

## Project Introduction

2-3 Teams 3-4 people per team

- Case Study
  - Hazard Analysis [HAZOP or FMEA with Fault Tree]
  - Ethics Analysis
  - Environmental Impacts
  - Global & Social Impacts
  - TL Review: byu.edu [team goals & evaluations]

7-8 Presentations per class period  
each 5 min long

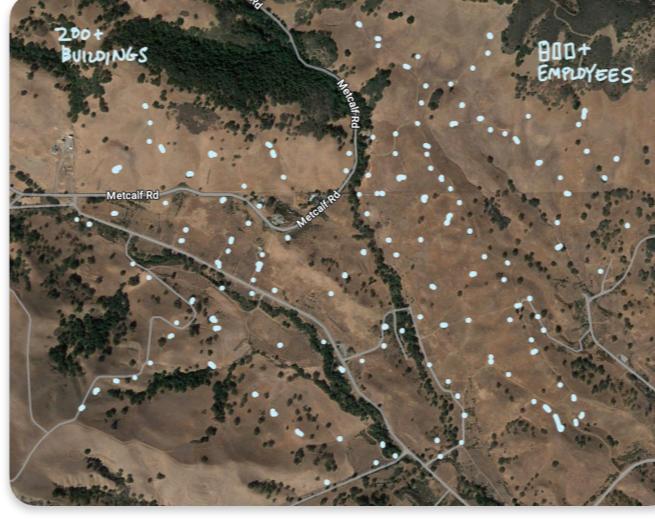
- Teams will have unique case studies
  - first come first serve
  - instructor approval

Individual & Group Graded portions

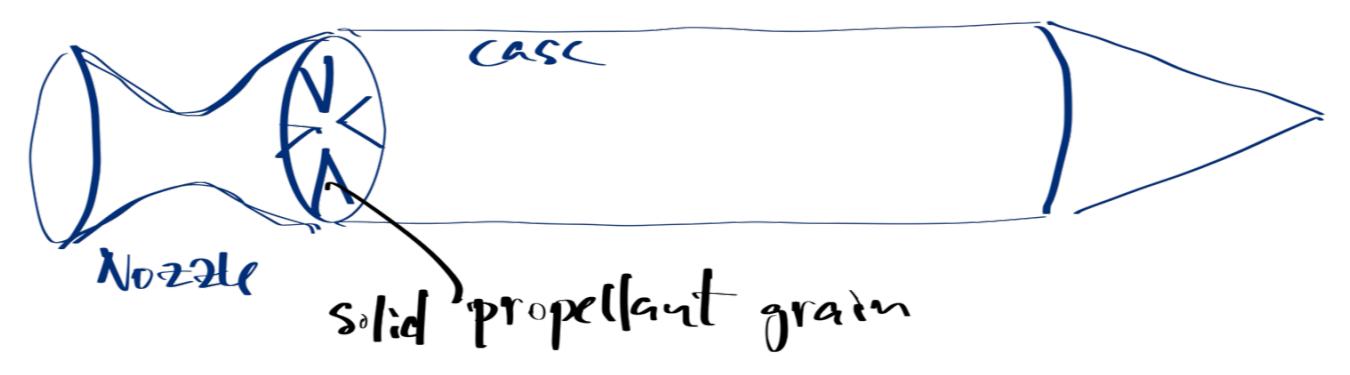
## FMEA CASE STUDY

PRATT & WHITNEY SPACE PROPULSION of UNITED TECHNOLOGIES CO.  
SAN JOSE CALIFORNIA

825 people employed in >200 buildings  
operating since 1959 in making rocket motors



