The Case of the Transuranic-Loving Squirrels

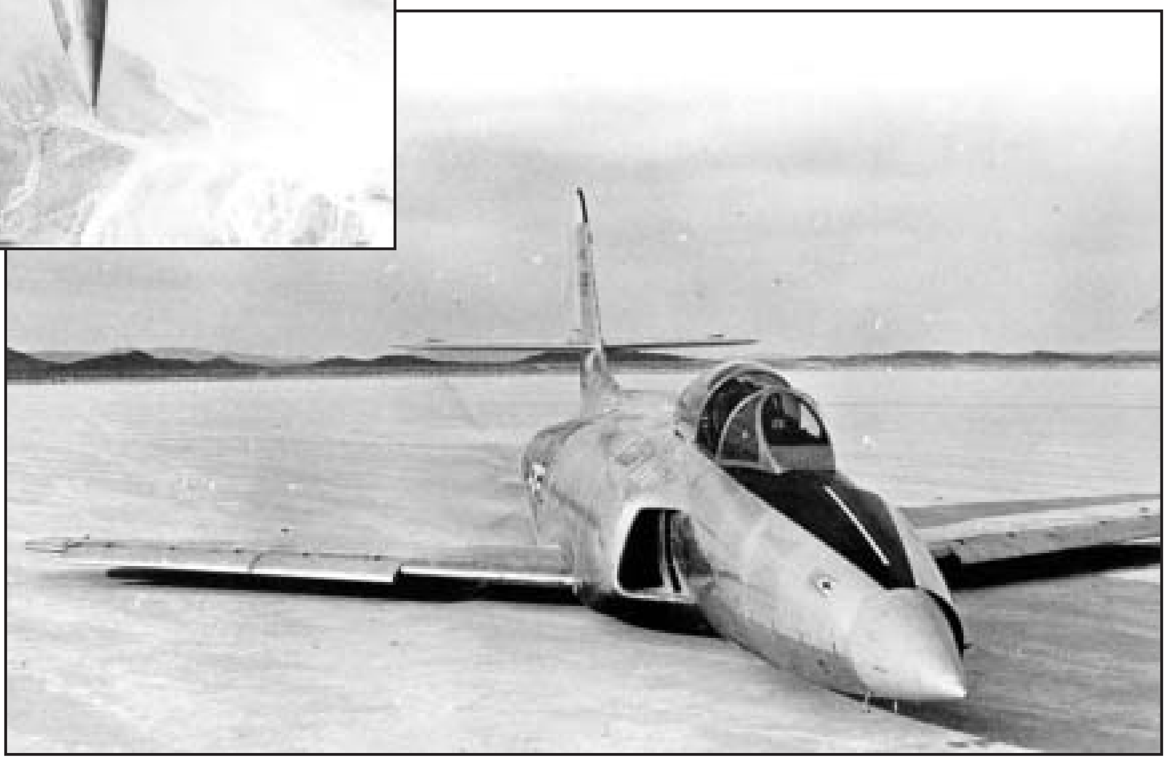
The Decontamination of the XF-90A

By James Seals

The Airplane

The XF-90 was designed to be a long-range penetration fighter that would escort long-range bombers (B-36 and B-50) to their targets. On June 20, 1946, the U.S. Army Air Force issued a contract to Lockheed for two prototypes. The first, the XF-90, was delivered for flight testing in the spring of 1949. The XF-90 reached a maximum speed of 668 miles per hour in level flight at 100 feet and a maximum speed of mach 1.2 in a dive. The second, the XF-90A, had 35-degree sweptback wings, a sharply pointed nose, and a pressurized cockpit. The plane could be fitted with supplemental wingtip-mounted fuel tanks and twin side-by-side Westinghouse XJ34-WE-15 turbojets, with afterburners producing 4200 pounds static thrust. Soon after initial flight testing on June 3, 1949, the two aircraft were retrofitted with afterburning J34 engines.

The XF-90 project was terminated in September 1950. One of the planes had been tested to destruction in the



Above: *The plane during a test flight.*

Right: *Photo of the plane taken after an emergency landing.*

The tail section of the aircraft.

National Advisory Committee for Aeronautics (now National Aeronautics and Space Administration) laboratory in Cleveland, Ohio. The other plane was used in aboveground nuclear testing at Frenchman's Flat on the Nevada Test Site (NTS).

