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P139 TEA TEB Waste

P139 Anomaly Repair Phase 2 (ANLY2)

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Revision-

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Pacific Spaceport Complex Alaska
Narrow Cape
Kodiak, Alaska

APPROVALS AND REVISION HISTORY

Approvals

Role	Title	Name	Signature
Author	Program Supervisor	Shannon Edwards	Shannon Edwards

Revisions

Rev	Date	Revision Description
-	-	-

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SUPPORTING DOCUMENTS

The current revision of all documents, are applicable only as specifically referenced herein.

Internal Documents

	Document Number	Document Title
1	A.Besio Email_04.25.02024	TEA-TEB Technical ID for Disposal

External Documents

	Document Number	Document Title
1	AkzoNobel TEB/TEAL 85/15	TEA-TEB MSDS

ACRONYMS

The following definitions and acronyms apply when referred to in this document:

Acronyms

Acronym	Definition
AAC	Alaska Aerospace Corporation
PSCA	Pacific Spaceport Complex-Alaska
TEA TEB	Triethylborane Triethylaluminum

1 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to provide the subcontractor technical documentation of the TEA TEB contents that need disposed.

1.2 BACKGROUND

Alaska Aerospace Corporation (AAC) experienced an anomaly event January 10, 2023 caused by a commercial customers launch vehicle coming back down after seconds of liftoff that concluded in a fire at the pad. The launch vehicle utilized triethylborane/triethylaluminum (TEA TEB) as it's igniter and resulted in some products exposed to fire as they were on the pad during the anomaly.

FIGURE 1. TEA TEB CONTENTS FOR DISPOSAL

FIGURE 2. TEA TEB CONTAINMENT CONEX

2 CONTENTS FOR DISPOSAL

2.1 CONTENTS

The information below represents the contents that either still potentially contain or were exposed to TEA TEB during the anomaly event and subsequent fire.

TABLE 1. CONTENTS IDENTIFICATION

Description	Quantity	Serial Number(s)	Photo Identifier
Bulk Cannisters	2	-	Red Circle
TT Long-Boy	4	1. 7499 2. 7502 3. 7501 4. 7500	Green Circle
TT Shorty	3	1.7876 2.7874 3.7875	Purple Circle
TT Long-Boy	1	1.7877	Yellow Circle
TT Long-Boy	2	1. 24173 2. 24174	Blue Circle
Silver Box	1	-	Green Square
Red Cylinder	1	-	Yellow Square

FIGURE 3. TEA TEB CONTENTS FOR DISPOSAL

TABLE 2. CONTENTS STATUS

Description	P139 Mechanical Function	P139 Anomaly TEA-TAB exposure	Pressurized Risk (yes or no)	Possible TEA TEB Contents Remaining (yes or no)
Bulk Cannisters	Containment Cannisters for TEA TEB storage and distribution.	Located at pad during P139 anomaly resulting in fire and possible degradation of the container making it unfit for travel to waste facility in current state.	yes	yes
TT Long-Boy	Containment canister for engine ignition located on the launch mount.	Pressurized to 600 psi and remained pressurized on impact, no way to verify if pressure has been relieved so treating as pressurized is best precaution.	yes	yes
TT Shorty	Inventory spare, not filled.	None	no	no
TT Long-Boy	Inventory spare, not filled.	None	no	no
TT Long-Boy	Spare, filled in tea-teb container.	Exploded in the anomaly, visually verified.	no	no
Silver Box	Mechanical mount for tea-teb canisters.	No exposure to tea-teb; is not a containment unit.	no	no
Red Cylinder	Cap for red circle	No exposure to tea-teb	no	no

