HYPERGOL HAZARDS

- Hydrazine
- Methylhydrazine (MMH)
- Dinitrogen Tetroxide

HYPERGOL

- Rocket fuel propellant constituents that ignite spontaneously upon contact with each other (FUEL + OXIDIZER) = BLAST OFF!

Hydrazine/Methylhydrazine Hazards

Absorption through the skin may cause damage to

- liver
- blood
- kidneys
- nervous system
- mucous membranes

Inhalation may cause

- respiratory tract irritation
- pulmonary irritation
- delayed gastrointestinal irritation
- convulsions (if exposed to higher concentrations).

Hydrazine/Methylhydrazine Hazards

- The hydrazines are also listed in Industrial Substances Suspected of Carcinogenic Potential to Man, which is published by (ACGIH)

- ACGIH Threshold Limit Value (TLV) is 0.01 ppm for an 8-hour time-weighted average exposure. (Includes methylhydrazine- MMH)

- NIOSH has recommended a ceiling concentration of 0.03 ppm for any 2-hour exposure. (0.04 ppm for methylhydrazine – MMH)

Hydrazine/Methylhydrazine Hazards

- Hydrazine vapors in air are a fire hazard due to chemical's broad flammability range (4.7% to 100%). (2.5% to 100% for MMH)

- Hydrazine smells like ammonia and is detected in the range of 3-5 ppm which is in excess of the OSHA Permissible Exposure Limit (PEL) of 1 ppm.

- Hydrazine undergoes a hypergolic reaction with a number of oxidizers: concentrated hydrogen peroxide, nitrogen tetroxide, concentrated nitric acid, oxygen, ozone

- Spontaneous ignition may occur when hydrazine comes into contact with the oxides of the following metals: iron (rust), copper, lead, and manganese.

Hydrazine/MMH Personnel Protection Plan

- Proper Training
- NO PERSONNEL may enter hydrazine containing area without the proper training
  - 10 Minute Video on Hydrazine Hazards
  - Hypergol Hazards Briefing
  - Emergency Life Support Apparatus (ELSA) Familiarization
  - Approved on Access List

Hydrazine/MMH Personnel Protection Plan

- Detection
  - Dosimeter Badges
    - Badge Number, Person's Name, date & Time will be Logged when Badges are Assigned
    - Once the Seal is broken on the Badge, they are only good for 2 days
    - The Badges have Color Indicator Standards Next to the Indicator Windows. Observe your buddies to verify that their Badges do not Change
    - When turning in a badge, the badge number person's name, date and time will be logged. (Security)
    - Badges will be compared to a dose-estimator once per day, unless there is some suspicion that your badge has changed color. (Safety)

Hydrazine/MMH Personnel Protection Plan

- How will you know if a leak has occurred?
  - Either an Interscan LD-18 or a Honeywell CM-4 Continuous Monitor will be used and each has audible & visual alarms
  - FD or Ground Safety checks with portable monitor (Either Interscan 41XX series, Draeger PAC III or Draeger Tubes as backup). You will be verbally told to evacuate
  - Dosimeter Badge. Monitor your buddies' badges and check for colormetric change. If so, sound the alarm loudly, so that everyone may evacuate the area.

Hydrazine/MMH Personnel Protection Plan

- Situational Awareness
  - Planning your evacuation should leak occur
    - Select closest exit that is away from the source of the hydrazine leak – **not on a route that goes past the source**
    - When alarm sounds leave out the appropriate exit
    - When outside look for wind indicator & escape upwind to an initial distance of 100 feet from the facility
    - The NASA/WFF Fire Department will respond and implement the appropriate Facility Incident Control Plan.
    - In the event that a leak has been verified by the Fire Department, move upwind at least 400 feet or as directed by the Fire Department personnel
    - Take a general count of who & who is not there, & report this to response personnel (fire department)

Hydrazine/MMH Personnel Protection Plan

- First Aid Measures
  - If hydrazine has contacted eyes, get to eyewash fountain outside building, remove contact lenses (if applicable) and wash eyes for at least 15 minutes
  - If hydrazine has contacted skin, get to safety shower, take off ALL contaminated clothing, and wash for at least 15 minutes
  - Any exposure to hydrazine will require immediate medical attention