The Job

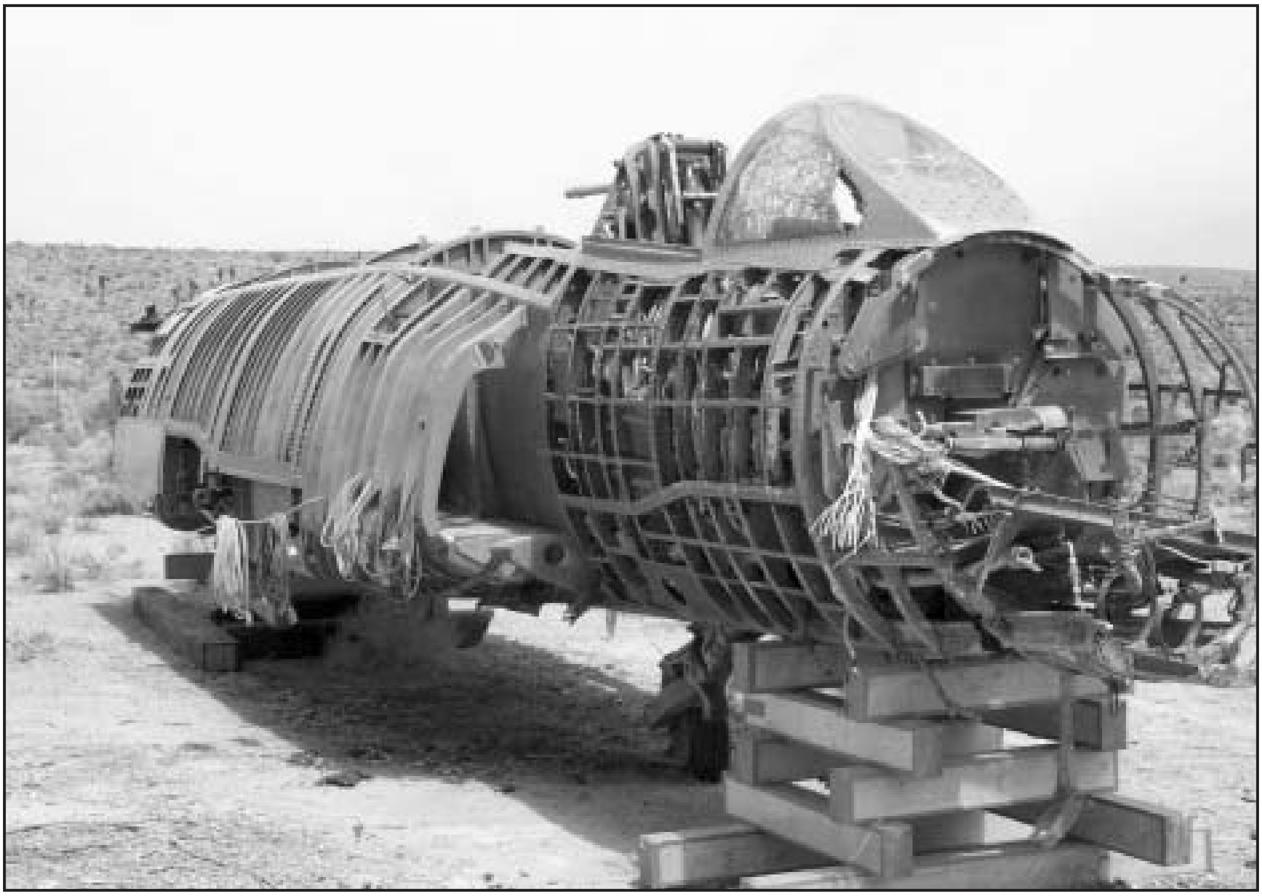
In November 2001, the U.S. Air Force Museum at Wright-Patterson Air Force Base contacted Fluid Tech Inc. to decontaminate the only remaining XF-90A, which was located on the NTS in Area 11, Plutonium (Pu) Valley, considered to be one of the most highly contaminated areas on the NTS. In 1957, four safety experiments for Pu dispersal had been conducted with several kilograms of Pu at ground level. The immediate ground-zero areas are high-contamination areas, approximately 300 ft in diameter, with transuranic soil concentrations ranging from 2700 to 8100 microcuries per square meter.

