Aircraft Disinsection Procedures.*

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ABSTRACT.

The increasing volume and speed of international air services has greatly increased the risk of disseminating insect pests and vectors of diseases, including agricultural pests and diseases. It is the responsibility of national plant quarantine services to institute the necessary control measures. Methods of disinsecting aircraft are discussed and it is recommended that spraying by aerosols be carried out upon the arrival of the aircraft at the airport of entry, and before the disembarkation of passengers and crew. Aerosol formulations used for aircraft disinsection should contain a concentration of the active principles of not less than that contained in the "Standard Reference Aerosol" recommended by W.H.O. Attention is drawn to the possibilities of vapour fumigation.

THE ever-increasing volume of international air traffic, the constantly increasing speed and range of aircraft and the development of insecticide resistant pests and disease vectors create considerable problems for plant quarantine services. This increasing air traffic places a heavy responsibility on the authorities charged with preventing the dissemination of insect pests or diseases affecting plants. Relatively few studies have been made of the effect of aircraft movements on the dissemination of insect pests ; the outstanding example being that of Campbell carried out in the Cocos-Keeling Islands (1952).

The F.A.O. Regional Plant Protection Committee at its fourth meeting in Manila drew attention to the risk of spreading diseases and pests by aircraft and recommended to member countries that appropriate steps be taken to reduce the risk to an absolute minimum. Considerable developments have taken place in aircraft treatment methods during recent years.

The standard procedures previously recommended were : (*a*) Pre-flight disinsection, i.e., treatment of the aircraft prior to the embarkation of the passengers and crew ; or (*b*) in-flight disinsection carried out prior to landing at airport of entry. These methods, though included in the recommended practices contained in previous editions of Annex 9 to the Convention of International Civil Aviation, were often found to be less than fully efficient. The following remarks in the Eleventh Report of the Expert Committee on Insecticides of the World Health Organization (1961) illustrate the position :

"The Committee reviewed the evidence that has accumulated since its seventh report in which recommendations were made against in-the-air disinsection of aircraft with aerosols. Notable examples were the report that during the year ending 30th June, 1957, out of 1,592 mosquitoes found aboard aircraft arriving at Miami International Airport following in-the-air treatment with aerosols before arrival, 305 were still alive, and the more recent advice from the Philippines Government that although its quarantine regulations specify in-the-air disinsection for incoming aircraft, collections made following landing, over a five-year period, showed that 87 per cent. of the mosquitoes were still alive.

"Replies to Circular letter 15 indicated that despite the ineffectiveness of in-the-air disinsection with aerosols, approximately 30 per cent. of the 111 countries replying require or accept this method of aircraft disinsection (6 per cent. with some reservations), while about 10 per cent. refuse to accept it in all or some instances.

"The Committee reaffirmed the previous recommendation that in-the-air disinsection of aircraft with aerosols should not be recognized as complying with the requirements of the International Sanitary Regulations."

"The Committee noted that, discounting those governments that have no disinsection requirements of any kind, some 60 per cent. of the remainder of those replying to the circular letter make provisions for post-arrival disinsection. The Committee also considered the frequent opportunities for vectors aboard aircraft to escape after the plane has landed and before disinsection could be accomplished (e.g., through open cockpit windows, from the wheel wells or through the cabin door as it is opened to admit the Airport Health Officer or his representative)."

The deliberations of the World Health Organization Committee led to the development of the 'blocks away' disinsection method. This

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method was incorporated in the Fifth Edition of Annex 9 (containing recommended practices) to the Convention on International Civil Aviation dated April, 1964.

The new recommended procedures are :— Section 2.21

When disinsecting is required by a Contracting State as a public health measure, that requirement shall be deemed to have been met by discharging into those portions of the aircraft which may carry insects from one area to another, an insecticide of a strength, formula and method of dispersal recommended by World Health Organization and acceptable to that State, such insecticide to be effectively discharged :—

(*a*) into the flight deck and into those portions of the aircraft which cannot be reached when the aircraft is moving, as near as possible to the time of the aircraft's last departure before entering the State and in sufficient time to avoid delaying such departure ; and

(*b*) into those portions of the aircraft which can be reached when the aircraft is moving, after the time of the aircraft's last departure before entering the State, either—

(i) by means of an aerosol spray, or any equivalent system, while the aircraft is taxying from the ramp to the runway for takeoff ; or

(ii) if the aircraft is suitably equipped, by means of an automatic dispersal of vapour while the aircraft is flying, but as far in advance as possible and at least thirty minutes prior to first landing ; or

(iii) by other equally effective means.

