



## DEFENCE OHS FACT SHEET No. 18 – November 2009

### RANGE FUEL

The purpose of this Fact Sheet is to provide information on a cleaning product used in Defence in the 1970s until the 1990s. Range Fuel was a general purpose cleaning solvent used for fast degreasing of artillery pieces and other weapon parts. Some current and former Army personnel have expressed concerns about possible health impacts due to their exposure to range Fuel.

#### WHAT IS RANGE FUEL?

Range Fuel was a product containing unleaded petrol (ULP, also known as unleaded gasoline) and commonly known as Industrial Solvent B. Its approved purpose was as a general purpose cleaning solvent suitable for fast degreasing of machinery and metal parts. There is extensive documentation of the required health and safety precautions listed in the 1984 revision to the Australian Defence Standard DEF(AUST) 475 and in an undated (but pre-1989) Australian Defence Standard DEF(AUST) 206C. There is no reference in this documentation to off spec or contaminated fuel being provided by RAAF. Range Fuel was identified in the ADF inventory as Industrial Solvent B. Its Defence Stock Numbers were: 9130-660091-937X (where the X is 2, 3, or 4 depending on the size of the container). It is understood that 9130-660091-9373 (20L size) and 9130-660091-9374 (200L size) are still listed on the ADF inventory, but that they have not been used for cleaning artillery and other weapon parts for some years.

This Fact Sheet refers only to Range Fuel/Industrial Solvent B/ULP, and not to other products such as leaded petrol or aviation fuel.

There is no specific information available on the toxicity of Range Fuel as such; however, there is extensive information on the chemistry and toxicity of ULP. Unleaded gasoline/petrol is a generic name for a complex mixture of hydrocarbons. Because gasoline/petrol is formulated to meet performance specifications, there can be wide variation in chemical composition. There is also considerable variability in chemical composition, depending on the source of the oil stocks and the processing methods used for distillation, blending and formulation. Unleaded gasoline/petrol typically contains hydrocarbons known as paraffins or alkanes, alkenes or olefins, naphthanes or cycloparaffins, aromatics such as toluene and benzene, and saturated hydrocarbons.

In the 1980s, unleaded gasoline/petrol often contained around 5% of benzene, although the level in unleaded petrol now is less than 1%. Range Fuel tested in 1998 was estimated to contain 26.3% aromatics, including 5% benzene, 7.5% toluene, 10% xylene and 4% ethyl benzene, as well as 25.8% olefins and 47.9% saturated hydrocarbons. The available analytical information on Range Fuel indicates that it was essentially the same product as ULP. Range Fuel may also have contained small quantities of other additives.

In Australia, petrol/gasoline is not covered by the Standard for the Uniform Scheduling of Drugs and Poisons.

Although Range Fuel as such is not listed as a hazardous substance by the Australian Safety and Compensation Council (ASCC) in the *Approved Criteria for Classifying Hazardous Substances* [NOHSC(1008:2004)] 3rd Edition (the Approved Criteria), unleaded petrol (identified as gasoline, natural, CAS Number 8006-61-9) is listed by ASCC (see Safe Work Australia website at <http://hsis.ascc.gov.au/TheList.aspx> for guidance on hazard classification criteria). The criteria included in the Approved Criteria are adopted from European Community (EC) legislation for classifying dangerous substances.

In Australia, ASCC has set an 8-hour time-weighted average (TWA) exposure standard of 900 mg/m<sup>3</sup> for gasoline. A short term exposure limit (STEL) standard has not been set for a workplace environment. There is no standard for skin exposure.



## HOW COULD RANGE FUEL ENTER THE BODY?

Exposure to Range Fuel can occur by inhalation of the vapour or by skin contact. Of these two possible routes, inhalation of the vapour is by far the most likely source. Personnel using Range Fuel for fast degreasing of machinery and metal parts may be exposed to the vapour. The chemical composition of the vapour differs from the liquid, because the more volatile chemicals tend to concentrate in the vapour. Little information is available on how much Range Fuel enters the body when it gets on the skin, although we know that some of the chemicals in Range Fuel, such as benzene, are likely to penetrate the skin more easily than some of the other chemicals in Range Fuel. Most of the Range Fuel vapour that is breathed in is breathed out unchanged, but some of it can rapidly enter the blood and get into other body tissues such as the liver. The liver breaks down Range Fuel chemicals into a range of substances which then travel in the blood to the kidneys, and from there leave the body in urine.

