency. Aerosol dispensers containing a detergent/bactericide/odour-counteragent will satisfactorily deal with the problem until more effective action can be taken on the ground. In cases where a special cleaning will be needed on arrival, a radio message should be sent so that arrangements can be made beforehand and delays prevented.

The methods used by some airlines to decontaminate surfaces in the case of a spill or leakage of etiological agents (infectious substances) include the following:

(1) The use of carboxide (a mixture of 10% ethylene oxide and 90% carbon dioxide), which needs to be applied at the rate of 136 kg for every 28 m^3 of space (300 lb/1000 ft^3). The temperature in the aircraft must be more than 21 °C (70 °F) and the relative humidity 30%. The aircraft is sealed and the gas admitted through plastic or copper tubing with perforated holes along its length, until a cabin pressure of 48 kPa (7 lbf/in^2) is obtained. This pressure should be maintained for 6-12 hours.

(2) A mixture of ethylene oxide and Freon II can also be used at the rate of 68 kg for every 28 m^3 of space (150 lb/1000 ft^3).

(3) A third method is the introduction of betapropiolactone in vapour form at the rate of 4.5 l for every 700 m^3 of space (1.2 gal (US), 1 gal (UK)/25 000 ft^3). For this, relative humidity must be over 70% and temperature 21 °C (70 °F). Exposure time is 2 hours, and the aircraft can return to service after a further 2 hours, since the vapour is rapidly dispersed. Betapropiolactone must be 98% pure, otherwise a polymer will form and settle on surfaces as a sticky coating that is difficult to remove.

When any of the above three ingredients is used, disinfecting should be carried out only by trained personnel.

8.5 Distribution of responsibilities and suggested areas of concern, by authority or agency

A. Distribution of responsibilities

Authority or agency	*Responsibility*
Health administration	Ensuring that airports within its territory have at their disposal the requisite organization and equipment for the application of disinfection procedures (Articles 15 and 19.2).[a]

[a] The article numbers cited refer to the International Health Regulations.

Health authority	Inspection of aircraft.
	Detention of aircraft that is infected or suspected of having carried a person with an infectious disease.
	Disinfection or requesting disinfection of aircraft, or articles on board, or both.

B. Suggested areas of concern

Authority or agency	*Area of concern*
Airlines	Transmission of a radio message to the health authority of the next airport of call notifying a suspected case of infectious disease on board.
	Disinfection of aircraft at the request of the health authority.
	Reducing the risk of disease by keeping aircraft—particularly toilets and galleys—in a hygienic condition.
Aircraft manufacturers	Design and manufacture of aircraft interiors that are easy to clean, with a minimum number of potential dirt traps and inaccessible areas.

9. CARGO

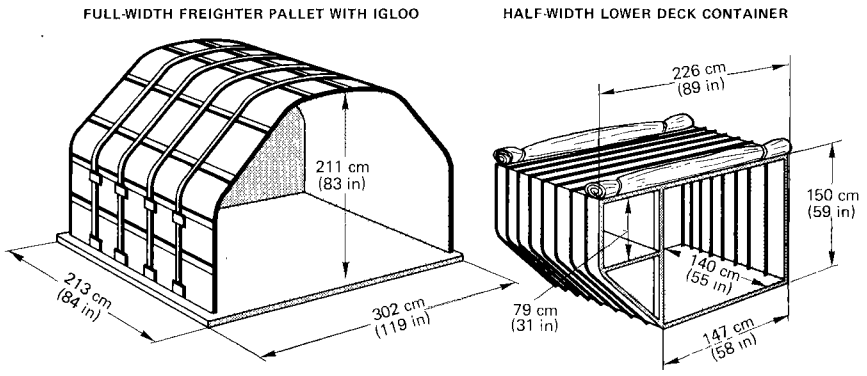
9.1 General

The shipment of cargo by air is becoming increasingly frequent and constitutes an important source of revenue for all airlines. Cargo is shipped either in aircraft specially adapted for the carriage of freight or in the holds of passenger aircraft.

Air cargo currently includes all commodities, with the exception of low-value bulk goods—e.g., iron ore and coal—, but of particular interest from a hygiene aspect is the carriage of animals of every description, foodstuffs and toxic materials. Apart from the possibility of animals being infected with diseases transmissible to man, foodstuffs may be contaminated, and vectors of disease may be transported in cargo.

With the introduction of wide-bodied aircraft, the container system of cargo carriage has expanded rapidly. For the purpose of air carriage, there are two types of container. One type is required to interface directly with the aircraft's loading and restraint systems and to meet all statutory restraint requirements without the use of supplementary equipment. As such it becomes a component part of the aircraft. The other type—a unit load device—, although not complying with the above conditions, is nevertheless purpose-built for carriage on aircraft. Typical examples of each type are shown in Fig. 33 and 34.

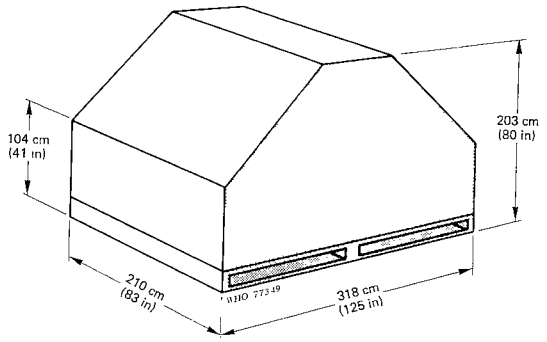
FIG. 33. AIRCRAFT UNIT LOAD DEVICES



Approximate volume: 12 m^3 (420 ft^3)

Approximate volume: 4.5 m^3 (150 ft^3)

FIG. 34. FULL PALLET SIZE CONTAINER



Approximate volume: 11 m^3 (380 ft^3)

While no disease-transmission incidents have been associated with the use of containers, the potential danger should be recognized and the necessary preventive measures taken.

9.2 Animals

Animals, both wild and domestic, tropical fish, birds and insects of all sizes and species are transported in large numbers by air, regularly and frequently. The relevant IATA regulations (*41*) list over 270 different animals, ranging from "Aardvark" to "Zebu".

More than 150 zoonoses are now recognized (*42*). The list of diseases transmissible from animals to man is impressive, and although there is little information on incidents that have occurred as a result of handling, the risk cannot be overlooked, and for this reason precautions should be adopted to safeguard airline personnel.

As domestic pets can transmit some diseases—rabies, for example—and, in addition, may harbour insects, all animals should be transported in the freight holds. If pets are allowed to travel in passenger cabins, members of the cabin staff are likely to come into contact with them at some stage, and as these crew members handle food there is a potential risk of contamination.

Suggested precautions

(1) Before any animal is accepted for transport, it must be ascertained that no discomfort will be caused to passengers or crew from odours, noise or the animal's escape from restraint during the voyage. The consignor should be given full information concerning the regulations governing import permit, veterinary health certificate, veterinary examination, quarantine, and trans-shipment, as well as any prohibition restrictions currently in force in the country of destination.

(2) Only healthy animals in a suitable condition should be accepted. Those that are unfit, infirm, diseased or injured, or likely to give birth during the journey should be rejected.

(3) All animals should be carried in containers suitable to their species and size. All containers must have handles or other means of lifting to reduce the risk of handlers being bitten or scratched. The containers should be properly secured during flight, and so designed as to allow adequate circulation of air and to permit the removal of excreta and the inspection of their occupants without having to be opened, thus precluding the possibility of the animals' escaping. The floor of containers should be leak-proof and covered with absorbent material to prevent the issue of faeces and urine.

(4) Animals should not be placed near foodstuffs: whenever possible they should be transported in a different hold.

(5) Animals for laboratory use must be separated from other animals to reduce the risk of cross-infection.

(6) Different species of animals should not be mixed, and care should be taken not to place in close proximity cages containing animals naturally hostile to each other.

Some hygiene problems may occur during flight, but the major problems arise after the animals are offloaded. Odours from the animal or its body wastes are often present, penetrating and persistent in varying degree, according to the species. There will be animal wastes, food debris and litter, and insects may be present. In order to reduce surface contamination of the aircraft, the hold floor under and around the cages should be covered with sheets of heavy-gauge polyethylene, waxed paper or roofing felt.

To minimize odours during flight and while cages are being handled, solid deodorant sachets should be attached to each container, but out of the animals' reach. Just before the doors are closed, the hold itself may also be sprayed with an aerosol deodorant that is not harmful to the animals. They must never be sprayed with disinfectant.

The following precautions should be taken by all personnel involved in animal handling or in cleaning aircraft that have carried animals.

(1) Washable impervious elbow-length gauntlets should be worn.

(2) After animals or cages have been handled, gloves and hands should be washed with a germicidal soap.

(3) Contact with animals should be avoided as far as possible.

(4) If the staff are bitten or scratched by an animal, they should report immediately to a physician. Information on the species of animal concerned will help the physician in his choice of treatment.

(5) Any clothing soiled by animal blood or excreta should be removed and sent for cleaning.

(6) All staff who handle livestock should be immunized against tetanus (this may conveniently be combined with immunization against typhoid and paratyphoid).

Cleaning procedures

(1) All cleaners must wear gloves and rubber boots. These must be washed after use.

(2) All nonpermanent containers and materials, such as cartons, wooden trays, polyethylene sheeting, waxed paper, and roofing felt, must be removed and destroyed.

(3) All waste food and other debris should be removed with a vacuum cleaner from areas where they might become lodged.

(4) The floor and shelves of freight holds and permanent animal containers should be thoroughly swabbed and washed with a solution of an approved fat-solvent detergent/germicide.

(5) The interior should be fogged with an efficient odour-counteragent designed to neutralize odours from animals and their body wastes. For maximum efficacy, cargo doors should be closed during this spraying.

The above operations are minimum procedures, and on some occasions a more vigorous cleaning will be needed. However, if the hold is cleaned as recommended after each cargo of animals is carried, the risk of disease transmission should be averted, and nuisance kept to an acceptable level—if not entirely eliminated.

Handling at airports

All airports from which animals are exported, imported or held in transit should be provided with animal holding rooms. Imported animals and animals for export must be kept in separate rooms, and cubicles provided in each so that different species can be segregated. The rooms must be well lit, ventilated and heated, with tiled walls and floors, hot and cold running water and drainage. Floors should be washed at least once daily with a solution of fat-solvent detergent/disinfectant, and the rooms should be kept in a clean condition.

Vehicles used for transporting animals should also be well ventilated, heated for tropical animals, and kept in a clean condition. Veterinary advice must be readily available.

9.3 Food

Many items of food are now transported by air. If freighter aircraft containers are used, and as it would be impracticable and uneconomic to reserve containers exclusively for the carriage of food, precautions should be taken to prevent any contamination of foodstuffs by other cargo.

Containers should always be left in a clean condition, and in addition to the normal cleaning, all those used for the carriage of foodstuffs should be washed out thoroughly before loading commences and after the load has been discharged. A solution of detergent/germicide is recommended. After being washed, the container should be allowed to

dry thoroughly before re-use. This procedure should be carried out on a worldwide basis and not only at base airports.

9.4 Hazardous materials

Some cargo may be classified as hazardous, because unless certain precautions are taken flight safety may be endangered.

Cargo should be correctly packaged to prevent leakage. This can be caused not only by faulty packaging but by the effects of variation in pressure and temperature occurring during flight, for which correct provision must be made. If shippers, cargo agents, freight forwarders and airline personnel lack knowledge of the proper precautions to take, the carriage of flammable, toxic or corrosive liquids could jeopardize the safety of the aircraft.

