

AN SUTUMAN WCB environmentalist

Report on a visit to Cascade Aerospace, 1337 Townline Road, Abbotsford on Friday 10 May 2002.

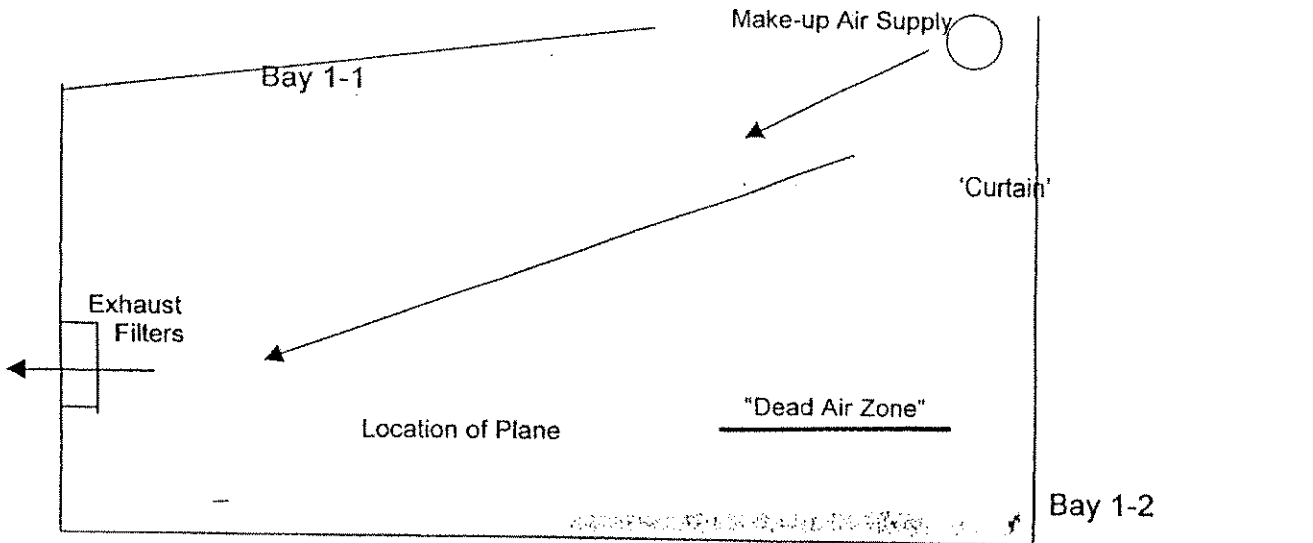
The comments in this report will be in addition to the process details found in the reports from Cascade Aerospace already placed on the files of these claimants.

I met with Todd Siefke and Richard Bellamy (Safety and Health Coordinators for the company).

We first reviewed the layout of the hangar, clarified the actual process details for the first use of the Turco 6776 LO product on March 15/16, and reviewed the sampling data that was provided by Theodore Sterling et al.

This is a very large structure with two bays, each capable of housing four 737 aircraft. There is a central divider that contains various services – including make-up air supplies. Each bay is sub-divided into four "quadrates". The dimensions of each pair (1-1 and 1-2) are about 200 feet long, by 150 feet wide by between 90 and 120 feet high (the roof slopes from a central peak). The bay (1-1) in which the paint stripper was applied has been separated from its adjoining bay (1-2) by a large paint curtain hung from near the ceiling (but with a 10-20 feet gap) and a second curtain hung at the end of the bay in front of the doors to the tarmac. The office end of the bay (opposite to the main bay doors) was not hung with plastic sheets, thus leaving open the ground level and mezzanine walkways.

Make-up air is provided from ductwork located near the ceiling above the main plastic drape and opposite to the exhaust filters, which are located on the exterior wall – but are 20 feet above the floor level. The air flow will be across the bay but is unlikely to reach the floor level. The cross-sectional area of the bay is about 20,000 square feet (200 ft long by 100 ft high).



The dust samples were collected inside bay 1-1 and, on the other side of the curtain, in bay 1-2. These were found to contain formic acid at amounts ranging from 3300 mg/kg of dust (by the exhaust filters) and 2200 mg/kg (by the main drape curtain) to 870 mg/kg

in bay 1-2. Strangely, samples collected in the other two bays at the other end of the building had levels higher than in bay 1-2, namely 2100 and 1400 mg/kg. These results cannot be readily explained. During the second application, air samples were collected by Cascade OH&S coordinators and one sample collected in the ground level walkway (near to the exit to the lunchroom, at about 08.45 am) indicated formic acid at about 40 ppm in the air. Formic Acid is a strong irritant and has very poor warning properties, i.e. it cannot be smelled until it is over the exposure limit of 5 ppm. Thus supplied-air respirators are the minimum level of respiratory protection. Samples were also collected (by Sterling) for airborne benzyl alcohol. The results were generally below 10 ppm, (although one sample collected for eight hours during the first application was analyzed at 10 ppm) which indicates little vapour being generated. This alcohol is not very volatile, and appears to remain in solution – thus, in any overspray.