## CAN RANGE FUEL BE HARMFUL?

The extent to which Range Fuel can affect health is determined by how much of it you are exposed to, how much is taken into the body, whether you are exposed for a long or a short time, the route or pathway by which you are exposed (such as breathing, eating, drinking or skin contact), and other individual characteristics such as your age, sex, nutritional status and state of health.

Varied effects can occur depending on the chemical nature of the individual components of Range Fuel. Many of the harmful effects seen after exposure to Range Fuel are due to the individual chemicals in the mixture, such as low amounts of benzene in the Range Fuel. Inhaling or swallowing large amounts of Range Fuel can cause death. High concentrations of Range Fuel vapour are irritating to the lungs when breathed in.

Exposure to Range Fuel vapour in confined or poorly ventilated areas may cause the rapid onset of unconsciousness. Inhalation of Range Fuel vapour may cause dizziness, slurred speech, excitement and incoordination, and Range Fuel vapour may be irritating to the eyes and respiratory system.

Breathing in high levels of Range Fuel vapour for short periods of time, or swallowing large amounts of Range Fuel, may cause harmful effects to the nervous system. Harmful effects on the lungs can occur when someone swallows large amounts of Range Fuel, because when the person vomits, the Range Fuel can enter the lungs, causing chemical pneumonitis. Less serious nervous system effects may include dizziness and headaches; more serious effects may include coma, breathing difficulties and lung damage, as well as adverse effects on kidney and liver function. The more the amount breathed in or swallowed, the more serious the health effects.

Chronic or long-term exposure to high levels of Range Fuel vapour over long periods of time may also cause nervous system effects.

In laboratory experiments of continuous exposure to high levels of Range Fuel vapour, the laboratory animals developed liver and kidney tumours. However, there is no evidence that exposure to Range Fuel vapour causes cancer in humans. The International Agency for Research on Cancer (IARC) has determined that there is *inadequate evidence* for the carcinogenicity in humans of gasoline; and that there is *limited evidence* for the carcinogenicity in experimental animals of unleaded automotive gasoline. The overall evaluation was that gasoline is *possibly carcinogenic to humans (Group 2B)*.

There is not enough information to determine if Range Fuel causes birth defects or affects reproduction.

If liquid Range Fuel is swallowed, it will irritate the lining of the stomach.

Prolonged skin exposure to Range Fuel may cause skin burns and is usually a result of inadequate or inappropriate use of personal protective equipment (PPE). Repeated exposure of the skin to Range Fuel may result in dermatitis. Skin exposure to Range Fuel is not thought to be a major factor in overall toxicity, based on the likelihood that the skin contamination will occur at the same time as inhalation of Range Fuel vapour, which is the main route of entry to the body.



For more information on benzene, a component of Range Fuel, see DCOH Fact Sheet No. 2 on benzene. However it should be noted that the effects of benzene are reduced in proportion to the concentration or amount of benzene present in the Range Fuel mixture.

### WHAT LEVELS OF RANGE FUEL WOULD CAUSE HARMFUL HEALTH EFFECTS?

The main risk to the health of exposed workers is by inhalation of vapours. Exposure to Range Fuel may also occur through skin contact.

Long-term health effects can occur from repeated exposures to Range Fuel at levels not high enough to cause short-term effects. The minimum concentration of Range Fuel vapour needed to produce a mild effect such as a cough is about 140 parts per million in air. The level of Range Fuel vapour that can cause effects on the central nervous system is about 900 parts per million in air. At greater than about 10,000 parts per million, petrol vapour can rapidly exert an anaesthetic effect, resulting in unconsciousness. The level of Range Fuel vapour that can cause death when breathed in is about 10,000 to 20,000 parts per million. Swallowing about 355 to 500 mL of liquid Range Fuel can also cause death.

### IS THERE A MEDICAL TEST TO SHOW WHETHER YOU HAVE BEEN EXPOSED TO RANGE FUEL?

There are laboratory tests to determine if you have recently been exposed to some components of Range Fuel, such as benzene, although these are specialised tests and not usually available at a GP's surgery. For more information on benzene, see the DCOH Fact Sheet No. 2 on benzene. For people possibly exposed many years ago, there are no specific tests available to measure past Range Fuel or benzene exposure.

### WHAT PRECAUTIONS SHOULD BE TAKEN WHEN USING RANGE FUEL?

The health risks involved in handling and using Range Fuel are minimal, provided that it is used in accordance with appropriate health and safety practices.

