Olin Rocketry

# Phase A Flight Operations Plan

| Document Information | | |
|---|---|---|
| **Author** | Kyle Emmi | 2/12/2019 |
| **Current Version** | Version 1 | |
| **Release Date** | 2/19/2019 | |
| **Signatures** | | |
| **Author** | Kyle Emmi | 2/12/2019 |
| **Revision History** | | |
| **Version 1** | 2/19/2019 | Initial Release |

# Main Check List

# Project Manager

(All the bold tables are the lists you are in charge of on the other you just need to sign the yellow box once completed)

Your tasks include:

1) AC 426 Material list
2) Weather Check List
3) Spectator Area
4) Launchpad Area
5) Rocket Setup

| AC 426 Material list | In room | At launch site |
|---|---|---|
| 1. 5 cameras from the Library | | |
| 2. 4 camera stands | | |
| 3. Caution Tape | | |
| 4. Cables for Facebook live | | |
| 5. 3-5 Walkie talkie | | |
| 6. 1 tables | | |
| 7. First Aid Kit | | |
| 8. Fire Extinguisher | | |
| | | |
| | | |
| | | |

| Weather Check List | Initials (Done) |
|---|---|
| 1. National Weather Service (weather.gov) website checked for Needham, MA. | |
| 2. All the following are deemed true:<br>a) Forecast is sunny or partly cloudy<br>b) Wind speed is less than 15mph<br>c) Wind direction is towards $23^o$-$160^o$ or $230^o$-$270^o$ or $270^o$-$307^o$ (see map attached) | |
| **If wind is towards $270^o$-$307^o$**<br>Meeting is required between Project Manager, System Engineer, Launch Director and Safety Manger and all four need to sign it in each pepper.<br>**Else, Ignore** | 1)<br>2)<br>3)<br>4) |
| | |

| Safety Equipment Check | Initials (Done) |
|---|---|
| First Aid Kit | |
| Fire Extinguisher | |
| Charged self-phone in case of emergency | |
| No club member approaching the pad is wearing synthetic clothing or hair spray | |
| | |

| **Spectator Area** | **Initials (Done)** |
|---|---|
| **Safety Officer and team members assigned to the Spectator area have marked off the Spectator area with caution tape on the north side of East Drive so Spectators can move no further south than the edge of the lawn.** | |
| | |

| **Launchpad Area** | **Initials (Done)** |
|---|---|
| **Team attendants set up launch pad. Project Manager, Systems Engineer, Safety Officer, & Launch Director approve of launch pad.** | |
| | |

| Rocket Setup | Initials (Done) |
|---|---|
| **1. T-15 Minutes: Team attendants insert avionics payload and turn on the flight computer** | |
| **2. T-10 Minutes: Fairings Armed** | |
| **2. T-5 Minutes: Team attendants insert engine into rocket. Project Manager, Systems Engineer, Safety Officer, and Launch Director approve of rocket configuration and readiness.** | |
| **3. T-3 Minutes: Team attendants insert ignitor and engine plug into engine.** | |
| **4. T-2 Minutes: Launch area cleared** | |
| | |

| Firing the Rocket | Initials (Done) |
|---|---|
| 1. All spectators and team attendants in position. | |
| 2. Launch Director prepared to give countdown | |
| 3. Launch | |
| | |

| Rocket Retrieval | Initials (Done) |
|---|---|
| 1. Recovery team deployed | |
| 2. No spectators or team attendants making any effort to catch the rocket as it falls | |
| 3. No climbing trees once the rocket has been found | |
| 4. If rocket still on tree when you leave fill in the **"Tree form"** | |
| | |

| Clean Up | **Initials (Done)** |
|---|---|
| 1. All spectator area demarcations taken down | |
| 2. Launch pad packed away | |
| 3. Lot C “No Parking” sign removed | |
| 4. All materials returned to AC 426 | |
| | |

# Main Check List

# Launch Director

(All the bold tables are the lists you are in charge of. On the others you just need to sign the yellow box once completed)

Your tasks include:

1) AC 426 Material list
2) Weather Check List
3) Spectator Area
4) Launchpad Area
5) Rocket Setup
6) Rocket Retrieval
7) Clean up

| AC 426 Material list | In room | At launch site |
|---|---|---|
| 1. 5 cameras from the Library | | |
| 2. 4 camera stands | | |
| 3. Caution Tape | | |
| 4. Cables for Facebook live | | |
| 5. 3-5 Walkie talkies | | |
| 6. 2 tables | | |
| 7. First Aid Kit | | |
| 8. Fire Extinguisher | | |
| | | |
| | | |
| | | |

| Weather Check List | Initials (Done) |
|---|---|
| 1. National Weather Service (weather.gov) website checked for Needham, MA. | |
| 2. All the following are deemed true:<br>a) Forecast is sunny or partly cloudy<br>b) Wind speed is less than 15mph<br>c) Wind direction is towards $23^o$-$160^o$ or $230^o$-$270^o$ or $270^o$-$307^o$ (see map attached) | |
| | |
| **If wind is towards $270^o$-$307^o$**<br>Meeting is required between Project Manager, System Engineer, Launch Director and Safety Manger and all four need to sign it in each pepper.<br>**Else, Ignore** | 1)<br>2)<br>3)<br>4) |

| Safety Equipment Check | Initials (Done) |
|---|---|
| First Aid Kit | |
| Fire Extinguisher | |
| Charged self-phone in case of emergency | |
| No club member approaching the pad is wearing synthetic clothing or hair spray | |
| | |