IATA regulations governing the transport of hazardous materials (*32*) are approved by the appropriate government authorities and incorporated in the national regulations of many countries. Among other aspects, they describe in detail correct methods of packaging. Over 2000 articles are listed, of which the following are examples: compressed gases, flammable and nonflammable; corrosive materials; etiological agents (infectious substances); explosives; flammable liquids; flammable solids; magnetized materials; oxidizing materials; poisonous articles; radioactive materials; and other articles having anaesthetic, irritating, noxious, toxic or other properties that could cause extreme annoyance or discomfort to passengers and crew in the event of leakage during flight. Many articles are listed as not acceptable for carriage in passenger aircraft. It is essential that all persons engaged in shipping or accepting air freight should be fully aware of the detailed provisions set forth in the IATA Restricted Articles Regulations, and therefore all concerned should possess a current edition of these Regulations, which are published annually.

9.5 Distribution of responsibilities and suggested areas of concern, by authority or agency

A. Distribution of responsibilities

Authority or agency	*Responsibility*
Health administration	Ensuring that airports in its territory have an effective system for the removal and safe disposal of cargo considered dangerous to health.
	Ensuring that as far as practicable containers are kept free of infectious material, vectors or rodents (Article 50 of the International Health Regulations).

Airport authority	Provision of holding rooms for animals in transit, where the amount of traffic warrants such provision.

B. Suggested areas of concern

Authority or agency	*Area of concern*
Airlines	Maintaining the cleanliness of any animal holding rooms (in their ownership) or animal transport vehicles.
	Maintaining the cleanliness of containers used for the carriage of food and ensuring their freedom from contamination.
	Providing protection for staff who handle animals.
	Ensuring shippers' compliance with IATA Restricted Articles Regulations or national regulations, as appropriate.

10. VECTOR CONTROL

10.1 General

Passengers and crews must be protected against diseases spread by insects. Given the speed of present-day aircraft, it would be possible to fly several times round the world within the incubation period of these diseases. This emphasizes the need for the rapid detection and destruction of the responsible vectors. In addition to the risk to air travellers, there is the danger of potentially harmful insects and rodents being carried from one area to another.

The control of mosquitos, flies, other insects of health significance, and rodents is of particular importance at many airports. The diseases that they can transmit include yellow fever, typhus, relapsing fever, plague, malaria, dengue, encephalitis, filariasis, sandfly fever, leishmaniasis, and trypanosomiasis. Detailed control methods for the vectors concerned will be found in the seventeenth report of the WHO Expert Committee on Insecticides (*43*).

Aedes and some other mosquitos can carry the virus of yellow fever (a disease that has broken out in great epidemics in the past) from one person to another. When the disease occurs in epidemic proportions, business and commerce may come to a halt until it is brought under control. The International Health Regulations indicate specific measures that should be applied at international ports and airports in relation to the control of yellow fever.

Mosquitos of the genus *Anopheles* can transmit malaria from one person to another. Each year millions of people die from the disease, and many more are incapacitated; there are perhaps 100 times as many cases as there are deaths. Since each case produces a certain physical disability, the economic losses due to malaria are very great. Thus, every effort should be made to prevent the introduction of malaria-carrying mosquitos into receptive areas by commercial aircraft.

Flies, which often breed in filth, manure, offal and decaying organic matter, are frequently responsible for the contamination of food supplies. They may carry the germs of filthborne diseases and infect prepared food, in which the germs may multiply greatly, particularly if the food stands at room temperature for several hours.

In addition to flies, insects such as ants, cockroaches and other "beetles" thrive on organic matter; they may contaminate and cause considerable damage to food supplies. The measures needed to keep these insects under control are the observance of scrupulous cleanliness

and the storage of food in proper containers, supplemented by the application of chemicals.

Rats often carry fleas, among them the plague vector *Xenopsylla cheopis*. While rats have rarely been found on aircraft, history shows that they follow the arteries of commerce, and as more and more goods are moved by air they are increasingly likely to become international air travellers. They do much damage, particularly in food storage premises. Rats, when hungry or thirsty, are capable of gnawing through aluminium and puncturing plastic tubing in a frantic search for food and water. Instances have been reported of their gnawing through wires on aircraft. There is good justification for going to some trouble and expense to keep them out of airports and aircraft.

Mosquito control, fly control and rodent control (*44*) should be community efforts. The work of a single property owner may be undone by the carelessness or lack of interest of his neighbour. Efforts should therefore be directed towards securing the interest of community officials and others in carrying out insect and rodent control programmes.

10.2 Vector control in airports

Mosquito control: general principles

Rooms used by crews and passengers in transit at international airports should be effectively mosquito-proofed in areas where mosquitos (and flies) are prevalent. Screening should contain at least 6 meshes per cm (16 meshes per inch). Care should be taken to screen all openings, including doors, windows, air ducts, floor drainage-holes at the base of walls, and any other apertures. Screen doors should open outwards, and screening should be protected from accidental damage by heavy-calibre wire netting or other effective means. Screens should be kept in good repair. If sleeping rooms are not screened, bed-nets should be provided and used during the mosquito season. Measures should be taken daily to destroy any mosquitos that might have gained entrance. A regular systematic search should be made for the presence of mosquitos in sleeping quarters, particularly in areas where yellow fever or malaria is prevalent.

Residual sprays containing an insecticide to which the local mosquitos are susceptible should be used on walls and ceilings, particularly in sleeping quarters. Spraying should be done at regular intervals, as specified in the recommendations contained in the seventeenth report of the WHO Expert Committee on Insecticides (*43*).

Protection against mosquitos is often attained more completely and satisfactorily by destroying their breeding places or killing the insects in their larval stages than by mosquito-proofing or by the use of residual insecticides. To accomplish this, the entire area within the mosquito flight-range of buildings used by crews and passengers should be brought under control by ditching, drainage, filling, and elimination of water containers, or by the application of larvicides.

Aedes *control*

The International Health Regulations describe the general measures to be taken for the control of the mosquito vectors of yellow fever and the protection of buildings. To keep the area within the perimeter of an airport free from *Aedes aegypti* and other vectors in their larval and adult stages, it is necessary to maintain active antimosquito measures within a protective area extending for a distance of at least 400 m (¼ mile) outside the perimeter.

To control mosquito breeding—particularly the breeding of *Aedes aegypti*—within a distance of 400 m (¼ mile) of the airport perimeter, a careful examination should be made of the whole terrain.

The location of all permanent water bodies in which mosquitos may breed should be marked on a map. As far as possible such water bodies should be eliminated by filling or drainage. Those that cannot be eliminated should be treated with suitable larvicides at monthly intervals. The advice of a competent entomologist should be sought in selecting larvicidal measures.

Since some mosquitos that carry yellow fever breed in receptacles containing water, such as cisterns, rain barrels, discarded tins, old tires, flower vases and water storage tanks, any larviciding programme must take such water collections into account. Water cisterns and tanks should be carefully enclosed or screened, and the air vents should not be overlooked. Discarded receptacles capable of holding water should either be destroyed or be otherwise disposed of. Tins should be perforated or flattened before they are discarded. Refuse dumps should be treated regularly with larvicides. Here, particularly, constant vigilance should be observed.

A regular search should be carried out at monthly intervals by experienced inspectors to check that no adult or larval *Aedes* or other yellow fever vectors are present either inside the airport perimeter or within a zone 400 m (¼ mile) outside the perimeter. The search procedure should be established by the airport health officer or, if no such officer is available, by some other qualified health official.

Anopheles *control*

To prevent the transmission of malaria it may not be necessary to control *Anopheles* mosquitos completely. The periodic spraying of buildings, particularly the interior of sleeping quarters, is highly desirable. The techniques and materials should be carefully chosen in consultation with an experienced malariologist or entomologist to suit the local conditions. From a practical standpoint and in the interests of the comfort, convenience and safety of air crews and passengers, airports and transit areas should be mosquito-proofed.

Fly control

The best method for controlling flies (*43*) at an international airport is by securing communitywide participation in measures designed to eliminate the natural breeding places of flies, combined with a scrupulous cleanliness at the airport itself. It may be necessary to supplement these measures by screening and by spraying inside buildings, using either "knockdown" sprays, such as those containing pyrethrins combined with other toxic agents, which have an immediate effect, or residual sprays containing DDT, HCH, or other suitable insecticides having a residual effect. If residual sprays are applied to interior surfaces with which the flies later come into contact, the formula chosen should be one that does not cause damage. For example, while it might be possible to apply oil solutions, water suspensions, or oil-and-water emulsions to rough surfaces, it would be advisable to use solutions or emulsions made with odourless white kerosene on high-grade interior finishes. Long-continued use of such residual insecticides as DDT and HCH on an extensive scale is likely to produce a resistant strain of flies. In such circumstances good control can often be maintained by using suspended cords treated with organophosphorus compounds.

An estimation of the number of flies present is useful, first, in determining whether fly control measures are effective and, secondly, in locating areas where fly breeding is most extensive. Two common techniques for counting flies are the use of the Scudder grille and fly-trapping. Even such a simple procedure as counting the number of flies on a kitchen-window frame and keeping a careful record of the results can yield useful data. Grilles or traps can be used in the area surrounding an airport to locate points of heavy fly infestation, thus providing an indication of the places where fly control is most needed.

Almost any moist, warm organic matter can supply enough food to be a breeding place for flies. Examples are kitchen slops, decaying fruit, open septic tanks, human or animal excrement, or even lawn clippings. In most instances flies tend to remain within 200-300 m (about 600-1000 ft) of their breeding places. It is important to dispose of organic wastes, including liquid wastes containing organic matter, in such a way as to eliminate any possibility of fly-breeding.

Rodent control: general principles

Rat control techniques include the following measures: elimination of rat harbourage—that is, places where rats can establish nests or find concealment; proper storage of foodstuffs, so that they are denied access to any sort of nourishment; rat-proofing of structures to keep them out of buildings altogether; use of poisons to reduce rat populations; and fumigation to destroy any rats in aircraft or in certain types of buildings. The control of rats is not easy, and it is advisable to use the services of experts in devising and maintaining a rat control programme. Information on the techniques in common use is summarized in the report of a WHO Scientific Group (*45*) (see also reference *44*).

The first step in successful rat control is general cleanliness and good housekeeping. All refuse, debris and similar wastes should be removed frequently, especially from out-of-the-way corners and secluded places. All materials—food or otherwise—should be stored above ground- or floor-level, stacked in orderly piles or in bins. Any search for rat harbourage should be thorough. (In at least one case it was found that rats were nesting in triangular pylons supporting runway markers.) With clean, rat-proof structures the job of control with traps and poisons can be narrowed down to the killing of rats which occasionally find entrance through open doors or which are carried in with supplies.

A live rat seen in the daytime usually indicates the existence of about 15-20 rats in the immediate vicinity. Signs of rat infestation include droppings, freshly gnawed surfaces, and fresh tracks in dust, flour or other powdery materials.

In the absence of a poisoning operation, the presence of an unusual number of dead rats may be an early indication of the existence of plague and should be reported promptly to the health authorities. If plague is suspected, or is present, special precautions should be taken to kill the rat fleas. Fleas will leave a dead rat as soon as the body cools, and may transmit plague to humans. DDT or some other suitable insecticide powder should be used to dust all suspected areas so as to destroy all rat fleas. The special measures that must be taken with regard to aircraft, airports and local areas in the case of plague are described in the International Health Regulations.

Rat-proofing

Rat-proofing includes not only blocking off and eliminating openings through which rats can enter buildings, but also the elimination of harbourages and the keeping of food and garbage in rat-proof containers.

The following materials are classed as rat-proof:

(1) concrete at least 8 cm (about 3 in) thick, with metal lath;
(2) bricks, stone masonry or concrete blocks;
(3) 24-gauge (United States or British standard) galvanized iron;
(4) 16-gauge galvanized woven wire of not over 1-cm ($\frac{3}{8}$-inch) mesh.