In the workplace, the most likely source of exposure is through inhalation. Skin contact can also result in inhalation as the Range Fuel evaporates from the skin.

Engineering controls such as closed systems and ventilation should be the principal method for minimising Range Fuel exposure in the workplace. Exhaust ventilation systems should be designed to capture and contain Range Fuel vapour. Ventilation equipment should be checked for adequate performance at least every 3 months. Areas containing high levels of Range Fuel should be restricted to essential workers. If feasible, these workers should avoid direct contact with Range Fuel. When there is potential for Range Fuel exposure, workers should be provided with and required to use appropriate personal protective clothing and equipment. Suitable protective equipment, including petrol-resistant gloves, should also be used when using Range Fuel for fast degreasing of machinery and metal parts in the field. Care must be taken to avoid getting Range Fuel onto the skin. Hands and skin must never be washed with Range Fuel.

Respirators should not be used as the primary control for routine operations, but they may need to be used during situations such as implementation of engineering controls, some short-duration maintenance procedures, and emergencies.

Respirators, if worn, must be of approved design meeting the appropriate Australian Standards. A complete respiratory protection program should include regular training and medical evaluation of personnel, fit testing, periodic environmental monitoring, periodic maintenance, inspection, and cleaning of equipment, proper storage of equipment, and written standard operating procedures governing the selection and use of respirators. The program should be evaluated regularly.



## WHAT SHOULD I DO?

*Current serving members:* If you believe that you have been exposed to Range Fuel and are suffering health effects from this exposure, you should complete form AC563 (Accident or Incident Report Form) and contact your local ADF Health Service to arrange a clinical assessment and an exposure evaluation.

*Current and former ADF members:* You may lodge a claim with the Department of Veterans' Affairs if you believe that your health has been adversely affected by exposure to Range Fuel. Call 133 254 or 1300 550 461

*Civilian employees:* If you believe that your health has been affected by exposure to Range Fuel, you should contact the Defence Hazardous Exposure Evaluation Scheme (DHEES) (toll free line 1800 000 655) and register your personal and possible exposure details.

## FIRST AID AND EMERGENCY TREATMENT

Remove the victim from the source of the exposure, making sure not to endanger the rescuer.

If the victim is not responsive, commence CPR, making sure not to breathe the fumes and not to contaminate the rescuer.

If the victim shows signs and symptoms of poisoning, ring **000** for an ambulance, and contact the **National Poisons Information Service** (telephone **13 11 26**) for detailed guidance on handling the emergency.

**Inhalation:** If the victim has been poisoned by breathing Range Fuel vapour, get victim into fresh air. If possible, give 100% oxygen, and seek medical treatment.

**Eye contact:** If Range Fuel contacts the eye, wash it out with copious quantities of water or saline as soon as possible, and refer for medical evaluation.

**Skin and hair contact:** If Range Fuel contacts the skin or hair, wash it off with soap and copious quantities of water as soon as possible.

**Ingestion:** If Range Fuel has been swallowed, wash material from around mouth. Do not make the victim vomit; if the victim vomits spontaneously, collect the vomited material in a labelled, sealed plastic bag and send with the victim to hospital.

Contaminated clothing should be removed and placed in a sealed plastic bag. Use plastic gloves for this task and then discard them.

Send patient for medical evaluation as soon as possible. In more severe cases the patient may need to be transported urgently by ambulance.

Further guidance should be obtained from a specialist clinical toxicologist at an early stage.

## Further information

For further information see:

1. DCOH Fact Sheet No. 2 on benzene
2. International Agency for Research on Cancer (IARC) Gasoline (Group 3b) Summary of Data Reported and Evaluation – (1998) <http://www.inchem.org/documents/iarc/vol45/45-03.html>
3. Petrol Toxicological Overview. UK Health Protection Agency. (2007) <http://www.hpa.org.uk/HPA/Topics/ChemicalsAndPoisons/CompendiumOfChemicalHazards/1190384328586/>
4. Toxicological Profile for Gasoline. US Agency for Toxic Substances and Disease Registry (June 1995) <http://www.atsdr.cdc.gov/toxprofiles/tp72.pdf>

The sponsor of this Fact Sheet is the [Defence Centre for Occupational Health](#) (DCOH) within the Occupational Health and Safety (OHS) Branch.