| **Spectator Area** | **Initials (Done)** |
|---|---|
| **Safety Officer and team members assigned to the Spectator area have marked off the Spectator area with caution tape on the north side of East Drive so Spectators can move no further south than the edge of the lawn.** | |
| | |

| **Launchpad Area** | **Initials (Done)** |
|---|---|
| **Team attendants set up launch pad. Project Manager, Systems Engineer, Safety Officer, & Launch Director approve of launch pad.** | |
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| **1. T-15 Minutes: Team attendants insert avionics payload and turn on the flight computer** | |
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| **3. T-3 Minutes: Team attendants insert ignitor and engine plug into engine.** | |
| **4. T-2 Minutes: Launch area cleared** | |
| | |

| Firing the Rocket | Initials (Done) |
|---|---|
| 1. All spectators and team attendants in position. | |
| 2. Launch Director prepared to give countdown | |
| 3. Launch | |
| | |

| Rocket Retrieval | Initials (Done) |
|---|---|
| **1. Recovery team deployed** | |
| **2. No spectators or team attendants making any effort to catch the rocket as it falls** | |
| **3. No climbing trees once the rocket has been found** | |
| **4. If rocket still on tree when you leave fill in the "Tree form"** | |
| | |

| Clean Up | Initials (Done) |
|---|---|
| 1. All spectator area demarcations taken down | |
| 2. Launch pad packed away | |
| 3. Lot C “No Parking” sign removed | |
| 4. All materials returned to AC 426 | |
| | |

# Main Check List

## Safety Officer

(All the bold tables are the lists you are in charge of. On the others you just need to sign the yellow box once completed)

Your tasks include:

1) Safety equipment check
2) Spectator Area
3) Launchpad Area
4) Rocket Setup
5) Firing the Rocket

| AC 426 Material list | In room | At launch site |
|---|---|---|
| 1. 5 cameras from the Library | | |
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| | |

| Safety equipment check | Initials (Done) |
|---|---|
| First Aid Kit | |
| Fire Extinguisher | |
| Charged self-phone in case of emergency | |
| No club member approaching the pad is wearing synthetic clothing or hair spray | |
| | |

| Spectator Area | Initials (Done) |
|---|---|
| Safety Officer and team members assigned to the Spectator area have marked off the Spectator area with caution tape on the north side of East Drive so Spectators can move no further south than the edge of the lawn. | |
| | |

| Launchpad Area | Initials (Done) |
|---|---|
| Team attendants set up launch pad. Project Manager, Systems Engineer, Safety Officer, & Launch Director approve of launch pad. | |
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| 4. T-2 Minutes: Launch area cleared | |
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| Firing the Rocket | Initials (Done) |
|---|---|
| 1. All spectators and team attendants in position. | |
| 2. Launch Director prepared to give countdown | |
| 3. Launch | |
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| Rocket Retrieval | Initials (Done) |
|---|---|
| 1. Recovery team deployed | |
| 2. No spectators or team attendants making any effort to catch the rocket as it falls | |
| 3. No climbing trees once the rocket has been found | |
| 4. If rocket still on tree when you leave fill in the **"Tree form"** | |
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| Clean Up | **Initials (Done)** |
|---|---|
| 1. All spectator area demarcations taken down | |
| 2. Launch pad packed away | |
| 3. Lot C “No Parking” sign removed | |
| 4. All materials returned to AC 426 | |
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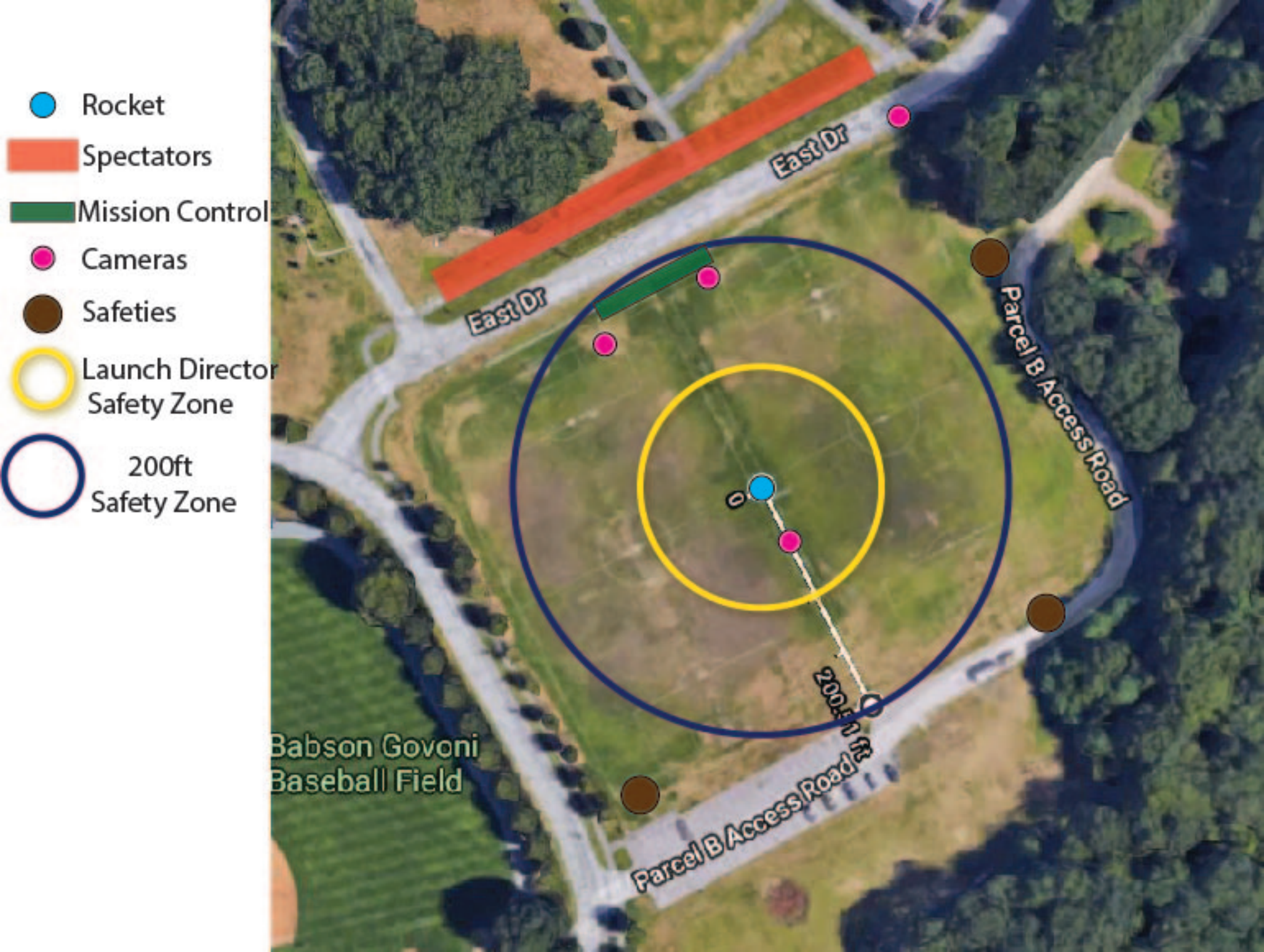
Rocket
Spectators
Mission Control
Cameras
Safeties
Launch Director Safety Zone
200ft Safety Zone
East Dr
East Dr
Parcel B Access Road
Parcel B Access Road
200 ft
Babson Govoni Baseball Field


