

FINDING OF NO SIGNIFICANT IMPACT (FONSI)
CHEMICAL RELEASE EXPERIMENT
U.S. AIR FORCE SPACE DIVISION

1.0 INTRODUCTION

1. The U.S Air Force proposes to conduct an experiment to identify the potential environmental consequences of an inadvertent release of hydrazine rocket propellant in space, during orbital or suborbital operations. The experiment will be sponsored by the Space Defense Initiative Organization. The experiment will be managed by the U.S Air Force Space Technology Center.
2. The experiment will be conducted in the thermosphere of outer space, at an earth of about 300 km.
3. The experiment will involve the ejection of three Get Away Special (GAS) satellites (one during the first and two during the second Shuttle flight), each containing about 100 pounds of specified hydrazine fuel, plus the required circuitry for tracking and ordinance activation.
4. The satellites will be ejected from a Space Shuttle which will be launched from Kennedy Space Center.

2.0 IMPACTS

2.1 IMPACTS OF THE PROPOSED EXPERIMENT

2.1.1 HYDRAZINE TRANSPORT TO THE TROPOSPHERE

1. It is anticipated the virtually none of hydrazine would reach the troposphere (the atmosphere extending from the surface of the earth outward to about 10 to 15 kilometers).
2. Small amounts, if any, of hydrazine reaching the troposphere would be diluted by more than 10^{18} pounds of air by the time any reached the ground on the order of years after its release.

2.1.2 TRANSPORT OF REACTION PRODUCT TO THE TROPOSPHERE

1. The effects of hydrazine reaction products would not be significant, regardless of whether they were transported to the troposphere, primarily because most of the products are standard atmospheric components.
2. The reaction of hydrazine with ozone in the upper atmosphere can potentially produce nitrosamines. However, these compounds would be degraded by reaction with OH radicals and daytime photolysis. Therefore, any nitrosamine produced by ozone reactions with hydrazine would be consumed before reaching the troposphere.

2.1.3 LOCALIZED INCREASE IN ULTRAVIOLET RADIATION

1. Because of the unmeasurably small quantity of ozone which could be depleted as a result of the proposed experiment, the quantitative increase in ultraviolet radiation would be insignificant.
2. There would be no significant effect to either human populations or the natural marine environments (specifically, phytoplankton).

2.2 IMPACT OF POTENTIAL ACCIDENTS

2.2.1 ON GROUND ACCIDENT

1. Potential on-ground accidents would likely be associated with Space Shuttle launch and landing. The addition of the hydrazine canisters would not be significant.
2. An accident spill during transport or onsite handling of the canisters would produce only localized, insignificant effects and would be handled in accordance with existing administrative procedures currently followed by the Air Force and NASA.
3. An accidental explosion during transport and handling to the launch site could also produce localized effects. These, too, would be handled in accordance with existing administrative procedures.

2.2.2 LIFTOFF ACCIDENTS IN SPACE

1. The principal potential accident during liftoff is an explosion induced by malfunction in the Shuttle launch vehicle, resulting of the canisters and ignition of the hydrazine. The subsequent exhaust product have been shown to have no significant environment impact.
2. Should the hydrazine fuel be released into the ocean from both canisters simultaneously, the concentration is estimated to be 40 ppm at a distance of 0.1 mile, well below the toxicity level of 146 ppm. This would produce only a temporary and highly localized effect . The overall impact would be insignificant.

2.2.3 ACCIDENTS IN SPACE

1. There would be no significant impact from an explosion in the upper atmosphere, prior to either the release of the canisters or the command for detonation.
2. In the event of an error in orbital placement, the GAS container would either fall to earth and be burned in the atmosphere or leave the gravitational system of the earth. In either event, there would be no significant impact.
3. A loss or ordinance control resulting in either an inability to detonate or incorrect detonation would not create significant environment impact.

3.0 MITIGATIONS

1. The canister will be designed to the requirements of the GAS container dimensions and weight limitations.
2. The Air Force has developed appropriate safety (administrative) procedures for the routine handling, transport, and utilization of hydrazine fuels which are utilized for numerous other operations.
3. Safety and other operational requirements of the Shuttle will be fulfilled by the contractor selected to design and construct the hardware and provide integration services.
4. Provisions will be made for unloading the canisters in the event of an extended launch delay or

other such circumstances.

4.0 ALTERNATIVE

4.1 LABORATORY TEST ALTERNATIVE

1. This alternative would require the duplication of both upper atmospheric conditions and the mechanism for diffusion of hydrazine and reaction products in the atmospheric. It would be virtually impossible to simulate in the laboratory the phenomena which will be tested by this release.
2. This alternative, therefore, is not feasible.

5.0 FINDINGS

1. In view of the above, a finding of no significant impact is made.
2. An Environmental Assessment for the proposed Hydrazine Release Experiment July 22, 1987, is on file at:

HQ Space Division
Post Office Box 92960
Worldway Postal Center
Los Angeles, California 90009
ATTENTION: Mr John Edwards, SD/DEV

Raphael O. Roig
Chairman Space Division
Environmental Protection Committee

Date