The above procedures, as adopted, overcome the previous objections by airlines to the ' blocks away ' method, namely that the introduction of an aerosol into the cockpit just prior to takeoff might affect the judgement of some pilots, who might be allergic to the spraying compounds, and thus endanger the safety of the aircraft.

However, until such time as automatic spraying equipment is installed in aircraft the ' blocks away ' method is open to the same objections as the in-flight treatment, namely that it is applied by airlines personnel who are likely to be more concerned with passenger reaction than thorough disinsection and pest control.

Under present circumstances the most reliable aircraft disinsection method is the post-arrival treatment by aerosol of all parts of the aircraft (including passenger, crew, cargo and baggage compartments) by a government inspector prior to the disembarkation of the passengers or crew. It is recommended for adoption by all member countries. It is emphasised that the provision of Annex 9 are only recommendations and all countries are free to register their disagreement and alternate requirements.

The following disinsection procedures are recommended.

Upon arrival of the aircraft at the first airport of entry and before the disembarkation of the passengers and crew, all passenger and crew compartments should be lightly sprayed with an aerosol by the responsible quarantine official. This is the so called ' knock down ' spray and the aircraft should be kept closed up for five minutes. Immediately after the disembarkation of the passengers and crew the aircraft should be closed up again and all compartments thoroughly disinsected, the aircraft remaining closed up for seven minutes. Concurrently with the above procedures the cargo and luggage compartments should be sprayed with an aerosol, then closed again for a period of seven minutes before unloading operations are authorized.

Pre-flight disinsection is still widely practiced in many countries. The certificates stating this treatment may be a useful additional safeguard, but the possession of such a certificate should not exempt an aircraft from post-arrival disinsection at the first airport of entry. Similarly in-flight disinsection should not be accepted as an alternate to thorough spraying by government personnel.

Aerosol formulations.

The next consideration is the formulation of aerosols best suited for aircraft disinsection, i.e., type and concentration of the active principles (both knock down and persistent), solvents, propellants, etc. It is understood that in most countries ordinary household aerosol preparations are being used for aircraft disinsection. It is submitted that household formulations are not altogether suitable for plant quarantine purposes. Pests of agricultural importance are usually more resistant to insecticides than flies or mosquitoes,

therefore, it is considered that for plant quarantine purposes an aerosol should contain a higher percentage of the active principles than is customary in commercial household preparations.

The following formula, called standard reference aerosol, is recommended for use in aircraft by the Expert Committee on Insecticides of World Health Organization :—

	Per cent. by weight.
Pyrethrum extract (25 per cent. pyrethrins)	1.6
D.D.T. technical	3.0
Xylene	7.5
Odourless petroleum distillate	2.9
Dichlorodifluoromethane	42.5
Trichlorofluoromethane	42.5

As compared with the above standard, a widely used commercial aerosol contains :—

Gamma isomer BHC (Lindane)	0.3 per cent. w/v
Pyrethrins	0.1 per cent. w/v
Piperonyl butoxide	0.5 per cent. w/v

Other formulations recommended by U.S.D.A. are :—

	Per cent. by weight.
G-651	
Pyrethrum extract (20 per cent. pyrethrins)	6.0
D.D.T.	2.0
Aromatic petroleum derivative solvent	8.0
Dichlorodifluoromethane (Freon 12 or Genetron 12)	84.0
G-1029	
Pyrethrum extract (20 per cent. pyrethrins)	6.0
D.D.T.	2.0
Aromatic petroleum derivative solvents :—	
Velsicol AR 60 or Socony Vacuum 544 G	6.0
Velsicol AR 50 or Socony Vacuum 544 C	2.0
Trichlorofluoromethane (Freon 11 or Genetron 11)	25.2
Dichlorodifluoromethane (Freon 12 or Genetron 12)	58.8

Information seems to indicate that there are technical difficulties in connection with aerosol formulation in increasing the D.D.T. content above 3 per cent. The solvents and propellants used have been tested and do not cause undue passenger discomfort, nor do they cause damage to the perspex or other parts of the aircraft.

The use of aerosols is the only treatment generally acceptable for aircraft disinsection but the method has some weaknesses such as :—

(*a*) relative ineffectiveness of aerosols applied in airborne aircraft ;

(*b*) difficulty of ensuring that treatment has been carried out.