Horizontal openings, such as the spaces under doors, should not be more than 1 cm ($\frac{3}{8}$-inch) wide. All doors (both outside and inside) and windows should be tight-fitting and rat-proof. Metal flashing on doors should extend under the doors and up both sides for at least 7.5 cm (3 in). Openings around pipes and wires should be closed with masonry. Where walls are made of wood such openings can be closed with metal, overlapping the wood 7.5 cm (3 in) all round. If black rats or roof rats (*Rattus rattus*) are present, skylights and other openings in the upper parts of the building should be rat-proofed.

Footings and foundation walls should be in good repair, crevices and other openings being filled with concrete and worked to a smooth finish. Metal lath should be used in concrete patches to keep rats from re-

opening their runways. Buildings with floors laid directly on the ground may be protected by constructing a curtain wall extending 60 cm (24 in) below ground and 30 cm (12 in) above ground, with a horizontal flange 20 cm (8 in) wide extending outwards from the building at the bottom of the wall footing. The wall should be continuous around the entire building.

Buildings on posts, without basements and without continuous masonry foundations, are difficult to rat-proof. Rats can easily gnaw through inside joists. Wood skirting on the building does not provide good protection. If the supporting sills are more than 60 cm (24 in) above the ground (or above piles of material on the ground) metal flashing or rat-guards can be constructed at the tops of the supporting posts. If the clearance from the ground is less than 60 cm (24 in) a metal shield is no barrier, since most rats can jump that distance.

To rat-proof ventilator and exhaust fan openings that cannot be sealed, a box screen can be built, using perforated metal or wire mesh. Chutes and conveyors that cannot be closed during the period of use should be fitted with rat-proof doors, which should be kept closed during inactive periods.

No amount of work in sealing access openings will successfully keep rats out unless doors are kept tightly closed at night and unless frequent inspection is made of all possible rat entries. Night personnel should close doors immediately after passing through. Rats have been known to follow directly behind watchmen. They become bolder as they get hungrier. A strong light shining down on the threshold may discourage rats from running through an open door.

Spaces under loading docks and platforms should be kept clear of rubbish and other rat harbourage. If possible, such spaces should be filled in. Outdoor accumulations of refuse should be removed as promptly as possible. Lumber and other stored material should be stacked compactly on supports at least 30 cm (12 in) off the ground and the same distance away from any building wall. Food or garbage stored out of doors should be kept in closed containers made of rat-proof material.

Rats can jump as high as 60 cm (24 in), burrow the same distance vertically into the earth, climb smooth pipes with a diameter of up to 7.5 cm (3 in), and travel along horizontal electric wires. The black rat or roof rat (*Rattus rattus*) can do all these things easily; the brown or Norway rat (*Rattus norvegicus*) is less agile.

10.3 Vector control in aircraft

Disinsecting: general principles

The International Health Regulations require disinsecting and deratting to be carried out in such a manner that passengers do not undergo any discomfort or suffer any injury to health, that no damage is done

to the structure or operating equipment of the aircraft, and that all risk of fire is avoided (see also reference *8*, para. 2.27 and 2.28).

The problem of vector control in aircraft—as opposed to such control in ground installations—is compounded by the fact that the methods and materials employed must not endanger the safety of the aircraft or be noxious in any way to passengers and crew.

Every aircraft should be disinsected, using methods approved by WHO, when leaving an airport situated in an area infected with yellow fever, or where the mosquito vectors of this disease exist, and bound for an area where these vectors have been eradicated. The same requirement applies to aircraft leaving an airport in an area where the transmission of malaria or other mosquitoborne diseases is occurring, or where insecticide-resistant mosquito vectors of these diseases are present (see also reference *8*, para. 2.20-2.26). The International Health Regulations permit the health authority at the airport of arrival to disinsect the aircraft again if there is evidence that the work has not been carried out satisfactorily.

In addition, many countries have imposed their own laws and regulations upon airlines, and require aircraft to be disinsected for reasons other than those stated in the International Health Regulations. One of these reasons may be to protect their territories against the importation of agricultural pests by aircraft. They may wish to use an insecticide other than one approved by WHO. In this eventuality, three points must be observed:

(1) Disinsecting must only take place when all crew and passengers have disembarked.

(2) There must be an assurance from the authorities using the insecticide that it will have no harmful residual effects on the aircraft structure.

(3) After disinsecting, an adequate amount of time must be allowed to ventilate the aircraft before boarding begins.

Annex VI of the International Health Regulations describes in detail recommendations on the disinsecting of aircraft, specifications for aerosols and approved insecticide formulations. In this connexion, attention is drawn to the following two new formulations mentioned therein:

Resmethrin or bioresmethrin (techn.) without added solvents	2%
Propellant: Freon 11 + Freon 12 (1:1)	98%

"Blocks-away" disinsecting

Of the two systems at present in use, "blocks-away" disinsecting and disinsecting on arrival, the former is strongly recommended to all airlines (provided it is carried out in accordance with the specified procedure), since if there are disease vectors on the aircraft it is logical to kill them at the start of the flight, before they can be a nuisance or health hazard to crew and passengers. For this type of disinsecting, all airlines

should issue instructions to cabin crew and ground staff, which must be conscientiously obeyed. The following is an example of suitable instructions for a wide-bodied aircraft.

After embarkation of passengers, during the interval between closing the aircraft doors and actual take-off, all parts of the cabin interior, including toilets, galleys and the lounge must be sprayed. The flight deck should be sprayed by the ground personnel, before the embarkation of the technical crew.

"Blocks-away" disinsecting must not be confused with in-flight disinsecting and must always be correctly designated on the Health Part of the Aircraft General Declaration. After all passengers have boarded, an announcement should be made that the aircraft is about to be disinsected to comply with the International Health Regulations. Immediately the aircraft starts to taxi, spraying should commence. Two 140-g (5-oz) single-use aerosol dispensers are sufficient for adequate treatment of the interior. The procedure should be carried out by two stewardesses or other cabin staff, starting at the rear of the cabin, on the left and right side respectively, as follows:

Stewardess I	*Stewardess II*
Rear toilets left	Rear toilets right
Zone 'E' left	Zone 'E' right
Zone 'D' left	Zone 'D' right
Centre toilets left	Centre toilets right
Zone 'C' left	Zone 'C' right
Zone 'B' left	Zone 'B' right
Lounge	Forward toilets left and right
Lounge toilets	Zone 'A' left and right

The duration of each aerosol discharge is approximately 140 seconds. The procedure should be carried out at a steady walking pace to ensure that the entire aircraft interior is sprayed during this time. Spraying of the cabin should be done upwards and away from the passengers. Any exposed food in the galleys must be covered.

Stations requiring "blocks-away" disinsecting should be responsible for supplying four of the aerosol dispensers, two for use and two spares in case of malfunction. (If the 140-g size is not available, seven 40-g ($\frac{1}{2}$-oz) aerosol dispensers—such as are employed for disinsecting smaller aircraft (e.g., Boeing 707)—should be used to achieve the same standard of disinsecting.) The dispensers are marked with a serial number. Only the numbers of the used dispensers are entered on the Health Part of the Aircraft General Declaration.

The empty aerosol dispensers must be retained and, upon the aircraft's arrival at its destination, must be produced along with the General Declaration as evidence of disinsecting. If, after the disinsecting procedure has been completed, the flight is aborted and the doors are opened when the aircraft returns to the ramp, the procedure must be repeated before the next take-off.

The flight deck, cargo compartments (holds 1, 2 and 3), cargo containers and wheel wells should be disinsected by ground staff. A multi-use standard reference aerosol containing a WHO-approved formulation insecticide should be used. An appropriate entry should be made on the Aircraft General Declaration (*8*, app. I) giving details of place, date, time and methods.

Disinsecting should be performed by staff conversant with requirements, and broadly follow a standard arrangement, namely:

(1) *Flight deck.* Disinsecting should be carried out before expected occupancy by the technical crew. If the technical crew remains on board during a stop-over, the captain should be asked whether he and his crew wish to leave the flight deck while disinsecting (a 2-minute operation) is performed. Duration of aerosol discharge: *5 seconds.*

(2) *Wheel wells.* Duration of aerosol discharge: *6 seconds.* (N.B. The nose wheel well is between 2 m (7 ft) and 2.7 m (9 ft) from the ground, depending on the weight of the load aboard. The main wheel well is a little less than 2 m (6.5 ft) from the ground.)

(3) *The forward compartment (No. 1 hold).* All containers, full or empty, should be removed from the hold. Palletized load may be left on board if convenient. Duration of aerosol discharge: *32 seconds.*

(4) *The aft compartment (No. 2 hold).* All containers, full or empty, should be removed from the hold. Palletized load may be left on board if convenient. Duration of aerosol discharge: *28 seconds.*

(5) *The bulk compartment (No. 3 hold).* Load is left on board. Duration of aerosol discharge: *10 seconds.*

(6) *Containers (No. 1 and No. 2 holds).* Each container, full or empty, must be disinsected before being loaded into the airceaft compartment. Disinsecting should take place as each container is moved on to the elevator prior to its being offered up to the hatch entrance. The aerosol discharge (duration: *5 seconds*) must be directed inside the container by opening the top corner of the canvas cover or through the special opening provided.

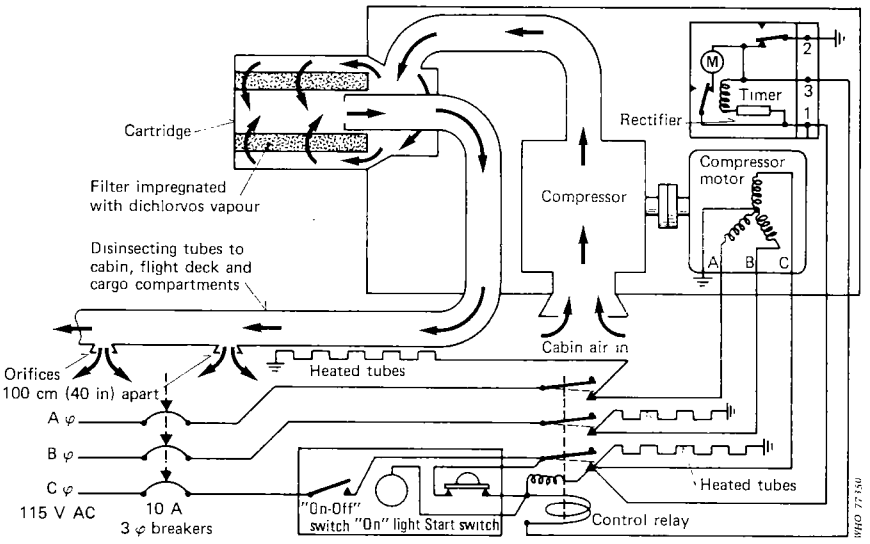
(7) *Hatch doors.* Hatch doors should be closed as soon as possible after final loading.

In-flight vapour disinsecting

In the International Health Regulations (see Article 90), reference is made to a third system of disinsecting—namely, vapour disinsecting carried out in flight. The majority of WHO Member States have accepted this system as valid, but so far it has not been put into operational use. An application involving the use of dichlorvos vapour[a] may in the

[a] The Twenty-seventh World Health Assembly approved the eighteenth report of the Committee on International Surveillance of Communicable Diseases, subject to the comments of an *ad hoc* Working Group (WHA27.45). This Working Group interpreted the recommendations of the Committee on International Surveillance of Communicable Diseases relating to dichlorvos as meaning that the Member States of the Organization should immediately accept as valid disinsecting by the system (*46*).