Franklin W.
Olin College
of Engineering
Parcel B Acc
Road
Babson - Harrington
Rugby Pitch
Great Plain Ave
Mary Chilton Rd
Winslow Rd
Measure distance
Click on the map to add to your path
Total distance: 882.18 ft (268.89 m)

# Launch Binder

April 3rd & 10th, 2019

| Timecode | Nominal Time | Action |
|---|---|---|
| T-40 | 11:00a | Materials gathered from AC426 |
| T-20 | 11:20a | Launchsite setup complete |
| T-10 | 11:30a | Battery inserted |
| T-5 | 11:35a | Engine inserted |
| T-3 | 11:37a | Ignitor inserted |
| T-2 | 11:38a | Launch area cleared |
| T-0 | 11:40a | Launch ignition |

## Project Manager

# “Start Early, Fail Often”
# Olin Rocketry 2018-2019

*Return this binder to the Launch Director following launch day operations*

# Launch Binder

April 3rd & 10th, 2019

| Timecode | Nominal Time | Action |
|---|---|---|
| T-40 | 11:00a | Materials gathered from AC426 |
| T-20 | 11:20a | Launchsite setup complete |
| T-10 | 11:30a | Battery inserted |
| T-5 | 11:35a | Engine inserted |
| T-3 | 11:37a | Ignitor inserted |
| T-2 | 11:38a | Launch area cleared |
| T-0 | 11:40a | Launch ignition |

## Systems Engineer

# “Start Early, Fail Often”
# Olin Rocketry 2018-2019

*Return this binder to the Launch Director following launch day operations*

# Launch Binder

April 3rd & 10th, 2019

| Timecode | Nominal Time | Action |
|---|---|---|
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| T-2 | 11:38a | Launch area cleared |
| T-0 | 11:40a | Launch ignition |

## Launch Director

# “Start Early, Fail Often”
# Olin Rocketry 2018-2019

*Return this binder along with its copies to AC426 following launch day operations*

# Launch Binder

April 3rd & 10th, 2019

| Timecode | Nominal Time | Action |
|---|---|---|
| T-40 | 11:00a | Materials gathered from AC426 |
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## Safety Officer

# “Start Early, Fail Often”
# Olin Rocketry 2018-2019

*Return this binder to the Launch Director following launch day operations*

# Olin Rocketry
# Safety Manual V1.0

Created: 11/1/17
Updated: 9/18/18

Babson Public Safety: (781) 239-5555

# Table of Contents



## Appendix A (Chemical MSDS)

# Chemistry Lab Safety

## Storage of Chemicals

All storage will be in accordance with the MSDS in Appendix A, the faculty in charge of the Chemistry Lab, and the Safety Office of the College. An exact location of all materials will be kept on file by the Project Manager and Chemistry Subteam Lead at all times.

## Use of the Chemistry Lab

Use of the Chemistry Lab is a privilege. Any rocket club member wanting to use the Lab shall fulfill all of the following requirements:

- The member must be a member of the Chemistry Subteam
- The member must be trained by faculty of the Chemistry Lab in the materials, processes, and machines that are needed to produce the final product.
- The member must be accompanied by another qualified member of the club.
- The member must instructed to create the fuel by the Chemistry Subteam Lead.

In summary, the Lab will only be used by qualified members that are not alone to create only necessary fuel.

## Timing of Fuel Creation

Fuel shall never be created more than a few hours in advance of an engine test. In all cases, fuel should be created in the morning, and the test firing should commence in the afternoon to provide as little a window as possible for the final fuel to exist. Whenever fuel is created, a Chemistry Subteam Member must be present at all times to supervise the fuel until the fuel is loaded into the test stand at the test firing (see Test Operations Safety for more information on fuel transportation).