2.2 CONTENTS SPECS

2.2.1 Bulk Cannisters

FIGURE 4. BULK CANNISTERS_1

FIGURE 5. BULK CANNISTERS_2

FIGURE 6. BULK CANNISTERS_3

2.2.2 TT Long-Boy

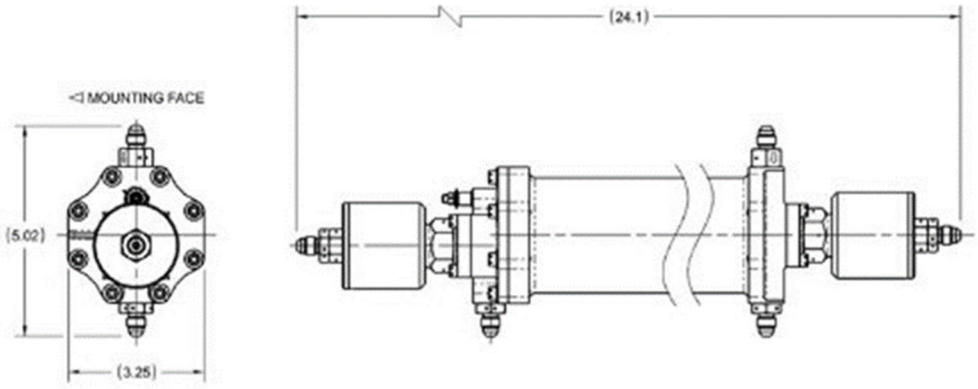

FIGURE 7. TT LONG-BOY_1

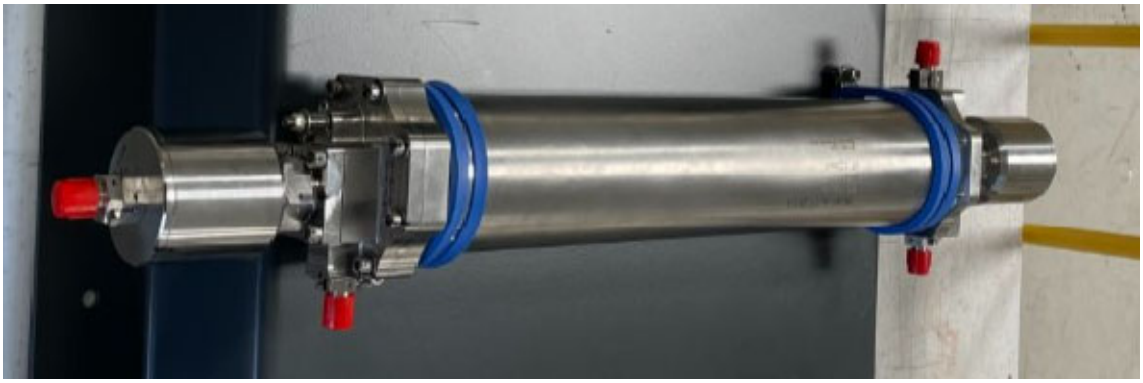

FIGURE 8. TT LONG-BOY_2

2.2.3 TT Shorty

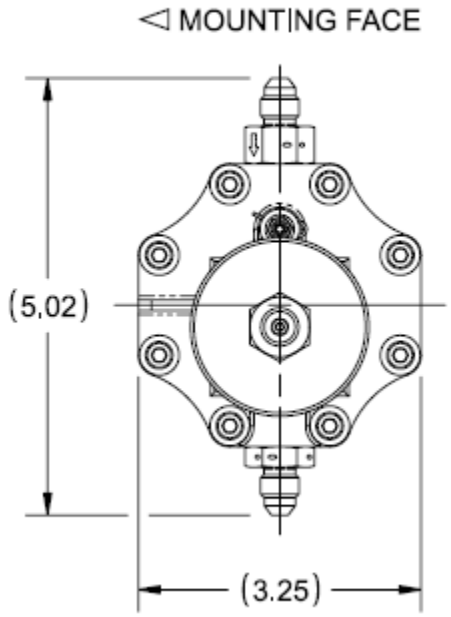

FIGURE 9. TT SHORTY_1

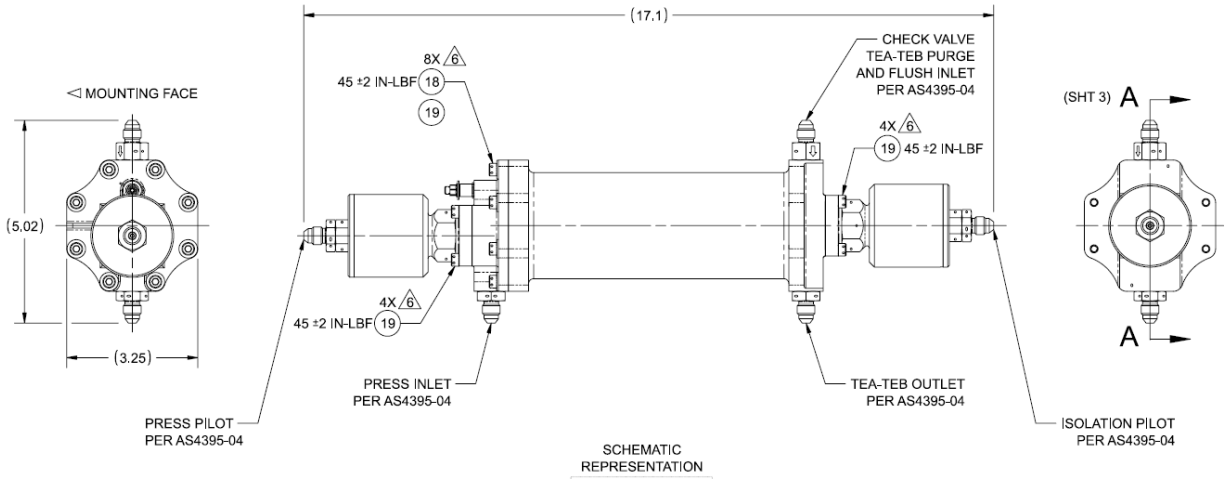

FIGURE 10. TT SHORTY_2

SPECIFICATIONS

VALVE CONFIGURATION	NORMALLY CLOSED
INLET CONNECTION	AS4395-04
OUTLET CONNECTION	AS4395-04
PNEUMATICS CONNECTION	AS4395-04
BODY PRESSURE	
MEOP (PSIG)	650
PROOF (PSIG)	1060 (1.5*MEOP/.92ECF)
BURST (PSIG)	1912 (2.5*MEOP/.85ECF)
PNEUMATICS PRESSURE	
MEOP (PSIG)	600 +/- 50
PROOF (PSIG)	1016 (1.5*MEOP/.96ECF)
BURST (PSIG)	1729 (2.5*MEOP/.94ECF)
OPERATING TEMP NOM	70
(DEG F) MIN	0
MAX	140
WORKING FLUID	TEA-TEB, HE, GN_2
TEA-TEB CAPACITY (LBM)	15.5 IN^3 (0.38 LBM)

FIGURE 11. TT SHORTY_3

3 SAFETY DATA SHEET

TEB/TEAL 85/15

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product Identifier
Triethylborane / Triethylaluminum

Supplier
Akzo Nobel Polymer Chemicals LLC
525 West Van Buren Street
Chicago, IL 60607-3823

www.akzonobel.com/polymer

Emergency telephone	**transportation emergency**
+1-914-693-6946 Chicago, IL USA	CHEMTREC - USA: 1-800-424-9300 CANUTEC - CANADA: 1-613-996-6666

Relevant identified uses of the substance or mixture
Propellant

Date of last issue / Revision number
2011/05/11 / 0.03

Chemical family
Metal alkyl

2. HAZARDS IDENTIFICATION

Emergency overview
DANGER!
EXTREMELY FLAMMABLE LIQUID AND VAPOR
CATCHES FIRE IF EXPOSED TO AIR
REACTS VIOLENTLY WITH WATER
CAUSES EYE AND SKIN BURNS
Reacts violently with water. Spontaneously flammable in air.