FIG. 35. AIRCRAFT VAPOUR DISINSECTING SYSTEM



near future become the in-flight approved method, at least for new or existing wide-bodied aircraft.

The principle of vapour disinsecting is shown schematically in Fig. 35. A small air compressor forces warmed cabin air through a cartridge containing an absorbent filter charged with a small amount of dichlorvos. The warm air stream from the compressor vaporizes the insecticide and carries it to areas of the aircraft through a tubing system.

The tubes extend the length of the cabin interior, into the cargo holds and the flight deck. The dichlorvos vapour is expelled from the tubing through very small orifices located about 1 m (3 ft) apart, and enters all spaces that might harbour insects. The vapour is discharged for 30 minutes. With a properly functioning system the concentration required to kill insects is obtained within 10 minutes, is maintained for 20 minutes, and within 4 minutes after completion of disinsecting—when the system stops automatically—, all dichlorvos disappears from the cabin air. The dosage rate is 0.15-0.25 mg per litre of air.

The system is semi-automatic. A member of the crew inserts the cartridge, which activates an electric contact. The cartridge can be used only once and an indicator changes colour when the dichlorvos has been dispensed. Production of the discharged cartridge and a recording in the Health Part of the Aircraft General Declaration are proof that disinsecting has been carried out. It is therefore vital that the colour change indicator should be reliable.

With this system, it is claimed, the discharge of vapour into the cargo hold will be sufficient to disinsect the interior of containers. If this

is not the case, however, other methods, such as fitting a dichlorvos vapour strip into each container, will be required.

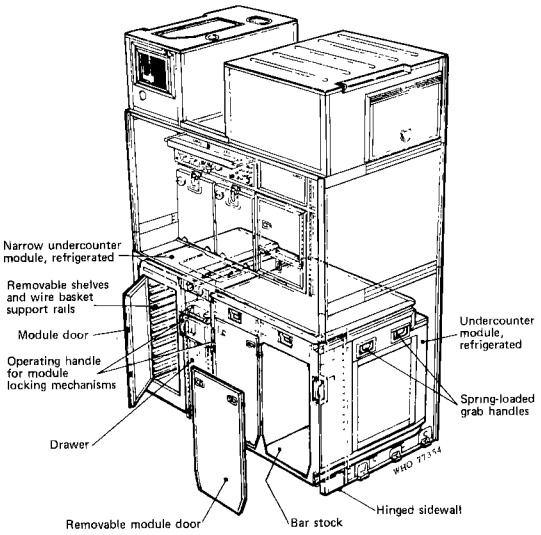
Cockroach disinfestation

An insect that is not mentioned in the International Health Regulations because it is not regarded as a disease transmitter—although it may contaminate food and create a regular harassment for airlines—is the cockroach.

Cockroaches gain access to aircraft in many ways. They may be present in cargo (especially fruit and vegetables), in food uplifted from countries where the insect is prolific, and even in passengers' baggage. As long as there are cockroaches in the vicinity it will be impossible to prevent their entry into aircraft. Regular treatment and preventive measures are essential to eliminate breeding and major infestation on aircraft. Aircraft galleys are ideal breeding sites, being warm and dark, with many inaccessible areas.

A further problem has arisen with the introduction of wide-bodied aircraft, which have catering modules. The modules are constructed with an outer and inner skin for insulation reasons, and the space between is ideal for insect harbourage. The modules are offloaded at transit airports, as well as at the base airport, for servicing at flight catering premises. If there are cockroaches in these premises they can easily penetrate the modules and be taken back to the aircraft. Fig. 36 shows how the modules fit into the galley units; potential breeding areas at the back of the module housing are not difficult to envisage.

FIG. 36. HOW MOBILE MODULES FIT INTO A GALLEY UNIT



Both modules and aircraft should be disinfested on a routine basis, instead of waiting until a major problem arises, which would necessitate a full-scale fumigation using either hydrocyanic acid (HCN) or methyl bromide. One recommended method is to spray the areas inside the aircraft interior most likely to harbour cockroaches, using an insecticide to which the insect is not resistant. The insecticide must also have a long-term residual effect so that disinfestation at 3-montly intervals will be sufficient. It must be fully approved for use, being nontoxic to humans and animals and nondetrimental to aircraft structures. A recommended insecticide is bendiocarb (chemical name: 2,2-dimethyl-1,3-benzodioxol-4-ol-methylcarbamate). It has the advantage over some other insecticides that it mixes readily with water and is odourless, nonstaining and noncorrosive; moreover, it is effective against insects resistant to organochlorine and organophosphorus preparations. It will persist for 3-6 months in a concentration of 0.6%.

To ensure maximum efficiency it is necessary to issue specific instructions for the correct application:

(1) Only staff who have received basic training should carry out the disinfestation.

(2) The insecticide must be applied in the most critical locations—e.g., galley and bar areas—but never on surfaces likely to be in direct contact with food.

(3) The solution should be applied by a low-pressure hand-operated sprayer emitting a coarse spray.

(4) Spraying should be carried out as a routine measure at intervals not exceeding 3 months.

(5) Records should be kept to ensure that the above schedule is adhered to in all aircraft.

(6) The manufacturers' instructions should be followed for mixing the solution, and the normal commonsense precautions followed by the operative, as recommended by the manufacturer.

(7) The spray should be directed into corners, cracks, crevices, cupboards and housing of all galleys and bars, but not into general air spaces.

(8) After all potential insect harbourages have been sprayed, a band of spray should be applied on the floor around the whole galley and bar area to provide a barrier for insects attempting to cross into passenger areas.

Each time a galley module is taken from the aircraft it should be washed, after the removal of left-over food, with hot water and an approved detergent, and then sprayed with a residual insecticide at intervals of 6 weeks. The spray should be directed into obvious insect harbourages such as handle housings, wheel housings and the space between the inner and outer skin, but not on to any surface with which food will be in direct contact. To prevent over-treatment a dated label should be affixed to the module after it has been sprayed.

Fumigation against rodents

The presence of rodents, particularly rats, on aircraft may constitute a health hazard or a danger to the functioning of the aircraft.

If an aircraft arrives at an airport having flown from a plague-infected area, the health authority may require it to be fumigated, because any rats on board might be carrying fleas capable of transmitting plague. If an aircraft has flown from a noninfected area, but a rodent has been reported on board, the airlines should fumigate in the interests of safety, because one of the greatest dangers from rats on aircraft is the possibility that they will gnaw through and sever control cables or wires to vital instruments. Apart from these two eventualities, the presence of rodents on board would be quite unacceptable to passengers.

Various fumigation agents are of recognized effectiveness, but the one most commonly employed is HCN. Because this is highly toxic, not only must it be handled by skilled and fully qualified operatives, but the airline must issue and enforce regulations to safeguard its own staff, as well as the general public.

A standard procedure should include the following operations:

(1) One person should be delegated with the responsibility of ensuring that all fuselage openings have been sealed, and of personally checking every accessible part of the aircraft to see that nobody is on board, before allowing the contractor to commence fumigation.

(2) He must then ensure that no other person approaches the aircraft until the contractor has produced a signed clearance certificate declaring the aircraft free from the fumigating agent.

(3) Warning signs must be placed in conspicuous positions around the aircraft.

(4) The contractor should then fumigate using 1 g HCN/m^3 of space (1 oz/1000 ft^3).

(5) After fumigation, the aircraft must be fully ventilated, and during this time all entrances should be guarded to prevent unauthorized entry. In the interests of safety and quicker ventilation, the aircraft should be fumigated in the open air.

(6) The contractor must then check by approved methods that the aircraft is free from residual fumigant and issue a certificate accordingly. The certificate must be signed in the presence of a responsible person who is authorized to allow entry into the aircraft.

(7) The contractor must search the aircraft for dead rodents. If any are found they must be picked up with tongs, placed in a sealed plastic bag and delivered to an approved pathological laboratory, which will search for the presence of plague fleas.

10.4 Distribution of responsibilities, by authority or agency

Authority or agency	*Responsibility*
Health administration	Ensuring that there are facilities for the control of vectors and rodents at airports (Article 19.2);[a] and that the containers used in international air traffic are kept free of vectors and rodents (Article 50).
	Keeping itself informed by the systematic collection and regular examination of rodents of the conditions at airports, especially if infected or suspected of being infected by rodent plague (Article 53.1).
	Keeping the area within the airport perimeter free from the mosquito vectors of yellow fever and malaria; maintaining active antimosquito measures within a 400-m ($\frac{1}{4}$-mile) zone outside the perimeter; keeping mosquito-proof any passenger buildings in direct transit areas at airports in or adjacent to an area where the above vectors exist.
	Furnishing WHO with annual data on the extent to which the airports in its territory are kept free from vectors of epidemiological significance.
Health authority	Preventing the introduction of disease vectors into aircraft.
	Disinsecting plague-infected aircraft on arrival at airport (Article 58).
	Taking all practicable measures to keep airports free of rodents and to extend ratproofing of airport installations (Article 16).
	Destruction of rodents on aircraft arriving from a plague-infected area (Article 55).

[a] The article numbers cited refer to the International Health Regulations.

Airport authority	Taking all the necessary measures to exterminate flies, cockroaches, etc., from the general airport area, including passenger and terminal buildings.
Airlines	"Blocks-away" or in-flight disinsecting of aircraft (Article 90).

ANNEXES

Annex 1

IMPORTANT CHARACTERISTICS OF SOME SELECTED FOODBORNE DISEASES [a]

Disease	Etiological agents	Incubation period and signs and symptoms	Source, reservoir, and epidemiology	Foods involved	Specimens and laboratory tests	Control measures
Cholera	*Vibrio cholerae* and *V. cholerae* biotype El Tor	2-3 days. Sudden onset, vomiting, profuse watery diarrhoea containing mucus (rice-water stools), abdominal pain, rapid dehydration, and collapse	Faeces and vomitus of infected persons and faeces of carriers. Main mode of transmission: contaminated water	Raw vegetables and shellfish; foods handled and eaten without further treatment	Faeces, suspect foods and water	Dispose of sewage in a sanitary manner; protect and treat water; practise personal hygiene; cook foods thoroughly; isolate cases. Immunization provides only incomplete protection.
Salmonellosis	*Salmonella:* over 1600 known serotypes, but only about 50 occur commonly	5–72 hours; commonly 12–36 hours. Diarrhoea, abdominal pain, chills, fever, vomiting, dehydration, prostration, anorexia, headache, malaise. Of several days' duration	Faeces of infected domestic or wild animals and human beings; carrier state usually lasts from a few days to a few weeks, but sometimes for months	Meat, poultry, eggs, and their products. Other incriminated foods include coconut, yeast, cottonseed protein, smoked fish, dried milk, chocolate confectionary	Faeces, suspect foods, environmental swabs	Chill foods rapidly in small quantites; cook foods thoroughly; pasteurize egg products and milk; avoid cross-contamination from raw to cooked foods; sanitize equipment.

[a] Reproduced, in modified form, from Bryan (*15*) by permission of the United States Department of Health, Education, and Welfare, Center for Disease Control. To simplify and extend the usefulness of this summary, only those diseases in which food is a primary vehicle of transmission are included; many others that have a more complicated epidemiology, such as taeniasis, ascariasis, and trichinosis, are omitted.