# Manufacturing Safety

Machine shop safety for Rocket team (the team) should be no different than safety for any other project in Olin's Shop (the Shop). Proper precautions should be taken in accordance with all Shop instructions and rules. Just because it is a team project does not give anyone permission to waiver from Shop etiquette and culture. Major guidelines for safe manufacturing behavior include but are not limited to:

- For a machine to be used by a member of the team, the member must be trained on that specific machine in accordance with Olin Shop policy.
- No chemicals, fuel, or any other materials that could potentially harm people or the machines may be taken into the shop and should especially not be machined or otherwise operated upon

- Non-exotic materials should be used whenever possible (i.e. plastics, aluminum, steel) and excessively hard materials (such as tungsten) should be avoided
- Steel and materials prone to melting should not be manufactured as the case for the motor in any circumstance.
- All welded aluminum components must be TIG welded

- Rocket components must be manufactured within reasonable tolerances set by the team system engineer and critical components (i.e. combustion chamber or rocket nozzle) must meet a strict level of tolerance
- All manufactured components must have their dimensions verified by no fewer than 2 members of rocket team, one of whom may be the machinist
- In general, flaws in a manufactured component warrant re-machining the part. Exceptions may be made by concurrence of both the system engineer and project manager

- A log of all manufactured components will be kept for every mission; this log must include, at a minimum, every manufactured component, the date of manufacturing, the signature of the machinist, the signature of the team member that verified the component, and any apparent flaws (to aid in failure analysis)

Misuse of the Shop not only will lead to action against the member of the club, but also repercussions against the team by the Shop and on the student body as a whole. No one wants this, please follow the rules and get trained.

# Launches at Olin

For a launch to occur at Olin, the following must be true in accordance with the law:

1. The rocket must have an engine with a rating of “G” or less
2. The engine must be bought from a store as opposed to being student made

Both of these guidelines are on the NAR (National Association of Rocketry) website and considered law by model and high powered rocketry enthusiasts everywhere. These rules are designed to be legal in all states.

For Olin specifically, Boston Logan International is an area of concern, however upon inspection of the sectional chart the floor of controlled airspace is well above the 0.125 miles we expect Olin Rocketry’s rockets to fly. If a higher altitude is expected in the future, the sectional chart will be consulted again and the FAA contacted if needed.

## Classification of Personnel

- Spectator: Any person either not in Olin Rocketry or not participating in the launch process.
- Team Attendant: Members of Olin Rocketry who will be assisting directly in launching operations.
- Safety Officer: Designated by Project Manager. In charge of all safety at launch, their instructions are the law at the launch site.
- Launch Director: Designated by Project Manager. In charge of logistical operations during launch, should be working closely with Safety Officer to ensure safe and effective launch.

## Safe Distances

Distances shall be reviewed in the days prior to the launch and should be enforced based on classification of the attendee. The following distances in the table below are minimums and should be enforced by the Safety Officer. As the team increases the power of the rockets it tests, the safe distance required shall grow.

**Safe Launch Distance Table**

| Total Impulse, N*s | Motor Type | Non-Complex | Complex |
|---|---|---|---|
| 0.01 to 1280 | A-J | 200ft | 250ft |
| 1280.01 to 2560 | K | 250ft | 350ft |
| 2560.01 to 5120 | L | 300ft | 500ft |
| 5120.01 to 10240 | M | 500ft | 1000ft |
| 10240.01 to 20480 | N | 1000ft | 1500ft |
| 20480.01 to 40960 | O | 1500ft | 2000ft |
| 40960.01 to 890K | P-T | 2000ft | 2500ft |

*Complex is a rocket with multiple stages or multiple engines firing at once

- These distances are for all launch activities at Olin.
- Spectators may be no closer than the amount specified in the table.

## Test Proceedings

The sole job of the Launch Director is to ensure the launch proceedings go without any hindrances. The timeline for the launch is laid out below.

- **Days before:**
    - Entire team is briefed on launch parameters, final preparations made on vehicle, Safety Officer and Launch Director selected, Olin community emailed on where Spectator location will be and what areas will be closed off to them at time of launch.
- **Hours before:**
    - Launch site closed off to public effectively with caution tape. Spectator space marked well.
    - Project Manager, Systems Engineer, Safety Officer, and Launch Director give final approval for launch stand and rocket.
- **5 minutes before:**
    - Upon final check of the mounted motor and verbal signal from Project Manager, Systems Engineer, Safety Officer, and Launch Director, the test area should be cleared and preparations taken for immediate firing.

- **Firing:**

        - Countdown given by Launch Director after area deemed clear and safe by Safety Officer. If the motor does not ignite, the ignition device should be turned off and after 2 minutes the rocket should be approached.
        - The Project Manager, Systems Engineer, Safety Officer, and Launch Director may choose to retry the launch or call off the test entirely, the decision must be unanimous.
- **After Firing:**
    - Launch attendants shall maintain contact with the rocket through RF beacon.
    - No effort to catch the rocket should be made upon landing.
    - If rocket lands in trees, caution shall be taken in retrieving the rocket. No spur-of-the-moment tree climbing.

## Conditions for a Scrubbed Launch

If inclement weather comes about or the wind changes direction or is blowing harder than 15mph, the launch shall be scrubbed by the Safety Officer and Launch Director. The wind should be blowing towards Parcel B or the Babson Baseball Diamond. If any activities are occurring at the Babson baseball diamond, the launch is also subject to being scrubbed.