Appearance
colorless clear liquid

Health effects
Skin and eye contact are the primary routes of exposure to this product.
Corrosive to skin.
Eye ;Causes burns

Carcinogenicity

Description	**Applicable**
IARC	no
NTP	no
OSHA	no
ACGIH	no

3. COMPOSITION/INFORMATION ON INGREDIENTS

Information on hazardous ingredients

Chemical description
Triethylborane / Triethylaluminum

Composition / information on ingredients

Number	**% w/w**	**CAS-number**	**Chemical name**
1	80 - 90	000097-94-9	Triethylborane
2	10 - 20	000097-93-8	Triethylaluminum

Other information
This material is classified as hazardous under OSHA regulations.

4. FIRST AID MEASURES

TEB/TEAL 85/15

Most important symptoms and effects
Causes burns. Causes injury to the cornea and eyelids. Risk of serious damage to eyes. Irritating to respiratory system, may cause delayed pulmonary oedema.

Description of first aid measures

General
Call a physician immediately.

Inhalation
Get medical attention immediately by calling a physician or a poison control center. Remove to fresh air. If not breathing, give artificial respiration. Oxygen may additionally be given, by trained personnel, if it is available.

Skin
While wearing impervious gloves and air-tight safety goggles, immediately start continuous flushing of all affected areas on the victim with water for at least 15 minutes. If victim is wearing air-tight safety goggles, do not remove them. Remove contaminated clothing and shoes. If clothing is stuck to the skin after flushing with water, do not remove it. Get medical attention immediately. Wash or destroy clothing. Thoroughly clean or destroy contaminated shoes.

Eye
Immediately start continuous flushing of eyes with water for at least 15 minutes. If easy to do, contact lenses should be removed during the flushing, by trained personnel. Hold the eyelids apart during the flushing to ensure rinsing the entire surface of the eye and lids with water. Get medical attention immediately.

Ingestion
Get medical attention immediately by calling a physician or a poison control center. Induce vomiting immediately, only as directed by medical personnel. The patient should lie on their left side while vomiting to reduce the risk of aspiration. Never give anything by mouth to an unconscious or convulsing person.

Indication of any immediate medical attention and special treatment needed
Persons with pre-existing skin, respiratory, and/or central nervous system disease may be at increased risk if exposed to this material.

Irrigate burn area with large amounts of water to decontaminate, if not already done. Chemical burns on the skin should then be treated like thermal burns. Skin reactions may take 24-48 hours to develop. If eyes are affected, flush eyes with buffered or plain irrigating solutions for at least 15 minutes, if not already done. If any ulceration or conjunctival injury is present, have an ophthalmologist examine the patient. Application of cool water helps relieve pain and swelling of both the skin and eyes. If swallowed, do not induce vomiting. Give patient plenty of water to drink. Ingestion of this corrosive material may cause severe ulceration, inflammation, and possible perforation of the gastrointestinal tract. Maintain adequate airway. Aspiration during induced emesis can result in severe lung injury. Contact a Poison Control Center for additional treatment information. Treat any additional effects symptomatically.

5. FIRE-FIGHTING MEASURES

Extinguishing media
vermiculite, dry chemical powder, dry sand.

Unsuitable extinguishing media
Never use water!!! See also Section: Other information.
foam
halons

Hazardous decomposition / combustion products
Products of complete combustion are carbon dioxide, water and boron oxide. Additionally, products of incomplete combustion may include carbon monoxide, elemental carbon and hydrocarbons (alkanes and alkenes).

Protective equipment
Firefighters must wear fire resistant protective equipment. Wear approved respirator and protective gloves.

Other information
Evacuate all non-essential personnel. Consider to let it burn out completely. Waterspray may only be used by experienced fire fighters. Cool closed containers with water. After a fire, ventilate thoroughly the area and soak with water, clean the walls and metallic surfaces.