Annex 1 *(continued)*

Disease	Etiological agents	Incubation period and signs and symptoms	Source, reservoir, and epidemiology	Foods involved	Specimens and laboratory tests	Control measures
Salmonellosis *(continued)*						Heat-treat animal feed and feed ingredients; process meat and poultry in a sanitary manner; maintain farm hygiene; practise personal hygiene; protect all food from human, bird, insect, and rodent excreta.
Typhoid fever (enteric fever)	*Salmonella typhi:* similar to other salmonellae but adapted to human host	7–28 days. Blood stream infection; headache, high continued fever, cough, anorexia, nausea, vomiting, constipation, slow pulse rate, tender and distended abdomen, enlarged spleen, rose spots on chest and trunk, delirium, dulled sensorium, diarrhoea, bleeding from bowel. Relapses occur. Slow convalescence (of 1–8 weeks)	Faeces and urine of infected persons. Carriers are important in transmission; some are long-term carriers. Water is also involved in transmission	High protein foods; raw salads, milk, shellfish. Foods that have been handled, and then eaten without further heat treatment	Faeces, urine, bile, gallstones, blood (during the early course of illness), bone marrow suspect food, sewer swabs	Immunization; practise personal hygiene; supervise carriers: prevent carriers from handling food; protect and treat water; dispose of sewage in a sanitary manner; control flies; practise food hygiene, as described for salmonellosis control.

Annex 1 *(continued)*

Disease	Etiological agents	Incubation period and signs and symptoms	Source, reservoir, and epidemiology	Foods involved	Specimens and laboratory tests	Control measures
Paratyphoid fever (enteric fever)	*Salmonella paratyphi* A, B, and C; similar to other salmonellae but more or less adapted to the human host	1–15 days. Same as typhoid fever but milder and of shorter duration (1–3 weeks)	Faeces and urine of infected persons; carriers are important in transmission	Milk, shellfish, raw salads, eggs	Faeces, urine, blood, suspect foods	Same as for typhoid fever. Vaccine is of questionable value in conferring immunity
Shigellosis (bacillary dysentery)	*Shigella sonnei* *S. flexneri* *S. dysenteriae* *S. boydii*	7–48 hours or longer, usually 24–28 hours. Extremely variable, mild to severe symptoms; abdominal cramps, diarrhoea, watery stools (frequently containing blood, mucus, or pus), tenesmus, headache, lassitude, prostration, nausea, dehydration	Faeces of infected persons. Main mode of transmission: person-to-person infection; also waterborne and foodborne infection	Moist, mixed foods: milk, beans, potato, tuna fish, shrimp, turkey, and macaroni salads; apple cider; and poi	Faeces and suspect foods	Practise personal hygiene; chill foods rapidly in small quantities; prepare food in a sanitary manner; cook foods thoroughly; protect and treat water; dispose of sewage in a sanitary manner; control flies
Clostridium perfringens (*C. welchii*) foodborne illness	Enterotoxin type A and type C	Type A: 8-24 hours, median 12 hours. Acute abdominal pain, diarrhoea; occasional	Faeces of infected persons and animals. Soil, dust, sewage, Both raw and cooked foods are frequently	Cooked meat and poultry that has stayed at room temperature for several hours or cooled slowly;	Faeces, suspect foods, environmental swabs	Chill foods rapidly in small quantities; practise personal hygiene; cure meats adequately; dispose of sewage

Annex 1 *(continued)*

Disease	Etiological agents	Incubation period and signs and symptoms	Source, reservoir, and epidemiology	Foods involved	Specimens and laboratory tests	Control measures
Clostridium perfringens (C. welchii) foodborne illness *(continued)*		dehydration and prostration; nausea, vomiting, fever and chills are rare. Short duration (of 1 day or less). Type A is rarely fatal in otherwise healthy persons. Type C (causing enteritis necroticans): 6 hours to 6 days, usually 24 hours. Diarrhaea, prolonged abdominal pain, gangrene of small intestine, shock, toxaemia. Case fatality rate: 40%.	contaminated with *C. perfringens*	gravy, stews and meat pies; sauces		in a sanitary manner. Thorough cooking will destroy vegetative cells but not heat-resistant spores. Reheat left-over foods to 75 °C (167 °F)
Staphylococcal intoxication	Enterotoxin A, B, C, D, E, or F of *Staphylococcus aureus* (pigmented and nonpigmented varieties)	1–7 hours, usually 2–4 hours. Sudden onset of nausea, salivation, vomiting, retching, diarrhoea, abdominal cramps, dehydration,	Nose and throat discharges; hands and skin; infected lesions, boils, pimples, faeces. The anterior nares of man are the primary reservoir.	Meat and fish products, poultry, cream-filled pastry, milk, cheese, sauces, puddings, dressings, high-protein left-over foods	Suspect foods, vomitus and faeces, nasal swabs, pus from infected sores	Chill foods rapidly in small quantities; practise personal hygiene; exclude persons afflicted with colds, diarrhoea or infected cuts from

Annex 1 *(continued)*

Disease	Etiological agents	Incubation period and signs and symptoms	Source, reservoir, and epidemiology	Foods involved	Specimens and laboratory tests	Control measures
Staphylococcal intoxication *(continued)*		sweating, weakness, prostration. Fever usually does not occur. Short duration, of not more than a day or two	Mastitic udders of cows and ewes. Arthritic and bruised tissue of poultry. Foods are usually contaminated after cooking			catering work; sanitize equipment. Thorough cooking, reheating and pasteurization destroy the organism but not the toxin
Vibrio parahaemolyticus infection	*Vibrio parahaemolyticus*. Found in coastal waters	2–28 hours, usually 12 hours. Abdominal pains, diarrhoea (watery stools containing blood and mucus), usually nausea and vomiting, mild fever, chills, headache, prostration. Recovery within 2–5 days	Sea water and marine life	Raw foods of marine origin; saltwater fish, shellfish, and fish products	Faeces and suspect foods	Cook foods thoroughly; chill foods rapidly in small quantities; prevent cross-contamination from saltwater fish; sanitize equipment; avoid uncooked saltwater fish
Botulism	Toxin A, B, E, or F of *Clostridium botulinum*. Toxins C and D usually cause botulism in animals	2 hours to 6 days, usually 12–36 hours. Nausea, vomiting, and abdominal pain may appear early. Headache, dizziness, lassitude, double vision, loss	Soil, mud, water, and intestinal tract of animals	Improperly canned or bottled low-acid foods (green beans, maize, beets, asparagus, chili peppers, mushrooms, spinach, figs, olives, tuna fish).	Suspect foods. Blood serum, stomach and intestinal contents; autopsy tissue (liver, small intestine)	Heat cans at a high temperature under pressure for a sufficient time; cook home bottled and canned foods thoroughly (boil and stir for 15 minutes); acidify;

Annex 1 *(continued)*

Disease	Etiological agents	Incubation period and signs and symptoms	Source, reservoir, and epidemiology	Foods involved	Specimens and laboratory tests	Control measures
Botulism *(continued)*		of reflex to light, difficulties in swallowing, dry mouth, weakness, constipation, respiratory paralysis. Partial paralysis may persist for 6–8 months. Sensorium is usually clear. Case fatality rate: 50–65%. Fatal in 3–10 days		Smoked fish. Fermented foods (seal flippers, salmon eggs). Foods stored in oil or vacuum packed also involved		keep foods refrigerated; cure in sufficient quantities of salt
Bacillus cereus food infection	*Bacillus cereus*	8–16 hours. Nausea, abdominal cramps, watery diarrhoea, some vomiting. Short duration (1 day or less). (Shorter incubation periods of 1½ days to 5 hours, with nausea and vomiting predominating, also occur. Similar to staphylococcal intoxication)	Soil and dust	Custards, cereal products, puddings, sauces, and meat loaf	Faeces and suspect foods. Selective isolation and identification	Chill foods rapidly in small quantities; practise personal hygiene; process and prepare food in a sanitary manner; reheat left-over food to 75 °C (167 °F)

Annex 1 *(continued)*

Disease	Etiological agents	Incubation period and signs and symptoms	Source, reservoir, and epidemiology	Foods involved	Specimens and laboratory tests	Control measures
Giardiasis	*Giardia lamblia*	Variable (1–6 weeks). Diarrhoea, mucous (fatty) stools, abdominal pain and distension, nausea, weakness, belching, vomiting, dehydration, weight loss. Blocks absorption of fats. Frequently no symptoms are produced	Cyst in human faeces. Common in warm climates and in children. Main mode of transmission: personal contact	Raw foods	Faeces, duodenal drainage. Microscopy	Practise personal hygiene; cook foods thoroughly; dispose of sewage in a sanitary manner
Amoebiasis (amoebic dysentery)	*Entamoeba histolytica*	5 days to several months, commonly 3–4 weeks. Variable symptoms, including abdominal discomfort and distention, diarrhoea, constipation, blood and mucus may be observed in stools, headache, drowsiness, ulcers.	Human faeces containing cysts. Main mode of transmission: personal contact. More common in tropics and areas where standards of hygiene are low	Raw vegetables and fruits	Faeces, lesion exudate, material aspirated from ulcers. Microscopy (vegetative and cyst stages), serology	Practise personal hygiene (food handlers); cook foods thoroughly; dispose of sewage in a sanitary manner; protect and treat water; control flies; avoid using human excreta (nightsoil) as fertilizer

Annex 1 *(concluded)*

Disease	Etiological agents	Incubation period and signs and symptoms	Source, reservoir, and epidemiology	Foods involved	Specimens and laboratory tests	Control measures
Amoebiasis (amoebic dysentery) *(continued)*		May spread to bloodstream causing organ infections and abscesses of liver, lung, or brain. Most infections are asymptomatic				
Intestinal myiasis	Diptera: *Piophila casei* (cheese skipper), *Musca domestica* (common housefly), *Stomoxys calcitrans* (stable fly)	Vomiting, diarrhoea, abdominal pain, convulsions	Flies; the larvae of most flies do not feed or continue development in the alimentary tract, thus causing only a pseudomyiasis	Meat, fruit, watercress, cheese, or other contaminated food or water that has been exposed to flies	Faeces. Microsopy (note that contamination of stools with fly eggs that may hatch into larvae can occur after defecation)	Practise good sanitation; protect foods from insect contamination; control flies
Viral hepatitis A	Hepatitis A virus	10–50 days; commonly about 30–35 days. Abrupt onset with fever, malaise, anorexia, nausea, and abdominal discomfort followed within a few days by jaundice	Person-to-person contact by faecal-oral route. Contaminated water is a common mode of transmission. The infectious agent may be found in faeces and urine	Sliced meats, raw or undercooked clams and oysters; milk, salads, and bakery products	Faeces, urine, and blood	Practise personal hygiene; dispose of sewage in a sanitary manner; cook foods thoroughly; prepare foods in a sanitary manner

DETAILS OF PERSONS WITH SUSPECTED FOOD POISONING SYMPTOMS

For Use on Aircraft

Passenger's name and address (block letters) Please state whether first class or economy class	Embarked	Disembarked	Symptoms and onset time(s) (GMT)	Aircraft food eaten and times of consumption						Other food eaten during previous 24 hours		
				Meal 3		Meal 2		Meal 1		Type	Place	Time (GMT)
				Food	Time (GMT)	Food	Time (GMT)	Food	Time (GMT)			

Flight No. .....
Sector .....

Signed .....
Rank .....
Date .....

Annex 3

SUSPECTED FOOD POISONING: QUESTIONNAIRE

For Use after Disembarkation

Name of passenger or crew member .....
Class of passenger .....
Contact address (if known) .....
.....
Flight No. and date .....
Port of embarkation/transit stops .....
.....
Food and drink consumed on aircraft .....
.....
.....
Food eaten during previous 24 hours and place of consumption ....
.....
.....
Symptoms of illness in order of occurrence .....
.....
.....
Time lapse between last food eaten and onset of illness .....
.....
.....
Medical attention received .....
.....
.....
Doctor's diagnosis (if applicable) .....
Results of any bacteriological examination of food or specimens ....
.....
Details recorded in log-book .....
.....
.....
.....
Any other helpful information .....
.....
.....
.....