The main reason why in-the-air aerosol treatments are not very effective are :—

(*a*) they are rapidly removed from the aircraft through ventilation ;

(*b*) they impact on various objects in the aircraft ; and

(*c*) they fail to penetrate into many parts of the aircraft where insects may be resting.

Most of the above difficulties could be overcome by a vapour disinsection method. In contrast to aerosol particles, vapour follows the laws for the dispersion of gases. The vapour will penetrate to all portions of the aircraft and, if an adequate concentration is maintained for a sufficient period of time, will exert the required insecticidal effect.

Experiments indicate that DDVP (0, 0-dimethyl 0-2, 2-dichlorovinyl phosphate) is a compound which appears to meet all the foregoing requirements and satisfactory systems have been developed in the United States for the vapour disinsection of aircraft. Commercial sprays containing DDVP for household use are already on the market, thus it is confidently expected that it would be approved for use in aircraft in the near future. The present tests are understood to be on the possible toxic effects to humans of concentrations required for effective insect control.

In view of the fact that the initial spray is only for knock down purposes it is thought an aerosol containing pyrethrins only might be suitable for the purpose, leaving the formulation with the persistent insecticide for the second application.

Summarizing the position and the recommendations.

1. The increasing volume and speed of international air services has greatly increased the danger of disseminating insect pests and vectors of diseases.

2. Pre-flight and in-flight disinsection, practiced by many countries, are ineffective.

3. Aircraft disinsection is the first line of defence against the incursion of introduced pests.

4. The treatment recommended by the International Civil Aviation Organization is the 'blocks away' method developed by the World Health Organization.

5. The reliability and effectiveness of the 'blocks away' method depends on the installation of mechanical means of aerosol dispersion.

6. Pending the installation of such equipment in aircraft, it is recommended that post-arrival disinsection be applied by the quarantine authorities on arrival of the aircraft at the airport of entry. Procedures recommended are :—

(*a*) a light knock-down spray immediately on arrival of the aircraft and prior to the disembarkation of passengers and crew ;

(*b*) a thorough spraying following the disembarkation of passengers and crew ;

(*c*) the aircraft to be kept completely closed up during both treatments ; and

(*d*) the cargo and luggage holds should be disinsected concurrently with the main compartments.

7. The aerosol formulation used for aircraft disinsection should contain a concentration of the active principles, both knock down and persistent, of not less than that contained in the 'Standard reference aerosol' recommended by W.H.O.

8. Attention is drawn to the latest developments using vapour fumigation methods, such as DDVP, for aircraft disinsection. Vapour fumigation is reported to be the most effective method of treatment ensuring complete dispersal of the fumigant.

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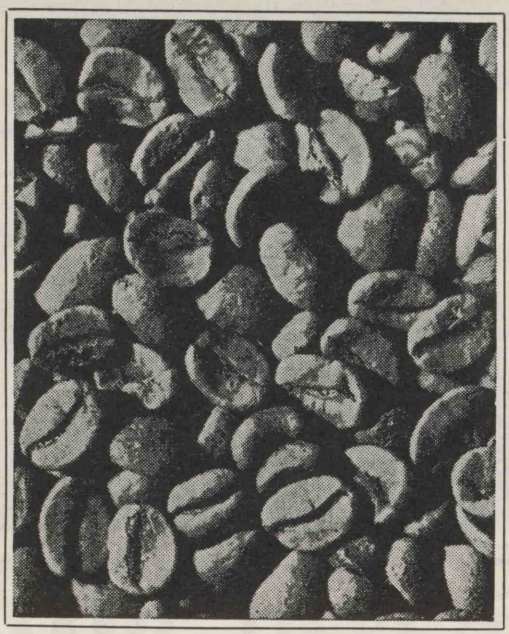