Oxidizer Hazards

Oxidizer (Dinitrogen Tetroxide – N_2O_4)

- Most hazardous constituent is nitrogen dioxide

Serious results may not be felt until hours or days after an exposure, even though heavy damage has occurred. A single acute exposure may cause death

Absorption - Highly corrosive to the skin and may cause chemical burns

Vapors are extremely irritating to the eyes and capable of causing pain and severe conjunctivitis (pink eye)

Inhalation – may cause upper respiratory tract/lung irritation

Oxidizer Hazards

- ACGIH Threshold Limit Value (TLV) is 0.2 ppm for an 8-hour time-weighted average exposure.
- NIOSH has recommended a ceiling concentration of 1 ppm for any 2-hour exposure.
- Oxidizer has an irritating acid-type odor and is detectable in the range of 1-3ppm.
- Oxidizer undergoes a hypergolic reaction with a number of hydrazine fuels.
- Oxidizer is not flammable but will accelerate the burning of combustible materials.

Oxidizer Personnel Protection Plan

- Proper Training
- NO PERSONNEL may enter oxidizer containing area without the proper training
  - Hypergol Hazards Briefing
  - Emergency Life Support Apparatus (ELSA) Familiarization
  - Approved on Access List

Oxidizer Personnel Protection Plan

- Detection
  - How will you know if a leak has occurred?
    - Either an Interscan LD-15 or a Honeywell CM-4 Continuous Monitor will be used and each has audible & visual alarms
    - FD or Ground Safety checks with portable monitor (Either Interscan 41XX series, Draeger PAC III or Draeger Tubes as backup). You will be verbally told to evacuate
    - Presence of obvious reddish vapor cloud. If so, sound the alarm loudly, so that everyone may evacuate the area.

Oxidizer Personnel Protection Plan

- Situational Awareness
  - Planning your evacuation should leak occur
    - Select closest exit away from oxidizer leak
    - When alarm sounds leave out the appropriate exit
    - When outside look for wind indicator & escape upwind to an initial distance of 100 feet from the facility
    - The NASA/WFF Fire Department will respond and implement the appropriate Facility Incident Control Plan.
    - In the event that a leak has been verified by the Fire Department, move upwind at least 400 feet or as directed by the Fire Department personnel
    - Take a general count of who & who is not there, & report this to response personnel (fire department)

Oxidizer Personnel Protection Plan

- First Aid Measures
  - If oxidizer has contacted eyes, immediately flush eyes with copious amounts of tepid water for at least 15 minutes
  - If oxidizer has contacted skin, get to safety shower, take off ALL contaminated clothing, and flush exposed area with copious amounts of tepid water for at least 15 minutes followed by washing area thoroughly with soap and water.
  - If inhaled, move to fresh air and monitor for respiratory distress.
  - Any exposure to oxidizer will require immediate medical attention

Hydrazine/MMH/Oxidizer Personnel Protection Plan

- Proper Training
  - Every person shall be issued an ELSA (Emergency Life Support Apparatus) wherever they may be required to egress an area using a route that takes them past a leak source.
  - An (ELSA) will need to be donned if there is a leak alarm and egress is required past the leak source. (If the nearest exit is away from the leak source, ELSA donning is not practicable).

Hydrazine/MMH/Oxidizer Personnel Protection Plan

- ELSA Familiarization
  - The procedure for Donning an ELSA
    1. Check Pressure on the Gage. If not Full get another ELSA
    2. Place strap around neck to free your hands
    3. Pull Tab exposing the air hood
    4. Work the air hood so that it will be easy to don
    5. Start Gas Flow
    6. Place hood over the head
    7. Exit the area, and proceed down the gantry stairs
    8. Egress should be in a controlled manner (DO NOT RUN)
    9. Visibility may be poor in the ELSA hood so take care when going down stairs– use handrail
    10. Once down remove the ELSA.
    11. If you've had an exposure, perform first aid and get medical attention
    12. Proceed upwind and out of danger.