Specimens of any suspect food to be retained whenever possible and sent packed in dry ice, or otherwise refrigerated, to the following address:

After answering as many of the above questions as possible please send this form to the above address.

Annex 4

GUIDELINES FOR A DETAILED INSPECTION CHECK-LIST

A. FLIGHT CATERING[a]

Location (including distance from airport if applicable):	Inspection date: Time:
Caterer:	Address:
Manager:	Person contacted (name and title):

Supply sources

Water:	Milk and milk products:
Shellfish:	Other perishable foods:

INDICATE EXISTENCE OF DEFECTS BY A CROSS (X)
(Specify defects and suggest rectifications in section "Comments and Recommendations", below)

STRUCTURAL FEATURES

Floors:

- Easy to clean, smooth, in good repair . . . . . ☐
- Sloped to drain, if floor drains used . . . . . ☐
- Clean . . . . . ☐
- Dustless method of cleaning . . . . . ☐
- Cleaned when least amount of food exposed . . . . . ☐

Walls and ceilings:

- Light colour, clean, in good repair . . . . . ☐
- Walls smooth, washable to level of splash . . . . . ☐

[a] A similar check-list can be used for other airport catering establishments.

Doors and windows:

- Clean . . . . . ☐
- Effectively screened against insects (or insect-repellent devices provided) . . . . . ☐
- Outward-opening, self-closing doors . . . . . ☐

Lighting:

- 400 lux (minimum) on working surfaces . . . . . ☐
- 200 lux (minimum) in storage rooms . . . . . ☐
- Fixtures clean, in good repair . . . . . ☐

Ventilation:

- All rooms reasonably free of odours and condensation . . ☐
- Extractor hoods, fans and other ventilation equipment clean and efficient . . . . . ☐

TOILET FACILITIES

- Adequate, conveniently located . . . . . ☐
- Well lit, outside ventilation . . . . . ☐
- Clean, in good repair, no flies . . . . . ☐
- Self-closing, tight-fitting doors . . . . . ☐
- Intervening ventilated area . . . . . ☐
- Provision of hand-washing notices . . . . . ☐

WATER SUPPLY

- Approved by national health administration . . . . . ☐
- Readily accessible, adequate under pressure . . . . . ☐
- Plumbing satisfactory . . . . . ☐

EMPLOYEES

General cleanliness:

- Changing facilities, including showers . . . . . ☐
- Clean outer garments used only for food service duties . . ☐
- Hands and fingernails clean . . . . . ☐
- No spitting, no tobacco used in food-preparation or food-packing areas . . . . . ☐
- "No smoking" signs posted . . . . . ☐

Hand-washing facilities:

- Adequate, conveniently located . . . . . ☐
- Constant supply of hot and cold running water . . . . . ☐
- Bactericidal soap, nailbrushes, individual towels (or properly installed and operated warm-air jet(s) provided) . . . . . ☐
- Clean, in good repair . . . . . ☐
- Hands washed after toilet use . . . . . ☐
- Provision of hand-washing notices . . . . . ☐

Disease control:

- Adequate medical screening . . . . . ☐
- Inquiry reveals no employee with recent history of communicable disease or gastrointestinal infection . . . . . ☐
- Waterproof dressings supplied for cuts, abrasions, etc. . . . ☐

Miscellaneous:

- Soiled linen, coats, aprons kept in containers . . . . . ☐
- Establishment not used for domestic purposes . . . . . ☐

EQUIPMENT AND UTENSILS

Design, construction and condition:

- Easy to clean, self-draining, smooth, of suitable material . ☐
- In good repair, no open seams, corrosion, breaks, cracks or chipped places . . . . . ☐

Cleansing:

- Clean food carts, shelves, tables, cutting boards, meat blocks, refrigerators, tray racks, sinks, dish-washing machines, etc. ☐
- Utensils thoroughly cleansed after each use . . . . . ☐
- Beverage containers thoroughly cleansed after each use . . ☐
- Suitable detergent, effective concentration . . . . . ☐
- Wash water changed frequently . . . . . ☐
- Satisfactory method for drying utensils (i.e., avoidance of drying cloths if possible) . . . . . ☐
- Single-service cups, plates, spoons, straws, etc., used only once ☐
- No steel wool used . . . . . ☐

Sanitizing treatment:

Utensils washed with detergent solution at 60–70 °C (140–160 °F) prior to rinsing in clean hot water at 82 °C (180 °F) or other approved method . . . . . ☐

Large utensils treated with live steam, boiling water rinse, or other approved method . . . . . ☐

Adequate dish-washing facilities provided . . . . . ☐

Thermometers, wire baskets, as required . . . . . ☐

Dish-washing machines:

Satisfactory machine, spray arms demountable or accessible for cleaning . . . . . ☐

Properly operated . . . . . ☐

Suitable detergent, effective concentration . . . . . ☐

Wash water at about 60 °C (140 °F) . . . . . ☐

Sanitizing rinse at 82 °C (180 °F) or above . . . . . ☐

Thermometer for rinse water . . . . . ☐

Storage and handling:

Suitable storage area, above floor level, protected from flies, dust, dirt, splash, etc. . . . . ☐

Area clean, utensils inverted or covered, when practicable . ☐

Beverage containers properly stored . . . . . ☐

Spigots properly handled and protected . . . . . ☐

No handling of contact surfaces . . . . . ☐

Nonporous shelf and drawer linings . . . . . ☐

Single-service untensils purchased in sanitary cartons, properly stored and handled . . . . . ☐

FOOD AND DRINK

Freezing and refrigeration facilities:

Blast freezing

Availability and functioning of indicating thermometers . . ☐

Deep freezing

Availability and functioning of indicating thermometers . . ☐

Stock rotation system in operation . . . . . ☐

Refrigeration

Readily perishable food or drink stored at 4 °C (40 °F) or below ☐

Refrigerators (except freezer units) with thermometers in warmest zone; separation of raw and cooked foods . . . ☐

Perishable foods packed for in-flight service stored at 4 °C (40 °F) or below (unless required for immediate service) . ☐

Ice from approved sources . . . . . ☐

Ice stored in approved manner . . . . . ☐

Wholesomeness:

Clean, no spoilage . . . . . ☐

Prepared in such a manner as to be safe for human consumption . . . . . ☐

pH control of susceptible foods (e.g., mayonnaise) . . . . ☐

Selection and indication of origin of food (e.g., pasteurized milk, seafood) . . . . . ☐

Treatment of salads . . . . . ☐

Different meals prepared for different air crew members . ☐

Portions of food once served not re-served in any form . ☐

Storage and protection:

Stored above floor level; premises not subject to flooding . ☐

Premises not subject to overhead leakage . . . . . ☐

Stock rotation system in operation . . . . . ☐

Food and drink containers covered, except during preparation and serving . . . . . ☐

Minimum manual contact with food and drink . . . . . ☐

Layout to prevent cross-contamination . . . . . ☐

No ingress of animals or birds into food premises . . . . ☐

Building rat-proofed . . . . . ☐

Control measures for rodents, flies, cockroaches, etc. . . . ☐

STORAGE AND DISPOSAL OF WASTES

Garbage disposed of through grinders, or adequate storage facilities provided . . . . . ☐

Storage area drained, impervious, clean . . . . . ☐

Covered, durable, watertight, rat-proof containers . . . . . ☐

Removed from storage area frequently and containers washed ☐

Adequate water pressure for cleaning containers . . . . . ☐

Hot water and steam available . . . . . ☐
Suitable back-siphonage preventer, properly installed . . . ☐
Liquid wastes into public sewer, or other approved disposal method . . . . . ☐
Drains from food and drink equipment not directly connected to sewer . . . . . ☐

TRANSPORTATION OF FOOD TO AIRCRAFT

Vehicles clean . . . . . ☐
Temperature control during transportation, when required . ☐

COMMENTS AND RECOMMENDATIONS:

Name and title of inspecting officer . . . . . .
. . . . . .
Signature . . . . . .

B. AIRLINE SERVICING AREA [a]

Airport:	Location:
Airline service:	Inspection date:
Person contacted (name and title):	Source of water supply:

INDICATE EXISTENCE OF DEFECTS BY A CROSS (X)
(Specify defects and suggest rectifications in the section "Comments and Recommendations", below)

WATER SUPPLY

Water system:

- No cross-connexions . . . . . ☐
- No back-siphonage connexions . . . . . ☐
- Adequate pressure . . . . . ☐
- Method and frequency of sampling satisfactory . . . . . ☐

Hydrants:

- Location satisfactory . . . . . ☐
- Acceptable type, good maintenance . . . . . ☐
- Acceptable uses only . . . . . ☐
- Quick-type coupling (or threaded for permanent hose connexion) . . . . . ☐
- Outlets downward or horizontal . . . . . ☐
- Proper surface drainage . . . . . ☐
- Drains from hydrant boxes or pits adequate and functioning to prevent flooding and mosquito breeding . . . . . ☐

[a] Exclusive of catering.

Water hose:

- Satisfactory material, smooth, no cracks . . . . . ☐
- Quick-type couplings, where required . . . . . ☐
- Satisfactory nozzle guard . . . . . ☐
- Hose properly protected and stored . . . . . ☐
- Hose properly handled, flushed before use . . . . . ☐
- Nozzles different size and shape from waste connexions . ☐

Water servicing vehicles:

- Smooth, heavy-gauge, corrosion-resistant material . . . . . ☐
- Completely enclosed from filling inlet to discharge outlet . ☐
- Vents, if provided, properly protected . . . . . ☐
- Complete drainage possible . . . . . ☐
- Inlet and outlet directed downwards . . . . . ☐
- Inlet and outlet provided with caps or closures with keeper chains . . . . . ☐
- Water tanks labelled . . . . . ☐
- Quick-type couplings, where required . . . . . ☐
- If hose transported on cart, proper storage facilities provided ☐
- Satisfactory transferral of water . . . . . ☐

WASTES DISPOSAL

Handling of toilet wastes:

- Personnel who remove wastes do not handle water or food ☐
- Waste tanks and flushing tanks labelled . . . . . ☐
- Retention tank flushing equipment available (not by direct connexion to water supply) . . . . . ☐
- Portable toilets enclosed or covered during transportation to disposal area . . . . . ☐
- Provision of suitable aircraft toilet fluid . . . . . ☐
- Sewage removed without spillage . . . . . ☐

Disposal of toilet wastes:

- Disposal facilities separate from food- or drink-servicing areas ☐
- Sewage disposal satisfactory . . . . . ☐
- Portable toilet or tank cleaning facilities completely enclosed, fly-proof . . . . . ☐

- Smooth, impervious floors, sloped to drain . . . . . ☐
- Room clean, in good repair . . . . . ☐
- Adequate water pressure . . . . . ☐
- Hot water or steam available . . . . . ☐
- Suitable back-siphonage preventer, properly installed . . . ☐
- Portable toilets emptied and cleaned immediately after removal from aircraft . . . . . ☐
- Service vehicles emptied and flushed frequently . . . . . ☐
- Satisfactory storage of clean portable toilets . . . . . ☐

Handling, storage and disposal of aircraft refuse:

- Refuse properly handled . . . . . ☐
- Storage containers satisfactorily covered . . . . . ☐
- Storage containers emptied frequently . . . . . ☐
- Receptacles cleaned, not at installations for portable toilet cleaning . . . . . ☐
- Receptacles properly stored, not with portable toilets . . . ☐
- Air-sickness containers properly handled and disposed of . ☐

Refuse collection and disposal:

- Refuse collection satisfactory . . . . . ☐
- Refuse disposal satisfactory . . . . . ☐

EMPLOYEES

Sanitation facilities:

- Separate, adequate, conveniently located toilets, locker rooms and washrooms . . . . . ☐
- Clean, in good repair . . . . . ☐
- Hand-washing facilities, with bactericidal soap, towels, nailbrushes, adequate water supply . . . . . ☐
- Provision of hand-washing notices . . . . . ☐

Disease control:

- Adequate medical screening for water service staff . . . . ☐

COMMENTS AND RECOMMENDATIONS:

Name and title of inspecting officer . . . . . .

