A mobile laboratory for real time analysis during forensic operations



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The Australian Federal Police (AFP) have developed the Mobilab, a mobile forensics laboratory, to provide on-site support to Australian Capital Territory (ACT), national and international investigations.

The AFP forensic division provides support to all AFP operational areas, including policing services in the ATC (and Jervis Bay), the major Australian airports, embassies and consulates within Australia, most Australian embassies, and the Christmas, Cocos and Norfolk Islands. As the agency that enforces Commonwealth law, the AFP is regularly involved in the investigation of national and transnational crimes such as acts of terrorism, people smuggling, electronic crimes and illegal drug importations. The AFP also provides police and forensic assistance to countries in South East Asia, Australasia and the Pacific.

Figure 1. External view of the Mobilab.

With such a broad territory to cover, AFP forensics has a fundamental need to be mobile. For many years this capacity has been provided by the use of portable detection and analysis equipment in temporary laboratories established at or near the site of an incident. The development of the mobile laboratory complements this capability by providing a safe, secure and clean laboratory that can travel by road, rail or air to anywhere in the world.

In essence, the Mobilab is a large caravan fitted with two independent compartments (Figures 1-6). The compartments can be accessed from the outside by external air tight doors and between compartments with an internal air tight door. The laboratory is connected directly to the power grid by shore ports at the front of the van. When shore power is not available, two on-board diesel generators supply all power needs for equipment, lighting and air-conditioning systems. The fuel tank holds sufficient diesel to power the laboratory for a minimum of 3 days. The van also has a bank of batteries to power the fridge and freezer during transport. Town water can be connected directly to the caravan through a standard hose fitting and, when needed, an on-board water tank housed below the sink holds about 100 litres of water. An identical tank holds waste water for decontamination prior to disposal.

The forward compartment is primarily designed for the chemical analysis of samples while the rear compartment is fitted for biological analysis. Both cabins are fitted with independent recycled air conditioning units and both have high efficiency particulate air (HEPA) filtered intake and exhaust ducts with variable speed fans. These allow the creation of positive or negative atmospheric gradients between the cabins and the cabins and the environment. This allows the cabins to establish the negative atmospheric pressures of a PC3 laboratory for microbiological and biological analysis. For other investigations such as those for trace levels of explosives, the cabins can be used as positively pressurised clean rooms.

The rear compartment houses a large Class III biosafety cabinet (glove box) which has a HEPA filtered intake duct and a series of two HEPA filters and a TEDA carbon filter on the exhaust duct. The exhaust duct is fitted with a variable speed fan which allows the user to regulate the negative pressure within the glove box. High negative pressures are used to capture the off-gas from volatile liquids such as sarin, whereas low negative pressures are used to minimise the disturbance of powders. This allows both biological and chemical specimens to be examined safely. The rear compartment also houses a Class II biosafety cabinet, a sink and a small amount of bench and storage space. The larger forward compartment is fitted with significantly more bench and