It has been determined by Cascade Safety and Health Coordinators that the initial application of the Turco 6776 LO was by pressure sprayer – and too high a pressure was used. This started at 11.30 pm (March 15) and was completed before 2 am (March 16). The stripper works for several hours and the loosened paint is "squeegeed" off onto a large tarpaulin on the floor under the plane. A second coat of the Turco 6776 LO is applied to loosen the more stubborn areas of paint. This was started at 8.30 am. On March 16th. After this coat has been removed, the neutralizer solution (5948 DPM) is sprayed onto the plane's surface. This contains monoethanolamine (3-7%) and dipropylene glycol monomethyl ether (1-5%). This process did not start until later in the afternoon of March 16th.

Once the applications are complete, the floor is pressure washed, into a drain channel in the floor, and the waste water is collected outside the building.

There was a problem with the operation of the exhaust ventilation system during the application of the stripper. For a period of time – maybe just a few minutes – the air flow was reversed – resulting in a pressurization of the enclosed work area (bay 1-1), rather than a slight pressure reduction, which results from air being exhausted.

The process has not been used since this application. The subsequent plane to have the paint stripped off was treated with the old product – basically methylene chloride. It is also likely that some routine cleaning has been done using compressed air in the weeks since the application of Turco 6776. This is not a standard practice, but is likely done by some staff, who do not realise the implications. Whatever contaminated dust remains has probably been recirculated into the air inside the plant on several occasions.

Initial Conclusions:

1. It is necessary to have air moving at 50 – 100 feet per minute to effectively capture airborne vapours, and a higher airflow to capture particulate material. The overspray containing formic acid will be in the form of a particulate aerosol (mist), as well as vapour. Since the spray was applied at an excessive pressure, and significant amounts of contaminated dust were found in the work area, it is reasonable to assume that there was an excessive amount of overspray in the form of mist. While it is impossible to estimate the airborne concentration of the mist – we do know that whatever mist was in the air would contain about 5% formic acid.

To move air at a rate sufficient to capture the mist would require in excess of 100 ft/min air flow across a cross-sectional area of 20,000 sq. ft. This means moving in excess of

2 million cubic feet of air per minute²(cfm)! It is unlikely that this can be achieved and the current exhaust fans are rated to move a total of 150,000 cfm – less than 10%.

Thus, the mist will remain suspended in the air inside the work area, and gradually falling onto the floor, and any other horizontal surfaces. Formic acid vapour will also remain in the air for many hours, as the air flow is relatively low.

The amount of air flowing across the room will also be significantly less than the calculation given, as much of the air exhausted will come from the open areas near to the exhaust fans – rather than from the make-up air units in the ceiling area. In actual fact, air flow across the bay was likely to be almost unmeasurably small – probably just a foot or two per minute.

Rough calculations suggest that improving the seals on the two main curtains, providing a further paint curtain to seal off the ground floor walkway and (somehow) providing a plastic sheet at a height of about 40 feet from the floor (with air fed into this enclosure through plastic ducts from the make-up air units) could allow for about 50 feet per minute across the reduced cross-sectional area.

The expense of erecting such an enclosure would be eliminated and the airborne hazard would be virtually nil, if the stripper were applied by roller.

2. Discussion with two workers confirmed that the first signs of discomfort for workers on the Saturday shift were reported by 9 am. One worker noticed a headache, followed by severe lethargy, while a second suffered severe eye irritation – but not until about 4 pm.

Formic acid is an organic acid with a low dissociation constant, relative to the common mineral acids (e.g. hydrochloric acid). This means that much of the material remains as the complete molecule (H.COOH) rather than as hydrogen ion (H⁺) and 'carboxyl' ion (H.COO⁻). It is the dissociated ions that are the irritant species. Thus eye, nose, throat and lung irritation will normally be slow in onset.

The neutralizer (5948 DPM) contains monoethanolamine, which is corrosive. Exposure to large quantities will cause irreversible burns, and exposure to small amounts in air will be significantly irritating. Since monoethanolamine is fairly volatile, airborne exposure will be a concern, regardless of the method of application of the neutralizer product (5948 DPM). The exposure limit of 3 ppm is designed to protect against the irritant effect. Unfortunately, there is no possible way to estimate the actual exposure during the application on Saturday 16 March (pm).

3. Since there was no barrier at the end of the bay where the passageways are located and there was a short-lived period during which the work area in bay 1-1 was actually pressurized, the airborne spray mist will have been spread throughout the accessible areas. Dust containing considerable amounts of the formic acid was found at the other end of the building, in bays 2-1 and 2-2. Anyone working in those areas at the time of either application of the 6776 LO is likely to have been exposed. The extent of the exposure is impossible to estimate at the stage.