Signature . . . . . .

C. REPORT ON VECTOR CONTROL AT AIRPORT

Insectborne diseases in area:

Is airport in or adjacent to an area infected with, or receptive to, yellow fever?

Prevalence of breeding places:

Control methods employed on airport and effectiveness:

Control methods employed in vicinity of airport and effectiveness:

All buildings mosquito-proofed, if necessary:

Disinsecting of ground area—method, materials, frequency, effectiveness:

Disinsecting aircraft—methods, materials, frequency, effectiveness:

Equipment listed below needed in special cases only

Equipment for disinsecting suspects, on hand, or available if needed:

Equipment for disinsecting baggage and clothes, on hand, or available if needed:

Facilities for storing and dispatching specimens to bacteriological laboratory, on hand, or available if needed:

Equipment for disinfecting baggage, clothes and bedding, on hand, or available if needed:

Equipment for destruction of rodents at airport and for deratting aircraft:

COMMENTS AND RECOMMENDATIONS:

Name and title of inspecting officer . . . . . .

. . . . . .

Signature . . . . . .

D. HOTEL ACCOMMODATION

Hotels selected by airlines for both passengers and crews should be clean, safe and comfortable, providing safe and wholesome food and water, of a standard compatible with the recommendations of this Guide.

Inspection of kitchens should be conducted along lines similar to those indicated in Section A. In addition, the restaurant, bars, public rooms and bedrooms (including bathrooms) should be inspected for cleanliness and freedom from insects and vermin. Drinking-water, including any that is specifically supplied to bedrooms in flasks or bottles, should be examined and its purity established.

Annex 5

SUGGESTED GUIDE FOR REPORTS ON QUALITY OF DRINKING-WATER SUPPLIED AT INTERNATIONAL AIRPORTS

The following minimum information relating to samples of water collected by health authorities or other public health agencies at each airport from outlets commonly used or accessible as sources of drinking-water in the airport or on aircraft should be recorded for permanent reference. Reports should be available for every international airport. Information on samples collected from different installations that are situated within the same airport area and served by a common water supply system should also be included. If water is supplied through multiple (i.e., separate) systems to different parts of an airport area, a separate report should be made for each system. All water samples should be examined in an officially recognized laboratory.

Item

1. Name and location of airport and identification of the water system covered by this report . . . . . .
2. Number of employees regularly present . . . .
3. Number of transients (crew and passengers) using the installation during the past 12-month period . . . .
4. Average daily population served (item $2 + \frac{\text{item } 3}{365}$) . . . .

Bacteriological Quality

5. Maximum interval between successive samplings for bacteriological examination during the past 12-month period . . . .
6. Minimum number of samples collected for bacteriological examination in any one month during the past 12-month period . . . .
7. Number of samples collected for bacteriological examination during the past 12-month period . . . .
8. Number of samples negative for coliform organisms . . . .
9. Percentage of samples satisfactory $(\frac{100 \times \text{item } 8}{\text{item } 7})$ . . . .
10. Number of samples containing *Escherichia coli* in 100 ml . . . .

11. Number of samples containing more than 10 coliform organisms in 100 ml . . . .
12. Number of times coliform organisms detected in two consecutive 100-ml samples . . . .

Chemical Quality

13. Maximum interval between successive samplings for chemical examination during the past 12-month period:
    (*a*) Short routine chemical examination . . . .
    (*b*) Complete chemical examination . . . .
    (*c*) Examination for toxic substances . . . .

Maximum concentrations reported (in mg/l), at any time on any sample during the period, of the following substances:

14. Arsenic (as As) . . . .
15. Cadmium (as Cd) . . . .
16. Cyanide (as CN) . . . .
17. Lead (as Pb) . . . .
18. Mercury (as Hg) . . . .
19. Selenium (as Se) . . . .

Explanatory Notes

In the following paragraphs, the section numbers cited refer to *International Standards for Drinking-Water* (*34*), and the item numbers to those in the present Annex for the recording of drinking-water quality at international airports.

To conform to *International Standards for Drinking-Water*, the following minimum conditions must be met:

Bacteriological examination

(1) For samples collected for bacteriological examination from the distribution system the maximum intervals between successive samplings (item 5) and the minimum numbers of samples examined in each month (item 6) should be related to the average population (item 4), as follows (section 7.1.1.1., table 6):

Population served	*Maximum interval between successive samplings*	*Minimum number of samples per month*
Less than 20 000	1 month	1 sample per 5 000 population
20 000-50 000	2 weeks	
50 001–100 000	4 days	
More than 100 000	1 day	1 sample per 10 000 population

Water in the distribution system

(2) Throughout any year, 95% of samples should not contain coliform organisms in 100 ml (section 2.3.1.2).

(3) No sample should contain *Escherichia coli* in 100 ml (section 2.3.1.2).

(4) No sample should contain more than 10 coliform organisms in 100 ml (section 2.3.1.2).

(5) Coliform organisms should not be detectable in 100 ml of any two consecutive samples (section 2.3.1.2).

Chemical examination

(6) For samples collected for short routine chemical examination of water from the distribution system, the maximum interval between successive samplings (item 13(*a*)) should be related to the average population (item 4), as follows (section 7.5.1):

Population served	*Maximum interval between successive samplings*
Up to 50 000	6 months
Over 50 000	1 month

(7) It is recommended that examination for toxic substances (item 13(*c*)) should be carried out at least once a year (section 7.5.1). The following are tentative limits for concentrations of toxic substances in drinking-water (section 6.2, table 1):

Item 14	Arsenic (as As) – 0.05 mg/l
Item 15	Cadmium (as Cd) – 0.01 mg/l
Item 16	Cyanide (as CN) – 0.05 mg/l
Item 17	Lead (as Pb) – 0.1 mg/l
Item 18	Mercury (as Hg) – 0.001 mg/l
Item 19	Selenium (as Se) – 0.01 mg/l

(8) Complete chemical examination (item 13(*b*)) of all supplies used or accessible for use should be carried out once a year.

Annex 6 [a]

AMOUNTS OF CHEMICALS REQUIRED FOR A STRONG CHLORINE SOLUTION [b] TO DISINFECT WATER VEHICLE TANKS BEFORE THESE ARE BROUGHT INTO SERVICE

Capacity				Bleaching powder (25–35%)		High-strength calcium hypochlorite (70%)		Liquid bleach (5% sodium hypochorite)		
m^3	l	gal (US)	gal (UK)	g	oz	g	oz	ml	fl oz (US)	fl oz (UK)
0.4	400	106	88	40	1.4	17	0.6	240	8	8.5
0.5	500	132	110	50	1.8	22	0.8	300	10	10.6
0.6	600	158	132	60	2.1	26	0.9	360	12	12.7
0.7	700	185	154	70	2.5	30	1.1	420	14	14.8
0.8	800	211	176	80	2.8	34	1.2	480	16	16.9
1.0	1 000	264	220	100	3.5	43	1.5	600	20	21.1
1.2	1 200	317	264	120	4.2	52	1.8	720	24	25.3
1.5	1 500	396	330	150	5.3	65	2.3	900	30	31.7
2.0	2 000	528	440	200	7.0	86	3.0	1 200	40	42.2
3.0	3 000	792	660	300	10.6	130	4.6	1 800	60	63.4
4.0	4 000	1 056	880	400	14.1	170	6.0	2 400	80	84.5
5.0	5 000	1 320	1 100	500	17.6	220	7.8	3 000	100	105.6

[a] Adapted from Rajagopalan & Shiffman (*16*), p. 83.
[b] Approximately 30 mg of applied chlorine per litre of water. Not suitable for drinking purposes.

Instructions for Chlorinating with Strong Chlorine Solutions

(1) Clean the inside of the tank thoroughly by brushing and flushing.
(2) Dissolve the chemical in a bucket (not more than 100 g (3.5 oz) of calcium hypochlorite or bleaching powder in one bucket of water).
(3) Half fill the tank with water and pour in the solution; then fill the tank completely with water.
(4) Leave the strongly chlorinated water for at least 12 hours in the tank. This water should not be used for drinking purposes.
(5) Empty the tank completely and let the water run to waste.
(6) Flush the tank with potable water through the valve coupling.

NOTE: Inasmuch as the concentration of active chlorine is greater at lower pH values, it is important that the pH of the disinfecting solutions should be kept within the range of 5–6.5.

Annex 7

SUGGESTED NATIONAL ADMINISTRATIVE PROVISIONS NECESSARY TO ENSURE THE PROPER APPLICATION OF HEALTH AND HYGIENE MEASURES AT AIRPORTS

(1) All governments should ensure that their national legislation provides for full compliance with the health and hygiene requirements enumerated in this Guide.

(2) In every country government agencies, either at national or at local level, should have uniform responsibility throughout the national territory to enforce these requirements. As far as possible, allowing for local conditions, each part of the legislation should be applied uniformly by the agencies concerned.

(3) Each agency responsible for an airport should be able to exercise its authority over the whole geographical area of the airport. It is not desirable to divide the area into sections and apportion jurisdiction to a number of different agencies.

(4) Where there is a division of responsibilities between national, regional and local agencies for administration and enforcement purposes, it is the province of the national agency to establish a proper system of communication and clear lines of demarcation between the responsibilities of each level of authority.

(5) Local agencies should have the responsibility for day-to-day control and inspection of health and hygiene standards. In order to ensure that these agencies have adequate powers of enforcement, national legislation must be sufficiently comprehensive to cover all the administrative, medical, veterinary and sanitary control measures advocated in this guide.

Such legislation should also authorize the local agency to participate in the health education and training of staff employed by airports, airlines or any other commercial undertakings concerned with the provision of food and drinking-water supplies for consumption by airline passengers, air crews, ground staff, and members of the general public visiting airports.