Fueling Facility Danger Area

V-55

V-55 Marshalling Areas

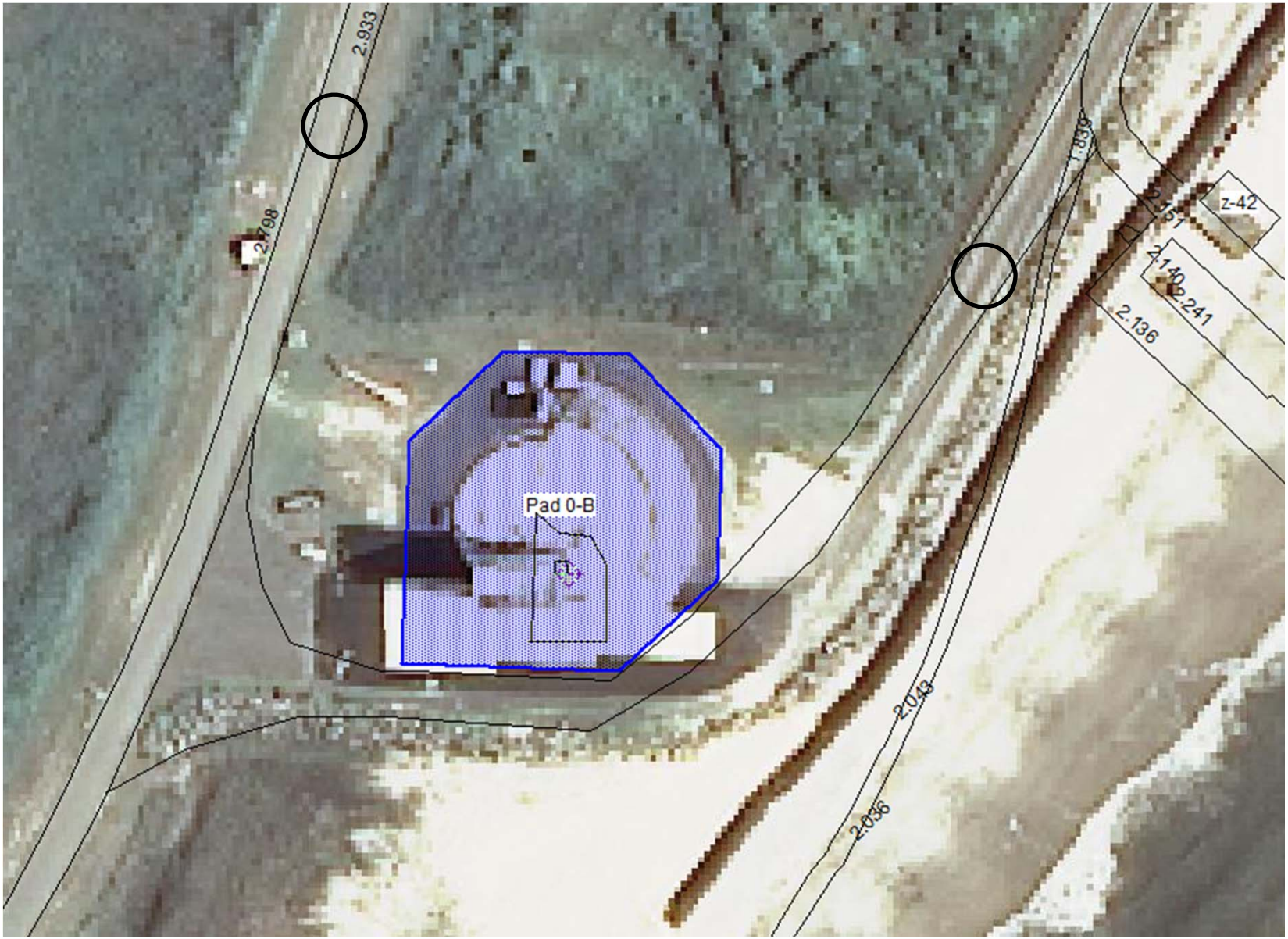
Oxidizer Storage (Z-20)

Hydrazine/MMH Storage (Z-25)

Z-20/Z25 Marshalling Areas

Horizontal Integration Facility (HIF)

HIF Marshalling Areas



Pad 0B Marshalling Areas


Pad 0A Marshaling Area