Fire and explosion hazard
CAUTION: reignition may occur. In case of fire and/or explosion do not breathe fumes.

TEB/TEAL 85/15

NFPA ratings	
Hazard classes	**Rating**
Health	3
Flammability	3
Reactivity	3
Other information	-W

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Avoid contact with skin and eyes. For personal protection see Section 8.

Environmental precautions
Do not allow to enter drains or water courses.

Methods and material for containment and cleaning up
Stop leakage if possible. Take precautionary measures against static discharges. Allow controlled hydrolysis. Isolate spill area. After fire has been extinguished or has been allowed to burn out completely, wait CONSIDERABLE TIME (until smoke is no longer observed). After that, carefully wash spill area with a waterspray.

Other information
Ignition will occur . Evacuate personnel to safe area.

7. HANDLING AND STORAGE

Precautions for safe handling
When using do not eat, drink or smoke. Handle in well ventilated areas. Take precautionary measures against static discharges. Apply grounding when transferring from one container to another. Avoid contact with moisture and water. Keep under nitrogen. Handle only in closed system. During sampling, disconnecting lines or opening connections, an aluminised suit should be worn. Avoid contact with skin and eyes. Avoid Incompatible materials (See Section 10).

Fire and explosion prevention
Spontaneously flammable in air. No specific recommendations.

Conditions for safe storage
Store in accordance with local/national regulations. Keep away from food, drink and animal feedingstuffs. Keep under dry nitrogen containing less than 10 ppm oxygen. Protect product from moisture and wet air. Keep container tightly closed and in a well-ventilated place.

Other information
Wash hands thoroughly after handling or contact. Keep work clothes separate and do not take them home.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters
Ensure good ventilation and local exhaustion of the working area.

Personal protection

Respiratory
In case of insufficient ventilation wear suitable respiratory equipment (respirator with Filter A/p2).

Hand
impervious gloves.

Eye
Safety glasses and a full face shield.

Skin and body
aluminised suit and protective boots (For further advice contact manufacturer).

Other information
Emergency-shower and facilities for rinsing eyes must be accessible. Launder clothes before reuse.

Triethylaluminum

TEB/TEAL 85/15

ACGIH TLV/TWA	2 mg/m³	
NIOSH REL/TWA	2 mg/m³	

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance liquid
Color colorless clear
Boiling point/range 95°C / 203°F (Triethylborane)
Melting point/freezing point not determined
Flash point not applicable
Flammability Extremely flammable. Contact with water liberates extremely flammable gases.
Explosive properties no
Oxidizing properties no
Vapor pressure not determined
Density not determined
Bulk density not applicable
Solubility in water Reacts violently with water.
Solubility in other solvents Miscible with saturated aliphatic and aromatic hydrocarbons.
pH value not determined
Partition coefficient n-octanol/water not applicable
Relative vapor density (air=1) not determined
Viscosity not determined
Non-Pyrophoric Limit Non-Pyrophoric Limit : not determined
Autoignition temperature Spontaneously flammable in air.
Upper/lower flammability or explosive limits not applicable
Volatile % not determined

10. STABILITY AND REACTIVITY

Conditions to avoid

TEB/TEAL 85/15

In order to prevent thermal decomposition do not overheat (T> 120°C / 248°F exothermic).

Chemical stability
Stable under recommended storage and handling conditions (see section 7).

Incompatible materials
Avoid contact with moisture and water, alcohols, acids, organic halides and oxygen containing compounds.

Possibility of hazardous reactions
Polymerization does not occur.

Hazardous decomposition products
Products of complete combustion are carbon dioxide, water and boron oxide. Additionally, products of incomplete combustion may include carbon monoxide, elemental carbon and hydrocarbons (alkanes and alkenes).

11. TOXICOLOGICAL INFORMATION

No experimental toxicological data on the preparation as such available. The following data are applicable to the ingredient(s) listed below.