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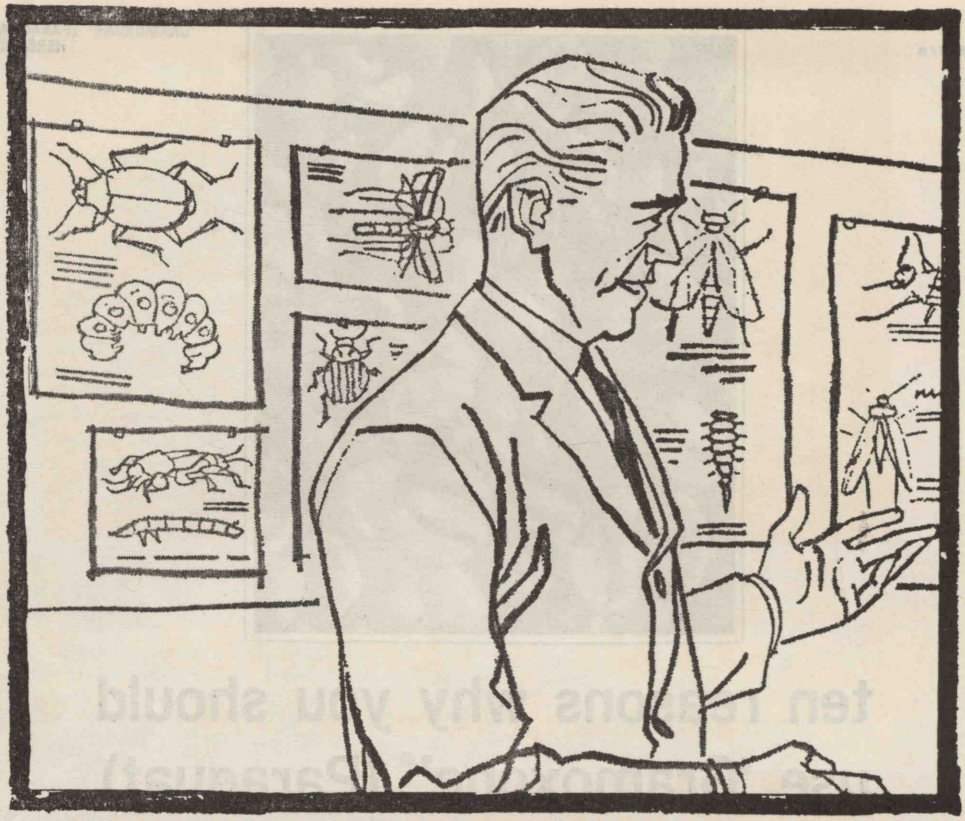

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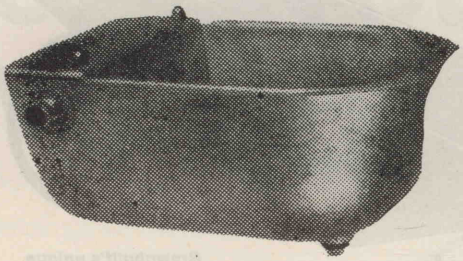

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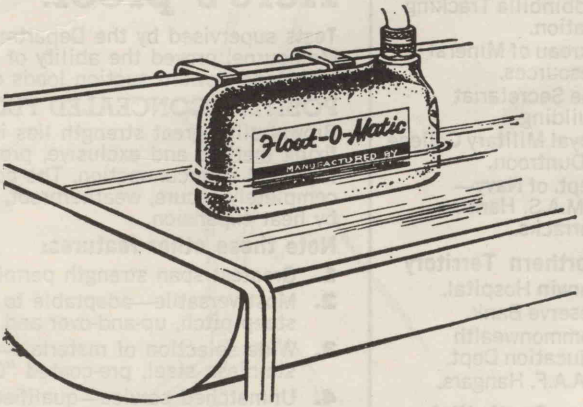

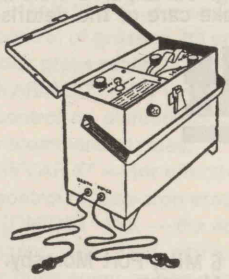

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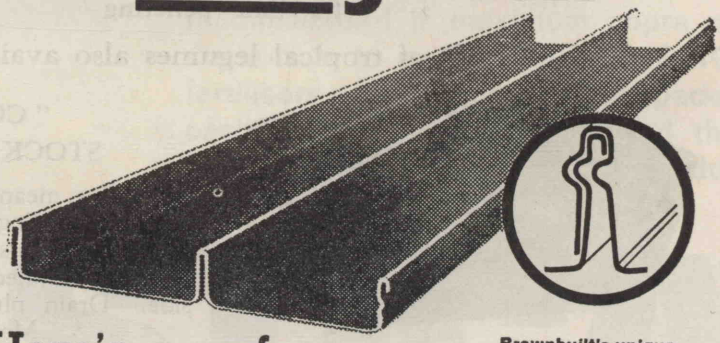