# First Aid and First Response

Babson Public Safety should be notified per the Launch Operations section.

Because any rockets over G class require a special launch location presided over by the National Association of Rocketry (NAR) or the Tripoli Rocketry Association (TRA), first aid and first response should be presided over by those organizations on their launch ranges. For launches presided over solely by the Olin Rocket Club, the following should be taken into account:

- A first aid kit should be present in the Club Attendant area. The first aid kit should be procured and inspected by the Safety Officer of the launch.
- A fire extinguisher that is able to put out a fire containing rocket fuel should also be procured by the Safety Officer and present at the test.
- A charged cell phone with reception and the phone number of Babson Public Safety in the contacts or on speed-dial.
- Any club member that will be approaching the test stand for integration or will be in the convoy carrying the motor to the test stand, shall not wear synthetic clothing or hair spray.

# SAFETY DATA SHEET

Version 5.5
Revision Date 06/02/2016
Print Date 11/29/2017

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Aluminum

Product Number : 202584
Brand : Aldrich
Index-No. : 013-001-00-6

CAS-No. : 7429-90-5

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce
Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Pyrophoric solids (Category 1), H250
Substances and mixtures, which in contact with water, emit flammable gases (Category 2), H261

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H250 Catches fire spontaneously if exposed to air.
H261 In contact with water releases flammable gases.

Precautionary statement(s)

| | |
|---|---|
| P210 | Keep away from heat/sparks/open flames/hot surfaces. No smoking. |
| P222 | Do not allow contact with air. |
| P223 | Do not allow contact with water. |
| P231 + P232 | Handle under inert gas. Protect from moisture. |
| P280 | Wear protective gloves/ eye protection/ face protection. |
| P335 + P334 | Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages. |
| P370 + P378 | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish. |
| P402 + P404 | Store in a dry place. Store in a closed container. |
| P422 | Store contents under inert gas. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS**

Combustible dust

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**3.1 Substances**

| | | |
|---|---|---|
| Formula | : | Al |
| Molecular weight | : | 26.98 g/mol |
| CAS-No. | : | 7429-90-5 |
| EC-No. | : | 231-072-3 |
| Index-No. | : | 013-001-00-6 |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Aluminium** | | |
| | Pyr. Sol. 1; Water-react. 2; H250, H261 | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

**4.1 Description of first aid measures**

**General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

**If inhaled**

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**

Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**

Flush eyes with water as a precaution.

**If swallowed**

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**4.2 Most important symptoms and effects, both acute and delayed**

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**

No data available

## 5. FIREFIGHTING MEASURES

**5.1 Extinguishing media**

**Suitable extinguishing**

**media**

Dry powder

**5.2 Special hazards arising from the substance or mixture**
No data available

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**
No data available

## 6. ACCIDENTAL RELEASE MEASURES

**6.1 Personal precautions, protective equipment and emergency procedures**
Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

**6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

**6.3 Methods and materials for containment and cleaning up**
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

**6.4 Reference to other sections**
For disposal see section 13.

## 7. HANDLING AND STORAGE

**7.1 Precautions for safe handling**
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.Keep away from sources of ignition - No smoking.
For precautions see section 2.2.

**7.2 Conditions for safe storage, including any incompatibilities** Keep container tightly closed in a dry and well-ventilated place. Never allow product to get in contact with water during storage.

Air and moisture sensitive. Keep in a dry place.
Storage class (TRGS 510): Pyrophoric and self-heating hazardous materials

**7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**8.1 Control parameters**

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| Aluminium | 7429-90-5 | TWA | 1.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Lower Respiratory Tract irritation<br>Pneumoconiosis<br>Neurotoxicity<br>Not classifiable as a human carcinogen | | |

| | | | | |
|---|---|---|---|---|
| | | TWA | 15.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 5.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 10.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 15.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 5.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 5.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 1.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Lower Respiratory Tract irritation<br>Pneumoconiosis<br>Neurotoxicity<br>Not classifiable as a human carcinogen<br>varies | | |
| | | TWA | 1.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Lower Respiratory Tract irritation<br>Pneumoconiosis<br>Neurotoxicity<br>Not classifiable as a human carcinogen<br>varies | | |
| | | TWA | 5 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 10 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 15 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 5 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 5 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 5 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 1 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Lower Respiratory Tract irritation<br>Pneumoconiosis<br>Neurotoxicity<br>Not classifiable as a human carcinogen<br>varies | | |

| | | | | |
|---|---|---|---|---|
| | | PEL | 5 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
| | | PEL | 5 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

**8.2 Exposure controls**

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
Protective gloves against thermal risks

Full contact

Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**9.1 Information on basic physical and chemical properties**

| | | |
|---|---|---|
| a) | Appearance | Form: powder |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 660.37 °C (1,220.67 °F) - lit. 2,460 °C (4,460 °F) - lit. |
| f) | Initial boiling point and boiling range | |
| g) | Flash point | Not applicable |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | May form combustible dust concentrations in air. |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | 2.7 g/cm3 at 25 °C (77 °F) |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n- octanol/water | No data available |
| p) | Auto-ignition temperature | Catches fire spontaneously if exposed to air. |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

**9.2 Other safety information**
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

**10.2 Chemical stability**
Stable under recommended storage conditions.

**10.3 Possibility of hazardous reactions**
Reacts violently with water.

**10.4 Conditions to avoid**
Exposure to moisture

**10.5 Incompatible materials**
acids, Acid chlorides, Halogens, Oxidizing agents, Bases, Oxygen

**10.6 Hazardous decomposition products**
Other decomposition products - No data available
Hazardous decomposition products formed under fire conditions. - Aluminum oxide
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