Triethylborane

Acute toxicity

Oral LD50
rat (male): 235 mg/kg

Inhalation LC50
1 hours exposure time: 738 ppm (rat)

Irritation

Skin
Corrosive

Eye
Corrosive; Risk of serious damage to eyes

Respiratory
Corrosive

Other toxicological information
The mandatory EU labelling has been followed.

Triethylaluminum

Acute toxicity

Oral LD50
No data available

Irritation

Skin
Corrosive

Eye
Corrosive; Risk of serious damage to eyes

Respiratory
Corrosive

12. ECOLOGICAL INFORMATION

No experimental ecological data are available on the preparation as such.

13. DISPOSAL CONSIDERATIONS

Product
Refer to manufacturer/supplier for information on recovery/recycling. Waste disposal in accordance with regulations (most probably controlled incineration).

Contaminated packaging
According to local regulations. Emptied container might retain product residues. Follow all warnings even after the container is emptied.

TEB/TEAL 85/15

Other information For further advice contact manufacturer.

14. TRANSPORT INFORMATION

Land transport
Transport hazard class 4.2
Packing group I
TREM-Card or ERG number NA ERG No.: 135
UN number 3394
Proper Shipping Name ORGANOMETALLIC SUBSTANCE, LIQUID, PYROPHORIC, WATER-REACTIVE (Triethylborane / Triethylaluminum)
Other information This product does not contain an environmentally hazardous substance per 49 CFR 172.101, Appendix A.
Required labels 4.2 + 4.3
Subsidiary risk 4.3

Sea transport (IMO / IMDG-code)
Transport hazard class 4.2
Packing group I
UN number 3394
EMS F-G, S-M
Marine pollutant no
Proper Shipping Name ORGANOMETALLIC SUBSTANCE, LIQUID, PYROPHORIC, WATER-REACTIVE (Triethylborane / Triethylaluminum)
Other information Label(s); 4.2 + 4.3

Air transport (ICAO-TI / IATA-DGR)
UN number Forbidden

15. REGULATORY INFORMATION

Product and or components listed below are subject to the following	
Triethylborane	
CERCLA Hazardous Substance	

TEB/TEAL 85/15

Massachusetts Substance List	yes
New Jersey R-T-K Hazard. Sub.	yes
Penn. Hazardous Substance list	yes
US Toxic Subst. Cont. Act (TSCA)	yes
Non-Domestic Subst.List-Canada	yes
Domestic Substance List-Canada	no
Connecticut Hazardous Material Survey	yes
Triethylaluminum	
CERCLA Hazardous Substance	
Massachusetts Substance List	yes
New Jersey R-T-K Hazard. Sub.	yes
Penn. Hazardous Substance list	yes
US Toxic Subst. Cont. Act (TSCA)	yes
Non-Domestic Subst.List-Canada	no
Domestic Substance List-Canada	yes
California Hazardous Substances	yes
Connecticut Hazardous Material Survey	yes
Illinois Toxic Substances Disclosure to Es	yes
Minnesota Hazardous Substance	yes
Rhode Island Hazardous Substances	yes

Hazard classes	
Description	**Applicable**
EPA Immediate health	yes
EPA Delayed health	no
EPA Fire	yes
EPA Pressure	no
EPA Reactive	yes
EHS Material	no
Hazard Rating Source	HMIS
HMIS Health	3
HMIS Flammability	3
HMIS Reactivity	3
HMIS Other	-W
WHMIS Hazard classes	B-6,D-1B,E,F

Other regulatory information
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by the Controlled Products Regulations.

16. OTHER INFORMATION

TEB/TEAL 85/15

History
Date of printing/ pdf file generated 2014/09/04
Revision 0.03
Composed by Regulatory Affairs - North America , T +1-312-544-7000. Regulatory Affairs- Europe.
Changes were made in section Information content globally harmonized.