

Night Clouds

12/2/05 http://science.nasa.gov/headlines/y2003/20jun_TMAclouds.htm Night Clouds

A series of upcoming rocket launches will create glowing white nighttime clouds visible from the eastern seaboard of the United States.

(Listen to this story via streaming audio on the NASA Website, a downloadable file, or get help.)

June 20, 2003:

One night soon, people on the eastern seaboard of the United States might see some strange clouds in the sky: milky white, glowing and twisting in the wind. The clouds will be manmade, created by scientists to study Earth's ionosphere--a layer of our atmosphere near the edge of space.

Three rockets launched from the NASA Wallops Flight Facility, Wallops Island, Va., will release a chemical called trimethylaluminum (TMA) into the air 90 km to 175 km above the Atlantic Ocean.

TMA burns spontaneously in the presence of oxygen. The harmless by-products of this glowing reaction will be visible from coastal Virginia, North Carolina, Maryland, New Jersey, Washington DC, and possibly parts of lower New York and Pennsylvania.

Right: A trimethylaluminum-burning cloud photographed over the University of Alaska's Poker Flat Research Range in 1978.

The launches will take place between 9:30 pm and 5:00 a.m. on a night yet to be decided between June 23rd and July 10th. The time and date depends in part on clear skies at two of three special camera sites located along the Virginia and North Carolina coasts.

Members of the public can keep track of the mission by calling the NASA Wallops Flight Facility launch

status line at: 757/824-2050. A pre-recorded message will be promptly updated when launches begin. NASA will also have a web site with text updates and live video of the launches during the mission at <http://www.wff.nasa.gov/webcast>.

The clouds will allow scientists to monitor winds in the ionosphere, explains Gregory Earle from the University of Texas in Dallas, the lead researcher for the project. "They will act as a tracer and allow us to view the winds at various altitudes over a period of time." This is important because of space weather. The ionosphere is a critical link in the chain of Sun-Earth interactions. Solar flares and radiation from sunspots break apart molecules and ionize atoms in Earth's upper atmosphere--this is how the ionosphere is formed. The ionosphere, in turn, affects such things as radio communications and Global Positioning System reception on Earth.

Left: Layers of the ionosphere. [more]

"The data gathered from this project will aid in our understanding of the relationship between the winds and ionospheric activity," says Earle. This research may one day lead to better forecasting of space weather effects on satellites, communications and power systems.

There will be four rockets launched, but only three will release TMA: the first, second and fourth rockets. The third rocket carries only scientific instruments. The TMA will be released over the Atlantic Ocean at altitudes from 56 miles (90 kilometers) to 109 miles (175 kilometers). The clouds will take about four to five minutes to form after the TMA release and remain visible for approximately 20 minutes.

There will be about 90 minutes between the launch of the first, second and third rockets. The third and fourth rockets will be launched about 10 minutes apart. The actual period between launches will be decided in real-time as the mission occurs.

NASA has used TMA for decades as part of rocket studies from sites worldwide to study the near-space environment. TMA burns slowly and produces visible light that can be tracked visually and with special camera equipment.

Above: TMA will be delivered to the ionosphere by three Terrier-Orion rockets like this one. The products

of the reaction, when TMA is exposed to air or water, are aluminum oxide, carbon dioxide and water. Aluminum oxides are commonly used to combat heartburn and to purify drinking water. TMA poses no threat to the public during preparation on the ground or during the release in Earth's atmosphere. **(This is questionable as the MSDS for Trimethyl Aluminum does not say exposure is safe.)**

The project is a NASA and multi-university effort. In addition to the University of Texas, students and personnel from Clemson University and Utah State University are participating in the mission.

Credits & Contacts

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The Science and Technology Directorate at NASA's Marshall Space Flight Center sponsors the Science@NASA web sites. The mission of Science@NASA is to help the public understand how exciting NASA research is and to help NASA scientists fulfill their outreach responsibilities.

Web Links

Live video of the rocket launches (NASA/Wallops)

Ionosphere links: Introduction to the Ionosphere (NOAA); Earth's Ionosphere (Oulu); Regions of the Ionosphere (Windows to the Universe).

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THE END

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Material Safety Data Sheet - Trimethyl Aluminum

Product Identity: StealthKote Sound Damping Liquid

SECTION I Product Identity

Manufactured by: Trigon Manufacturing Inc.