No data available

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: BD0330000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

## 12. ECOLOGICAL INFORMATION

**12.1 Toxicity**

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**

| | |
|---|---|
| Bioaccumulation | Salvelinus fontinalis - 56 d<br>- 268 µg/l |
| | Bioconcentration factor (BCF): 36 |

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

No data available

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

**Contaminated packaging**

Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**

UN number: 1396 Class: 4.3 Packing group: II
Proper shipping name: Aluminum powder, uncoated
Reportable Quantity (RQ):

Poison Inhalation Hazard: No

**IMDG**

UN number: 1396 Class: 4.3 Packing group: II EMS-No: F-G, S-O
Proper shipping name: ALUMINIUM POWDER, UNCOATED

**IATA**

UN number: 1396 Class: 4.3 Packing group: II
Proper shipping name: Aluminium powder, uncoated

## 15. REGULATORY INFORMATION

**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:

Aluminium CAS-No. 7429-90-5

Aluminium

**California Prop. 65 Components**

**SARA 311/312 Hazards**

Reactivity Hazard

**Massachusetts Right To Know Components**

CAS-No. 7429-90-5

Aluminium

CAS-No. 7429-90-5

**Pennsylvania Right To Know Components**

CAS-No. 7429-90-5

Aluminium

**New Jersey Right To Know Components**

Revision
Date 1994-
04-01

Revision
Date 1994-
04-01

Revision
Date 1994-
04-01

Revision
Date 1994-
04-01
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| H250 | Catches fire spontaneously if exposed to air. |
| H261 | In contact with water releases flammable gases. |
| Pyr. Sol. | Pyrophoric solids |
| Water-react. | Substances and mixtures, which in contact with water, emit flammable gases |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 0 |
| Chronic Health Hazard: | * |
| Flammability: | 3 |
| Physical Hazard | 1 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 0 |
| Fire Hazard: | 3 |
| Reactivity Hazard: | 1 |
| Special hazard.I: | W |

**Further information**


The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

# SAFETY DATA SHEET

## 1. Identification

**Product identifier** **AMMONIUM PERCHLORATE,**

**REAGENT Other means of identification**

**Product code** 3

**Recommended use** professional, scientific and technical activities: other professional, scientific and technical activities

**Recommended restrictions** None known.

**Manufacturer/Importer/Supplier/Distributor information Manufacturer**

| | | |
|---|---|---|
| **Company name** | GFS Chemicals, Inc. | |
| **Address** | P.O. Box 245<br>Powell, OH 43065<br>United States | |
| **Telephone** | Phone | 740-881-5501 |
| | Toll Free | 800-858-9682 |
| | Fax | 740-881-5989 |
| **Website** | www.gfschemicals.com | |
| **E-mail** | service@gfschemicals.com | |
| **Emergency phone number** | Emergency Assistance | Chemtrec 800-424-9300 |

## 2. Hazard(s) identification

| | | |
|---|---|---|
| **Physical hazards Health hazards** | Oxidizing solids | Category 1 |
| | Serious eye damage/eye irritation | Category 2A |
| | Specific target organ toxicity, repeated exposure | Category 1 |
| **Environmental hazards OSHA defined hazards** | Not classified. Not classified. | |

**Label elements**

**Signal word** Danger

**Hazard statement** May cause fire or explosion; strong oxidizer. Causes serious eye irritation. Causes damage to organs through prolonged or repeated exposure.

**Precautionary statement**

**Prevention** Keep away from heat. Keep away from clothing and other combustible materials. Take any precaution to avoid mixing with combustibles. Do not subject to grinding/shock/friction. Do not breathe dust/fume/gas/mist/vapors/spray. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection.

**Response** If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If on clothing: Rinse immediately contaminated clothing and skin with plenty of water before removing clothes. Call a POISON CENTER or doctor/physician if you feel unwell. Get medical advice/attention if you feel unwell. If eye irritation persists: Get medical advice/attention. In case of fire: Use water to extinguish. In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

**Storage** Store in a well-ventilated place. Keep container tightly closed. Do not store near combustible materials. Store locked up.

**Disposal** Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

**Hazard(s) not otherwise classified (HNOC)** None known.

**Supplemental information** None.

## 3. Composition/information on ingredients

**Substances**

| Chemical name and synonyms | Common name |
|---|---|

| | CAS number | % |
|---|---|---|
| AMMONIUM PERCHLORATE | 7790-98-9 | 100 |

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

## 4. First-aid measures

**Inhalation** Move to fresh air. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a physician if symptoms develop or persist.

**Skin contact** IF ON CLOTHING: rinse immediately contaminated clothing and skin with plenty of water before removing clothes. Wash off with soap and water. Get medical attention if irritation develops and persists. For minor skin contact, avoid spreading material on unaffected skin.

**Eye contact** Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

**Ingestion** Rinse mouth. Get medical attention if symptoms occur.

**Most important symptoms/effects, acute and delayed** Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Prolonged exposure may cause chronic effects.

**Indication of immediate medical attention and special treatment needed** Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.

**General information** Take off all contaminated clothing immediately. Contact with combustible material may cause fire If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

## 5. Fire-fighting measures

**Suitable extinguishing media** Water. Water spray. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

**Unsuitable extinguishing media** Do not use water jet as an extinguisher, as this will spread the fire.

**Specific hazards arising from the chemical** Greatly increases the burning rate of combustible materials. Containers may explode when heated. During fire, gases hazardous to health may be formed.