The Contamination

The airplane had been broken into two pieces right behind the engines, with the wing, fuselage, and engines at the center of one ground-zero area and the tail section at the center of another. The plane sections had been placed at these locations to provide realistic training for Broken Arrow (plane accident with nuclear material on board) exercises. Contaminated soil had been placed on surfaces and in openings of the plane. The XF90A had been exposed to more than 40

The fuselage section, during the jet engine removal operations.

Squirrel debris in the fuselage.



The fuselage with the skin removed.

Jet engine being transported to Fluid Tech's EMAD facility.

Main wing assembly being cleaned.

Tail section to be transported to EMAD.

years of whirlwinds, winds, and weathering, which resulted in slight amounts of airborne contamination (femtocuries) and deposits on the plane's surfaces.

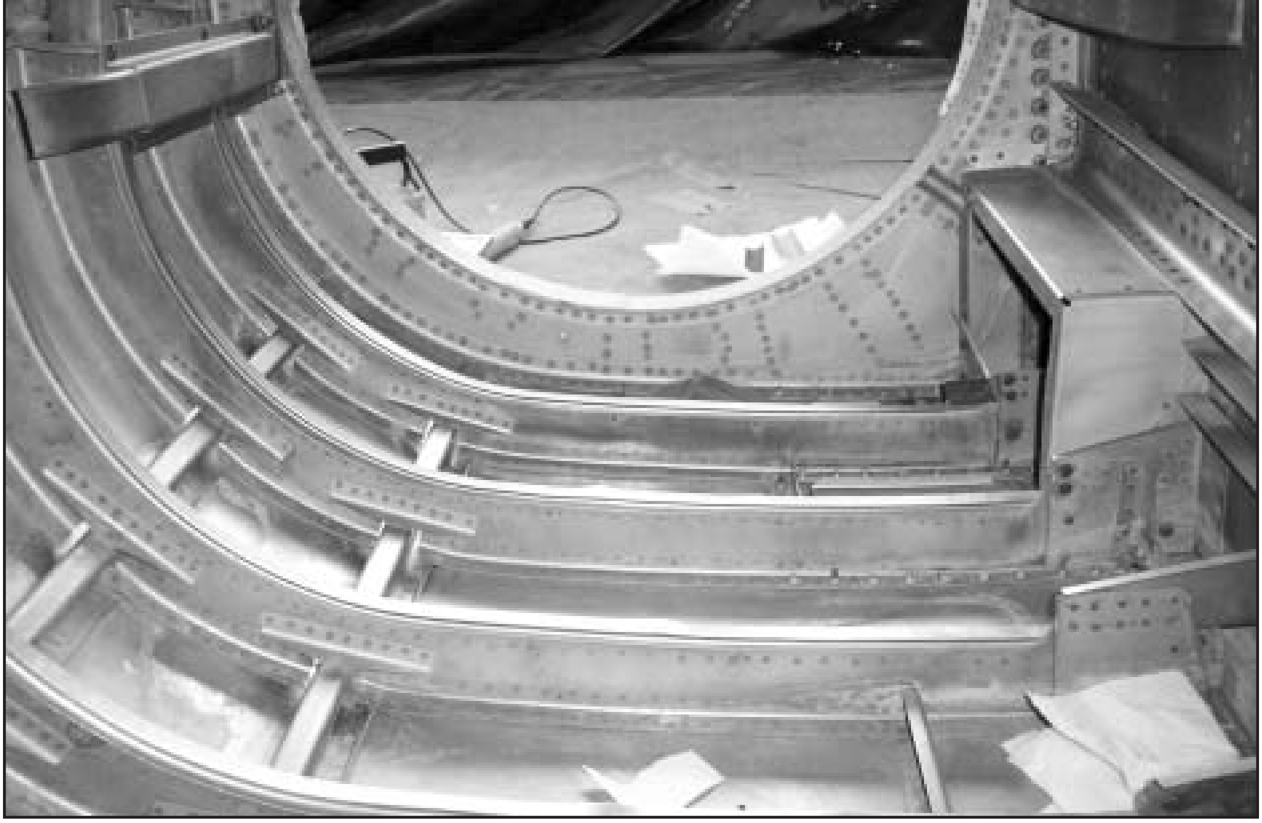
The main source of the plane's contamination, however, was a colony of transuranic-loving, white-tailed antelope squirrels, like small chipmunks, that considered the plane to be a high-rise condominium. The squirrels had dug burrows into the contaminated soil, collected twigs and brush from the highest concentration of contamination at the base of local vegetation, and moved into the plane. Once in the plane, the squirrels, with their contaminated fur and contaminated twigs, set up housekeeping. The squirrels seemingly could penetrate a keyhole; every crack and cranny in the plane was filled with brush and was, therefore, contaminated.