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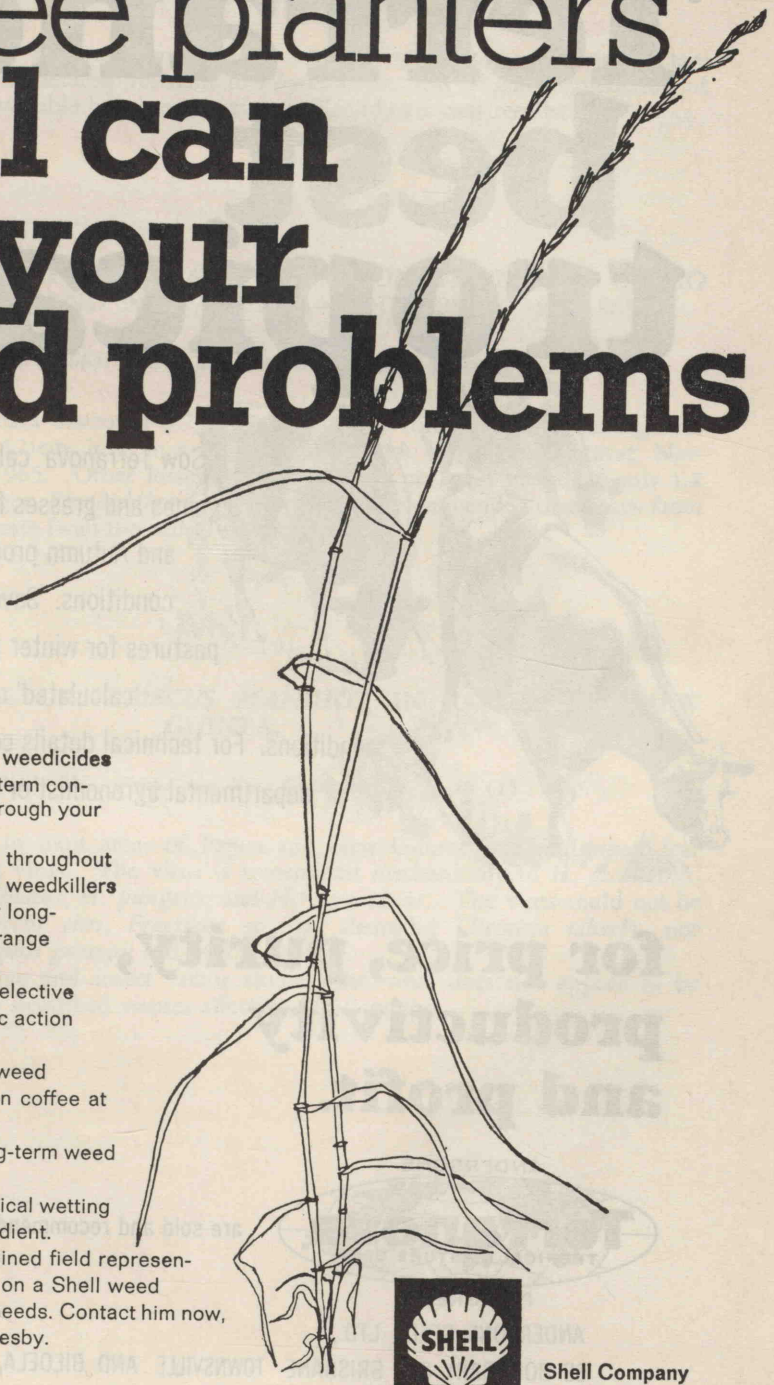

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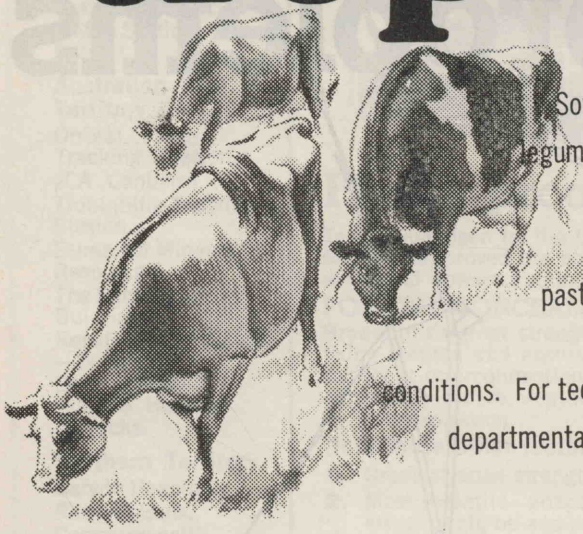

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