**Special protective equipment and precautions for firefighters** Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

**Fire fighting equipment/instructions** In case of fire and/or explosion do not breathe fumes. In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion. Move containers from fire area if you can do so without risk. Use water spray to cool unopened containers.

**Specific methods** Cool containers exposed to flames with water until well after the fire is out.

**General fire hazards** May cause fire or explosion; strong oxidizer. Contact with combustible material may cause fire.

## 6. Accidental release measures

**Personal precautions, protective equipment and emergency procedures**

**Methods and materials for containment and cleaning up**

Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Keep away from clothing and other combustible materials. Wear appropriate protective equipment and clothing during clean-up. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Keep combustibles (wood, paper, oil, etc.) away from spilled material. Ventilate the contaminated area. Stop the flow of material, if this is without risk.

Large Spills: Wet down with water and dike for later disposal. Shovel the material into waste container. Minimize dust generation and accumulation. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.

Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS. Wear appropriate protective equipment and clothing during clean-up.

**Environmental precautions** Avoid discharge into drains, water courses or onto the ground.

## 7. Handling and storage

**Precautions for safe handling** Keep away from heat. Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Keep away from clothing and other combustible materials. Take any precaution to avoid mixing with combustibles. Avoid contact with eyes. When using, do not eat, drink or smoke. Provide adequate ventilation. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Observe good industrial hygiene practices.

**Conditions for safe storage, including any incompatibilities** Keep away from heat. Store in a cool, dry place out of direct sunlight. Store in original tightly closed container. Store in a well-ventilated place. Do not store near combustible materials. Store away from incompatible materials (see Section 10 of the SDS).

## 8. Exposure controls/personal protection

**Occupational exposure limits** No exposure limits noted for ingredient(s).

**Biological limit values** No biological exposure limits noted for the ingredient(s).

**Appropriate engineering controls** Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Provide eyewash station.

**Individual protection measures, such as personal protective equipment**

**Eye/face protection** Wear safety glasses with side shields (or goggles).

**Skin protection**

**Hand protection** Wear appropriate chemical resistant gloves. Suitable gloves can be recommended by the glove supplier. Frequent change is advisable.

| | |
|---|---|
| **Other** | Use of an impervious apron is recommended. Wear fire/flame resistant/retardant clothing. |
| **Respiratory protection** | In case of insufficient ventilation, wear suitable respiratory equipment. |
| **Thermal hazards** | Wear appropriate thermal protective clothing, when necessary. |

**General hygiene considerations** Keep from contact with clothing and other combustible materials. Remove and wash contaminated clothing promptly. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

## 9. Physical and chemical properties

**Appearance**

| | |
|---|---|
| **Physical state** | Solid. |
| **Form** | Solid. |
| **Color** | White. |
| **Odor** | Odorless. |
| **Odor threshold** | Not available. |
| **pH** | Not available. |
| **Melting point/freezing point** | 266 °F (130 °C) |
| **Initial boiling point and boiling range** | Not available. |
| **Flash point** | Not available. |
| **Evaporation rate** | Not available. |
| **Flammability (solid, gas)** | Not available. |
| **Upper/lower flammability or explosive limits** | |
| **Flammability limit - lower (%)** | Not available. |
| **Flammability limit - upper (%)** | Not available. |
| **Explosive limit - lower (%)** | Not available. |
| **Explosive limit - upper (%)** | Not available. |
| **Vapor pressure** | Not available. |
| **Vapor density** | Not available. |
| **Relative density** | Not available. |
| **Solubility(ies)** | |
| **Solubility (water)** | Not available. |
| **Partition coefficient (n-octanol/water)** | Not available. |
| **Auto-ignition temperature** | Not available. |
| **Decomposition temperature** | Not available. |
| **Viscosity** | Not available. |
| **Other information** | |
| **Density** | 1.95 g/cm3 |
| **Molecular formula** | NH4ClO4 |
| **Molecular weight** | 117.49 g/mol |
| **Specific gravity** | 1.95 |

## 10. Stability and reactivity

| | |
|---|---|
| **Reactivity** | May ignite or explode on contact with combustible materials. |
| **Chemical stability** | Material is stable under normal conditions. |
| **Possibility of hazardous reactions** | Hazardous polymerization does not occur. |
| **Conditions to avoid** | Heat. Contact with incompatible materials. |
| **Incompatible materials** | Combustible material. Reducing agents. |
| **Hazardous decomposition products** | No hazardous decomposition products are known. |

## 11. Toxicological information

**Information on likely routes of exposure**

| | |
|---|---|
| **Inhalation** | No adverse effects due to inhalation are expected. |
| **Skin contact** | No adverse effects due to skin contact are expected. |
| **Eye contact** | Causes serious eye irritation. |
| **Ingestion** | Expected to be a low ingestion hazard. |

**Symptoms related to the physical, chemical and toxicological characteristics**

Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision.

**Information on toxicological effects Acute toxicity**

| **Product** | **Species** |
|---|---|
| AMMONIUM PERCHLORATE (CAS 7790-98-9) | |
| **Acute** | |
| *Oral* | |
| LD50 | Guinea pig |

**Test Results**

3310 mg/kg

| | |
|---|---|
| Rabbit | 1900 mg/kg |
| Rat | 4200 mg/kg |

* Estimates for product may be based on additional component data not shown.