Tail section begins to be disassembled at EMAD.

The Cleanup

Fluid Tech first stabilized the desert soils immediately surrounding the plane and the dirt roadways leading to the plane using TranSeal I, Fluid Tech's own dust suppressant, which complies with U.S. Environmental Protection Agency and Nevada regulations.

Because of the squirrels that had occupied the aircraft for 40 years and the attendant possibility of the presence of the *Hanta* virus, workers using a water truck and a high-pressure spray washer disinfected the plane with sodium hypo-chlorite (bleach). Every piece that left the contamination zone was pressure washed with soap and water and surveyed. Then, if necessary, pieces were pressure washed with water and sand using a pressure-washer wand, which had a venturi that pro-



Cleaned and decontaminated fuselage.

duced suction from the water flow, pulling sand into the high-pressure water. The sand was purchased from America Cement and Aggregate (located at the southeast boundary of the NTS). A schematic identified and showed the location of every piece of the plane before removal and listed the final contamination survey results for gamma, beta, and alpha contamination.

Disassembly of the aircraft involved using the company's all-terrain 38 000-lb-capacity crane to remove the engines and to separate the fuselage from the wings. The two engines were removed and wrapped for shipment to Fluid Tech's Engine Maintenance and Disassembly (EMAD) facility. (Interestingly, after 50 years, the engine compressor blades still rotated freely when spun by hand. The good bearings were from different manufacturers. Good bearings!)

Every rivet on the fuselage, wings, tail section, and outer skin was drilled out to the correct size for replacement with original size rivets. Drilling the rivets required an enormous quantity of drill bits and the careful selection of drill bit types (angle of tip point) and drill bit material (carbide, high speed, titanium nitride, titanium carbonitride, or aluminum nitride coated).

With the outer skin removed, every piece of equipment on the wings, tail section, and fuselage was removed. This included fuel tank, hydraulic lines, electrical junction boxes, electrical wiring, motor insulation, and miscellaneous parts too numerous to mention. The fuel tanks seemed to be made from a type of rubberized canvas, and there was a lead counterbalance on the vertical stabilizer.

Fluid Tech positioned a self-contained laboratory skid outside the fenced contamination zone opposite the hot line. The lab skid had a diesel electrical generator, potable water, electric air conditioning/heating, regulated power for instruments, hood and laboratory counting gear, and shelving for anti-c's. Whenever decontamination was taking place in the field, personnel counted all swipes and air samples daily. During the summer months, because of the severe heat, disassembly and decontamination activities took place during the graveyard shift with floodlights and generators.

Instrumentation used during preliminary surveys and the final survey included Ludlum Model 2360 with 100 cm^2 43-93 alpha/beta probes, a Ludlum Model 19 scintillation gamma detector, two Tennelec Automatic Planchet Counting Systems Series II swipe and air sample counters, numerous Ludlum Model 2200 scalers with Alpha 43-1 probes, and an Eberline Personnel Contamination Monitor PCM-1B alpha/beta monitor. Calibration and instrument verification was done using Eberline Model 594-4 Pu-239 and Eberline DNS-19 Tc-99 alpha/beta standards.

The final survey was done in Room 114 of the Fluid Tech EMAD facility. A background survey was conducted prior to the airplane's arrival. The room survey included both loose and fixed contamination and a gamma survey using 3- × 9-in. NaI detectors. Both gross and spectrum counting were taken at various heights and locations. Ortec's A65-B32, Version 5.10, Maestro 32 software was used for data interpretation. The survey criteria used were from Regulatory Guide 1.86, "Termination of Operating License for Nuclear Reactors, Transuranics," as a maximum value with an end point of no detectable transuranics.

Further Reading

"Penetration Fighter, the Lockheed XF-90," *Air Intelligence Review,* July 5, 1949.

James Seals is the radiation safety officer for Fluid Tech. *The company acknowledges the support of Robert E. Friedrichs, from the U.S. Department of Energy in Nevada, who provided invaluable support acting as liaison between the Air Force Museum, Bechtel Nevada (the prime contractor at the NTS), the Nevada Department of Energy, and Fluid Tech.*