535 W. Iron Ave. #120 Health 1

Mesa, AZ. 85210 Flammability 0

480-223-1000 Reactivity 0

Emergency Telephone Number 480-223-1000

Information telephone Number 480-223-1000

Date Prepared: September, 2003

SECTIONII Hazardous Ingredients

Chemical Identity-Common Name CAS# % By Wt. OSHA PEL Other Limits

Modified Acrylic Latex Polymer 70677-00-8 40-45% 100 ppm

Mica 12001-26-2 <5 % 3/mg/3

Talc 14807-98-6 5-10% 2mg/m3

Limestone 1317-65-3 15-20% 15 mg/m3 5 mg/m3 Resp

Aluminum Trihydrate 21645-51-2 9-12% 10mg/m3

2,2,4-TriMethyl-1,3-Pentanediol Monoisobutyrate 25265-77-4 <1% N/A

Barium Sulfate 7727-43-7 5-10% N/A

SECTION III Physical/Chemical Characteristics

Boiling Point 335—339 oF Specific Gravity) 1.6@25oC
Vapor Pressure N/A (H2O=1
Vapor Density 4.1 (Air=1) Evaporation Rate N/AV
Melting Point N/A (Butyl Acetate = 1)
Solubility in Water Complete
Appearance and Odor Dark Emulsion with a Slight Ether and Hydrocarbon Odor

SECTION IV Fire and Explosion Hazard Data

Flash Point 300+oF
Extinguishing Media Use water fog, foam or dry chemical. Product will dissolve in water.
Special Fire fighting Procedures Do not enter confined space without full bunker gear including SCBA. Cool fire-exposed containers with water.
Unusual Fire and Explosion Hazards Sealed containers exposed to intense heat may rupture from expansion of product vapors. Cool exposed containers with water to prevent expansion.

SECTION V Reactivity Data

Stability: Product is Stable
Conditions to Avoid: Avoid contact with direct flame and contact with strong oxidizing agents
Hazardous Polymerization: Will not occur

SECTION VI Health Hazard Data

Routes of Entry: Inhalation, Ingestion, Skin and or Eye
Inhalation: Avoid inhalation of vapors and mist or dust from dried material.

Skin: Safe for short turn skin contact.

Ingestion: May cause gastrointestinal irritation, contact Physician and do not induce vomiting.

Acute Health Hazard: Components may cause skin reactions / itching to individuals sensitized to acrylates. Flush eyes with water for at least 15 minutes and if irritation persists get medical attention. Use in well ventilated area to prevent respiratory irritation. Remove and wash any wet clothing before re-use.

Carcinogenicity: Contains trace amount of formaldehyde and silica which are both potential occupational carcinogens.

NTP: Formaldehyde and Silica listed as reasonably anticipated to be carcinogens.

IARC Monograph: Formaldehyde listed by IARC as a suspect teratogen.

OSHA Regulated: Components of this product are regulated see Section II,

Signs and Symptoms of Overexposure: Eye and Upper Respiratory System Irritation Medical Conditions Aggravated by Exposure: Pre-existing skin, eye and lung conditions may be aggravated by exposure. Individuals sensitized to acrylate monomers may be affected.

Emergency and First Aid Procedures: If ingested do not induce vomiting, call Physician.

SECTION VII Precautions for Safe Handling and Use

If this Material is Spilled or Released: Collect spilled material with absorbent and dispose or incinerated according to state and local requirements.

SECTION VIII Control Measures

Respiratory Protection: Prevent inhalation. If ventilation is not adequate to maintain exposures below required limits wear NIOSH approved respiratory protection.

Ventilation: Mechanical ventilation may be required if nature of application produces a high concentration of vapors and or mist.

Special Measures: Eye wash station or portable eyewash should be available. Special care should be taken when opening large containers of this material to prevent inhalation of vapors concentrated in the headspace of the container.

Personal Protective Equipment

Gloves: Prevent skin contact. Rubber, neoprene or plastic lined gloves.

Eye: Safety glasses with side-shields are required. Additional protection such as goggles or face shield may be required depending on application process.

Other: Clothing adequate to prevent skin contact.

Work/Personal Hygiene Practices: Wash affected areas with soap and water to remove. Remove and wash any protective clothing prior to re-use.

NFPA HMIS

Health 1 Health 1

Flammability 0 Flammability 0

Reactivity 0 Reactivity 0

Special Note: The information provided above is based on the characteristics of the uncured product. When the solvent portion (water) evaporates and the material cures it is relatively inert and only presents a hazard upon combustion.

The information contained herein is based on the data available to us and is believed to be correct. However, Trigon Mfg. makes no warranty, expressed or implied, regarding the accuracy of these data or the results to be obtained from the use thereof. Trigon Mfg. assumes no responsibility for injury from the use of the described product.

This MSDS conforms with the OSHA Hazard Communications Standard 1900.1210 and to the SARA Title III Section 313 for suppliers' notification