Annex 8

REVIEWERS

Dr D. A. Aston, Technical Officer (Food Hygiene), Veterinary Public Health, Division of Communicable Diseases, WHO, Geneva, Switzerland

Mr P. d'Auteuil, Division Sanitarian, Marriott In-Flight Services, Marriott Corporation, Washington, DC, USA

Dr G. Bergot, Chief Medical Officer, Medical Department, Paris Airport, Orly, France

Mrs B. Blomberg, Technical Officer, Protection of Environmental Health, WHO Regional Office for Europe, Copenhagen, Denmark

Mr R. W. Bonhoff, Director, Government and Industry Affairs — Facilitation, International Air Transport Association (IATA), Geneva, Switzerland (Member of the WHO Expert Advisory Committee on the International Surveillance of Communicable Diseases)

Mr F. A. Butrico, Chief, Department of Environmental Sciences and Engineering, WHO Regional Office for the Americas/Pan American Sanitary Bureau, Washington, DC, USA

Dr B. Bytchenko, Medical Officer, Bacterial and Venereal Infections, Division of Communicable Diseases, WHO, Geneva, Switzerland

Dr I. D. Carter, Chief, Epidemiological Surveillance of Communicable Diseases, Division of Communicable Diseases, WHO, Geneva, Switzerland

Mr R. F. Clapp, Sanitarian Director, Assistant to the Director, Environmental Health Services Division, Bureau of State Services, Center for Disease Control, Department of Health, Education, and Welfare, Atlanta, GA, USA

Dr J. G. Constantino, Corporate Medical Director, Pan American World Airways, New York, NY, USA (Member of the IATA Medical Advisory Committee)

Dr W. P. H. Dakin, Director of Medical Services, Qantas Airways Ltd, Sydney, New South Wales, Australia (Member of the IATA Medical Advisory Committee)

Dr N. N. Fetisov, Deputy Chief, External Relations Board, Ministry of Health of the USSR, Moscow, USSR

Dr A. B. Frykholm, Chief, Aviation Medicine Section, International Civil Aviation Organization (ICAO), Montreal, Canada

Dr C. G. I. Gordon, Senior Medical Officer, International Divison, Department of Health and Social Security, London, England

Mr R.R. Harcourt, Assistant Director (Environmental Health), Division of Public Health, Department of Health, Wellington, New Zealand

Mr F. Harrison, Director of Operations, Dobbs International (UK) Ltd, Feltham, Middlesex, England

Mr M. Jacob, Environmental Health Advisory Officer, Department of Health and Social Security, London, England

Dr J. L. Kilgour, Head of the International Division, Department of Health and Social Security, London, England
Dr M. Lahloub, Medical Officer, Promotion of Environmental Health, WHO Regional Office for Africa, Brazzaville, Congo
Dr L. G. Lederer, Corporate Medical Director, American Airlines Inc., New York, NY, USA (Member of the IATA Medical Advisory Committee)
Mr J. H. Le Van, Consulting Engineer, Chevy Chase, MD, USA
Mr J. N. Montgomery, Customer Engineering Manager, British Aircraft Corporation Ltd, Commercial Aircraft Division, Weybridge, Surrey, England
Mr R. J. Moulton, Chief, Facilitation and Joint Financing Branch, Air Transport Bureau, International Civil Aviation Organization (ICAO), Montreal, Canada
Dr J. I. Munn, former Scientist, Food Additives, Division of Environmental Health, WHO, Geneva, Switzerland
Mr J. C. Obel, Chief Public Health Officer, Ministry of Health, Nairobi, Kenya
Dr R. Okamoto, Chief Medical Officer for International Health, Minister's Secretariat, Ministry of Health and Welfare, Tokyo, Japan
Dr R. Pal, Scientist, Division of Vector Biology and Control, WHO, Geneva, Switzerland
Dr M. Postiglione, Medical Officer, WHO Regional Office for Europe, Copenhagen, Denmark
Mr J. R. Potts, Animal Health Division, Ministry of Agriculture, Fisheries and Food, Chessington, Surrey, England
Dr L. Reinius, Scientist (Food Hygiene), Veterinary Public Health, Division of Communicable Diseases, WHO, Geneva, Switzerland
Dr E. Roelsgaard, former Chief, Epidemiological Surveillance of Communicable Diseases, Division of Communicable Diseases, WHO, Geneva, Switzerland
Mr A. Tomassi, Sanitary Engineer, Pre-investment Planning, Division of Environmental Health, WHO, Geneva, Switzerland; former Regional Adviser in Environmental Health, WHO Regional Office for the Western Pacific, Manila, Philippines
Mr S. Unakul, Sanitary Engineer, Environmental Health, WHO Regional Office for South-East Asia, New Delhi, India
Mr J. W. Wright. former Director, Division of Vector Biology and Control, WHO, Geneva, Switzerland

REFERENCES

1. WORLD HEALTH ORGANIZATION. *International Health Regulations (1969),* 2nd annotated edition. Geneva, 1974.
2. WHO Technical Report Series, No. 174, 1960 (*Hygiene and sanitation in aviation:* First report of the Expert Committee).
3. WORLD HEALTH ORGANIZATION. *Guide to hygiene and sanitation in aviation.* Geneva, 1960.
4. DAVIES, R. F. Environmental health aspects of international traffic and the role of the World Health Organization. *Environmental health (London),* **88**: 163–166 (1975).
5. PEFFERS, A. S. R. ET AL. *Vibrio parahaemolyticus* gastroenteritis and international air travel. *Lancet,* **1**: 143–145 (1973).
6. TURNER, A. C. Food poisoning. *Practitioner,* **206**: 615–621 (1971).
7. INTERNATIONAL AIR TRANSPORT ASSOCIATION. *IATA World Air Transport Statistics,* Geneva, No. 20, 1975 [published annually].
8. INTERNATIONAL CIVIL AVIATION ORGANIZATION. *International standards and recommended practices: facilitation (Annex 9 to the Convention on International Civil Aviation),* 7th ed. Montreal, 1974.
9. INTERNATIONAL AIR TRANSPORT ASSOCIATION. *Food hygiene in air transport. Recommended code of practice.* Montreal, 1976.
10. INTERNATIONAL CIVIL AVIATION ORGANIZATION. *Manual on airport master planning.* Montreal, 1969 (Document 8796–AN/891).
11. WHO Technical Report Series, No. 399, 1968 (*Microbiological aspects of food hygiene:* Report of a WHO Expert Committee with the participation of FAO).
12. Information on malaria risk for international travellers: second edition (updated). *Weekly epidemiological record,* No. 24, pp. 181–200 (1976).
13. ASSOCIATION OF PUBLIC HEALTH INSPECTORS. *Towards cleaner food. Report of the Working Party on Food Hygiene.* London, 1972.
14. WHO Technical Report Series, No. 598, 1976 (*Microbiological aspects of food hygiene:* Report of a WHO Expert Committee with the participation of FAO).
15. BRYAN, F. L. *Diseases transmitted by foods (a classification and summary),* 5th printing. Atlanta, GA, US Department of Health, Education, and Welfare, Center for Disease Control, 1975 (DHEW Publication No. (CDC) 75–8237).
16. RAJAGOPALAN, S. & SHIFFMAN, M. A. *Guide to simple sanitary measures for the control of enteric diseases.* Geneva, World Health Organization, 1974.
17. CHATTERJEE, B. D. ET AL. *Vibrio parahaemolyticus* and diarrhoea associated with non-cholera vibrios. *Bulletin of the World Health Organization,* **42**: 460–463 (1970).
18. DAKIN, W. P. H. ET AL. Gastroenteritis due to non-agglutinating vibrios. *Medical journal of Australia,* **60** (2): 468 (1973) [letter].
19. Vibrio food-poisoning on an aeroplane. *British medical journal,* **4**: 117 (1973) [News and Notes section].
20. WHO Technical Report Series, No. 525, 1973 (*Pesticide residues in food:* Report of the 1972 Joint FAO/WHO Meeting).
21. WHO Technical Report Series, No. 505, 1972 (*Evaluation of certain food additives and the contaminants: mercury, lead and cadmium:* Sixteenth report of the Joint FAO/WHO Expert Committee on Food Additives).
22. WHO Technical Report Series, No. 539, 1974 (*Toxicological evaluation of certain food additives with a review of general principles and of specifications:* Seventeenth report of the Joint FAO/WHO Expert Committee on Food Additives).
23. INTERNATIONAL COMMISSION ON MICROBIOLOGICAL SPECIFICATIONS FOR FOODS. *Microorganisms in foods. 2. Sampling for microbiological analysis: principles and specific applications.* Toronto, University of Toronto Press, 1974.

24. UNITED KINGDOM, MINISTRY OF HEALTH & MINISTRY OF AGRICULTURE, FISHERIES AND FOOD. *Food hygiene codes of practice. 7. Hygiene in the operation of coin operated food vending machines.* London, H.M. Stationery Office, 1967.
25. ILLUMINATING ENGINEERING SOCIETY. *IES code for interior lighting January 1973. Recommendations for lighting building interiors.* London, 1973.
26. FOOD, DRINKS AND TOBACCO INDUSTRY TRAINING BOARD. *Training for food hygiene.* Croydon, 1974.
27. NORTH CAROLINA STATE BOARD OF HEALTH. *School food service sanitation.* Raleigh, NC, 1966 (Publication 500).
28. BAILEY, J. & FOSTER, D. W. pHysoHex and the food handler. *Sanitarian,* **69**: 250–256 (1961).
29. BAILEY, J. & FOSTER, D. W. Reducing the bacterial danger in food handling. *Sanitarian,* **70**: 379–385 (1962).
30. HOBBS, B. C. *Food poisoning and food hygiene,* 3rd ed. London, Arnold, 1974.
31. UNITED KINGDOM, DEPARTMENT OF HEALTH AND SOCIAL SECURITY, MINISTRY OF AGRICULTURE, FISHERIES AND FOOD & WELSH OFFICE. *Food hygiene codes of practice. 9. Hygiene in microwave cooking.* London, H.M. Stationery Office, 1972.
32. INTERNATIONAL AIR TRANSPORT ASSOCIATION. *IATA Restricted Articles Regulations,* 19th ed. Geneva, 1976 [published annually].
33. WHITTINGHAM, H. E. Hygiene and sanitation in aviation. *Journal of the Royal Institute of Public Health and Hygiene,* **17**: 110–124 (1954).
34. WORLD HEALTH ORGANIZATION. *International standards for drinking-water,* 3rd ed. Geneva, 1971.
35. WORLD HEALTH ORGANIZATION. *Surveillance of drinking-water quality.* Geneva, 1976 (Monograph Series, No. 63).
36. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, WATER SUPPLY DIVISION. *Cross-connection control manual.* Washington, DC, 1973 (Publication No. EPA–430/9–73–002).
37. UNITED KINGDOM, DEPARTMENT OF THE ENVIRONMENT. *Report of the Committee on Back-siphonage in Water Installations.* London, H.M. Stationery Office, 1974.
38. UNITED KINGDOM, MINISTRY OF HOUSING AND LOCAL GOVERNMENT & WELSH OFFICE. *Safeguards to be adopted in the operation and management of waterworks.* London, H.M. Stationery Office, 1967.
39. WHO Technical Report Series, No. 367, 1967 (*Treatment and disposal of wastes:* Report of a WHO Scientific Group), p. 6.
40. INTERNATIONAL AIR TRANSPORT ASSOCIATION, MEDICAL COMMITTEE. *Medical manual,* [Montreal, n.d.], app. B and C.
41. INTERNATIONAL AIR TRANSPORT ASSOCIATION. *IATA Live Animals Regulations,* 4th ed. Geneva, 1975.
42. WHO Technical Report Series, No. 378, 1967 (Joint FAO/WHO Expert Committee on Zoonoses: Third report).
43. WHO Technical Report Series, No. 443, 1970 (*Insecticide resistance and vector control:* Seventeenth report of the WHO Expert Committee on Insecticides).
44. WORLD HEALTH ORGANIZATION. *Vector control in international health.* Geneva, 1972.
45. WHO Technical Report Series, No. 553, 1974 (*Ecology and control of rodents of public health importance:* Report of a WHO Scientific Group).
46. WHO Official Records, No. 217, 1974, Annex 9.

ACKNOWLEDGEMENTS

The author is particularly indebted to Mr R. F. Davies, Community Water Supply and Sanitation, Division of Environmental Health, WHO, Geneva, for his contribution in reviewing the entire text, providing much useful information, and making detailed suggestions for improvements that were extremely valuable in giving the Guide its present form.

* * *

Thanks are also due to the following companies and agencies for permission to reproduce a number of illustrations in this Guide:

British Airports Authority (Fig. 30)

British Airways (Fig. 2, 4, 6, 7, 9, 10, 11, 12, 13, 14, 20, 21, 22, 23 and 28)

Lufthansa (Fig. 8 and 15)

Marriott In-Flight Caterers, London (Fig. 16)

National Transportation Safety Board, Washington, DC (Fig. 31)

Qantas Airways (Fig. 3 and 18).