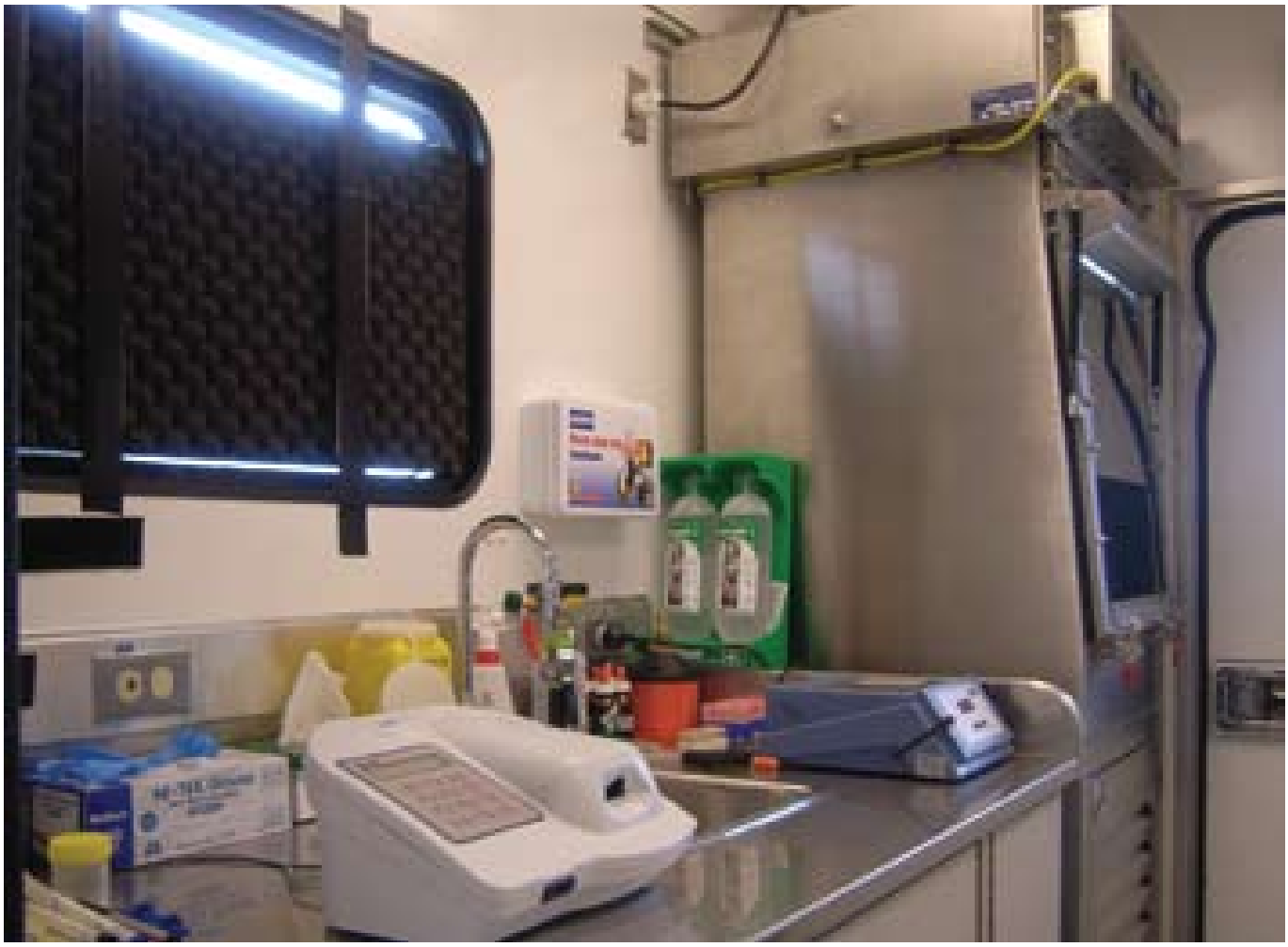

Figure 2. View of the rear cabin looking toward the rear of the van, showing the sink, bench and Class II biosafety cabinet.

Figure 3. View of the rear cabin looking toward the rear of the van, showing the glove box.

Figure 4. View of the forward cabin looking toward the rear of the van, showing the microscope bench and the door to the rear cabin.

Figure 5. View of the forward cabin looking toward the rear of the van, showing the gas chromatograph and mass spectrometer.

Figure 6. View of the forward cabin looking toward the front of the van.

storage space. It has gas lines for helium, hydrogen, nitrogen and air, all of which are plumbed into the compartment from the gas cylinders housed in the cylinder cupboard mounted on the drawbar of the trailer.

The Mobilab has been accredited by the National Association of Testing Authorities (NATA) under Australian Standard AS ISO/IEC 17025:2005 as a static forensic testing laboratory. This only applies when the Mobilab is located within a NATA accredited facility, such as the AFP forensic complex in the ACT. Currently there are no provisions under NATA to accredit a mobile facility. The Mobilab has been designated by the National Institute of Forensic Science Australia as a Chemical Warfare Analysis Laboratory Network (CWALN) laboratory. This allows the laboratory to provide presumptive level identification of a range of chemical warfare agents. The laboratory facilities, ventilation, protocols and work practices are compliant with the Australian Standard AS/NZS 2243.3:2002 for a PC2 laboratory as a minimum.

The laboratory can be deployed within 1 hour of notification and is fully functional within 2 hours of arrival, including completion of cleaning and background checks. It is currently set up to provide screening level capability for the analysis of the conventional chemical and biological warfare agents and confirmation level analysis for explosives, drugs and flammables, as well as other toxic industrial chemicals. Biological analyses include microscopy, colorimetric tests, antibody based strip tests, capillary electrophoresis and nucleic acid analysis; culture is not performed. The primary apparatus for chemical analysis is a combination gas chromatograph, mass spectrometer and dual flame photometric detector for phosphorous and sulphur (GC-MS DFPD). Other analyses include fourier transformed infrared spectrometry (FTIR) and raman spectroscopy. The glove box is large enough to allow the forensic investigation of most of the items requiring urgent analysis during the early stage of major investigations. Items that may be examined include wallets, briefcases, identification cards, telephones, envelopes, packages, documents, computers and electronic storage devices.

Primarily designed to process CBR contaminated samples, the Mobilab also provides a safe and clean laboratory environment for analysing standard forensic items. The laboratory can be used in a reactive manner when a major crime occurs, or be deployed in a supportive or pre-emptive manner such as its deployment to the Sydney airport for APEC in August 2007.

The Mobilab is a national asset available to government agencies in all Australian States and Territories that are involved with emergency response and/or national security.

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