**Skin corrosion/irritation** Prolonged skin contact may cause temporary irritation.

**Serious eye damage/eye irritation** Causes serious eye irritation.

**Respiratory or skin sensitization**

**Respiratory sensitization** Not available.

**Skin sensitization** This product is not expected to cause skin sensitization.

**Germ cell mutagenicity** No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

**Carcinogenicity** This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

**Reproductive toxicity** This product is not expected to cause reproductive or developmental effects

**Specific target organ toxicity - single exposure** Not classified.

**Specific target organ toxicity - repeated exposure**

Causes damage to organs through prolonged or repeated exposure. The perchlorate ion competes with iodide in the mechanism that governs uptake into the thyroid gland for growth hormone production. This effect is routinely countered by ensuring sufficient dietary intake of iodine, as perchlorate does not accumulate in the body. Studies on workers in plants where perchlorates are manufactured have shown no thyroid abnormalities; various clinical studies are ongoing.
Perchlorates occur naturally in trace amounts in the environment, and are not classified as carcinogenic.

| | |
|---|---|
| **Aspiration hazard** | Not available. |
| **Chronic effects** | Causes damage to organs through prolonged or repeated exposure |

## 12. Ecological information

| | |
|---|---|
| **Ecotoxicity** | The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. |
| **Persistence and degradability** | No data is available on the degradability of this product. |
| **Bioaccumulative potential** | No data available. |
| **Mobility in soil** | No data available. |
| **Other adverse effects** | No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component. |

## 13. Disposal considerations

| | |
|---|---|
| **Disposal instructions** | Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations. |
| **Local disposal regulations** | Dispose in accordance with all applicable regulations. |
| **Hazardous waste code** | The waste code should be assigned in discussion between the user, the producer and the waste disposal company. |
| **Waste from residues / unused products** | Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions). |
| **Contaminated packaging** | Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied. |

## 14. Transport information

| | |
|---|---|
| **DOT** | UN1442 |
| **UN number** | Ammonium perchlorate |
| **UN proper shipping name Transport hazard class(es)** | |
| **Class Subsidiary risk Label(s)** | 5.1 |
| **Packing group** | - |
| **Special precautions for user** | 5.1 |
| **Special provisions** | II |
| **Packaging exceptions** | Read safety instructions, SDS and emergency procedures before handling. |
| **Packaging non bulk** | |
| **Packaging bulk** | 107, A9, IB6, IP2, T3, TP33 |
| **IATA** | 152 |
| **UN number** | 212 |
| **UN proper shipping name Transport hazard class(es)** | 242 |
| **Class Subsidiary risk** | |
| **Packing group Environmental hazards ERG Code** | UN1442 |
| **Special precautions for user** | Ammonium perchlorate |
| **Other information Passenger and cargo aircraft** | |
| **Cargo aircraft only** | 5.1<br>- II |

No.
5L
Read safety instructions, SDS and emergency procedures before handling.

Allowed.

Allowed.

**IMDG**

**UN number** UN1442

**UN proper shipping name Transport hazard class(es)**
**Class Subsidiary risk**
**Packing group Environmental hazards**
**Marine pollutant EmS**
**Special precautions for user**
**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**

**DOT**


**IATA; IMDG**

AMMONIUM PERCHLORATE

5.1
-
I
I

No.
F-H, S-Q
Read safety instructions, SDS and

emergency procedures before handling. Not

applicable.


## 15. Regulatory information

**US federal regulations** This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

**TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**

Not regulated.

**CERCLA Hazardous Substance List (40 CFR 302.4)**

Not listed.

**SARA 304 Emergency release notification**

Not regulated.

**Superfund Amendments and Reauthorization Act of 1986**

**(SARA) Hazard categories** Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

**SARA 302 Extremely hazardous substance**

Not listed.

**SARA 311/312 Hazardous chemical** Yes

**SARA 313 (TRI reporting)**

Not regulated.

**Other federal regulations**

**Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List**

Not regulated.

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)**

Not regulated.

**Safe Drinking Water Act (SDWA)** Not regulated.

**US state regulations**

**US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)**

Not listed.

**US. Massachusetts RTK - Substance List**

AMMONIUM PERCHLORATE (CAS 7790-98-9)

**US. New Jersey Worker and Community Right-to-Know Act**

AMMONIUM PERCHLORATE (CAS 7790-98-9)

**US. Pennsylvania Worker and Community Right-to-Know Law**

AMMONIUM PERCHLORATE (CAS 7790-98-9)

**US. Rhode Island RTK**

Not regulated.

**US. California Proposition 65**

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

**International Inventories**

| Country(s) or region | Inventory name | On inventory (yes/no)* |
|---|---|---|
| Australia | Australian Inventory of Chemical Substances (AICS) | Yes |
| Canada | Domestic Substances List (DSL) | Yes |
| Canada | Non-Domestic Substances List (NDSL) | No |
| China | Inventory of Existing Chemical Substances in China (IECSC) | Yes |
| Europe | European Inventory of Existing Commercial Chemical Substances (EINECS) | Yes |
| Europe | European List of Notified Chemical Substances (ELINCS) | No |
| Japan | Inventory of Existing and New Chemical Substances (ENCS) | Yes |
| Korea | Existing Chemicals List (ECL) | Yes |
| New Zealand | New Zealand Inventory | Yes |
| Philippines | Philippine Inventory of Chemicals and Chemical Substances (PICCS) | Yes |
| United States & Puerto Rico | Toxic Substances Control Act (TSCA) Inventory | Yes |

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

## 16. Other information, including date of preparation or last revision

**Issue date** June-16-2015

**Version #** 01

**Disclaimer** GFS Chemicals cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

**Revision Information**

Product and Company Identification: Physical States
Physical & Chemical Properties: Multiple Properties
Transport Information: Proper Shipping Name/Packing Group
Regulatory Information: Safety Phrases
GHS: Classification