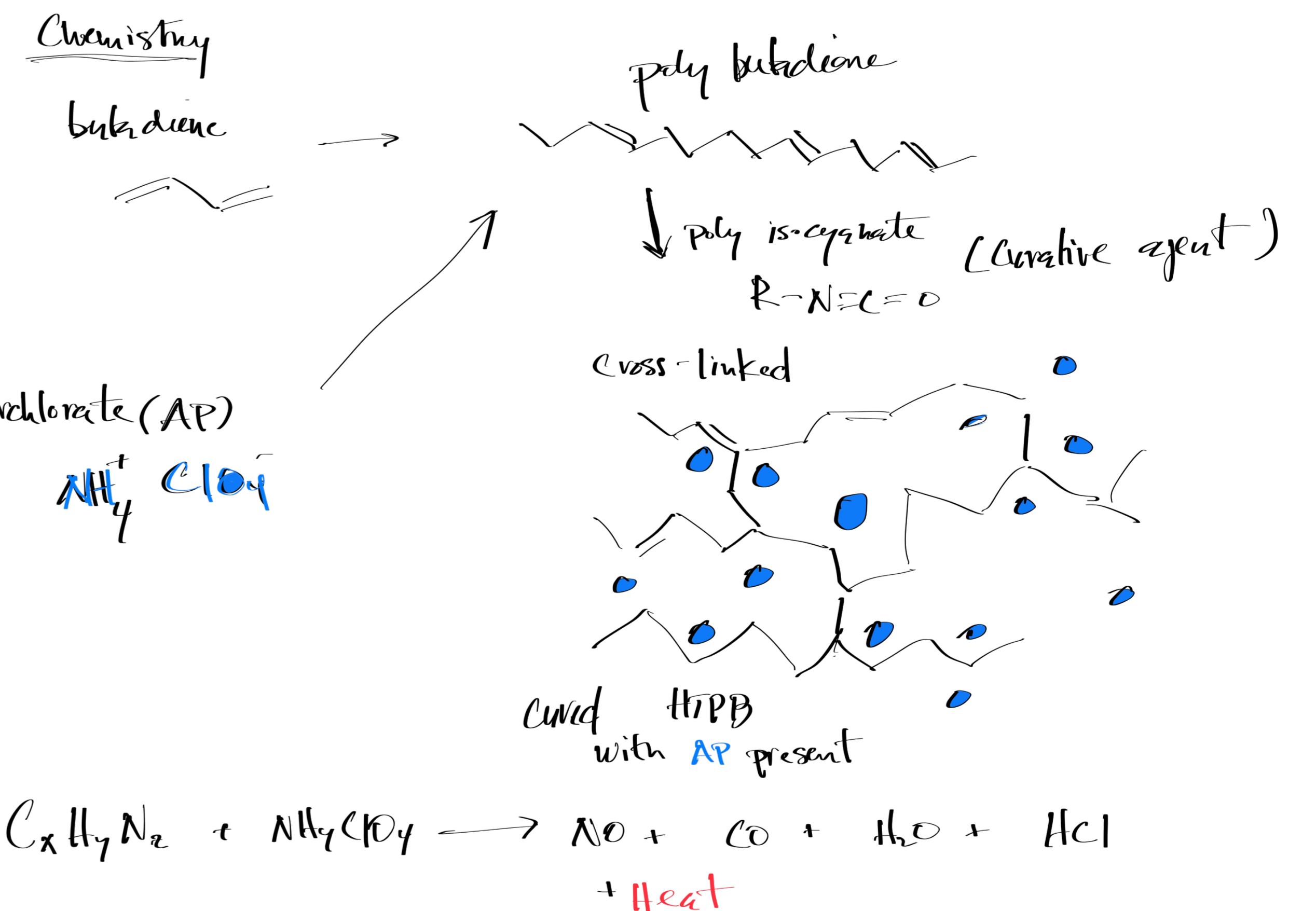
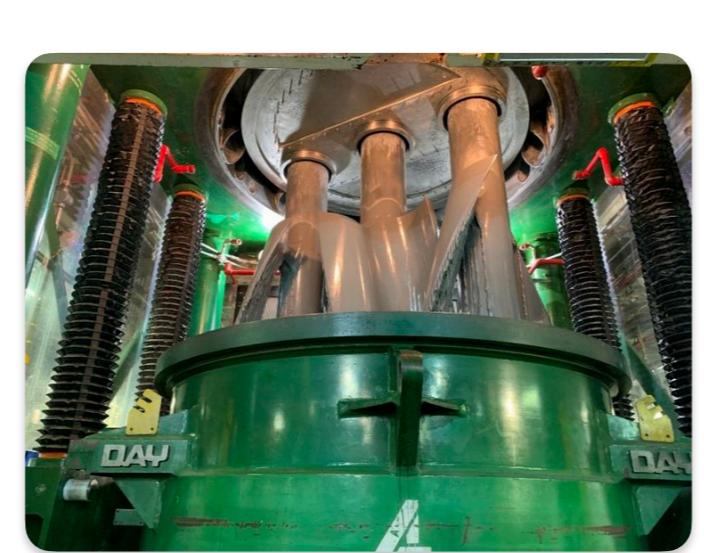
Rocket Motor  
Minuteman III & Booster Rockets for space



An ammonium perchlorate, aluminum, HTPB (hydroxy-terminated polybutadiene)

### Incident #1 August 2003

Mix Building Explosion  
400 gallon mixer

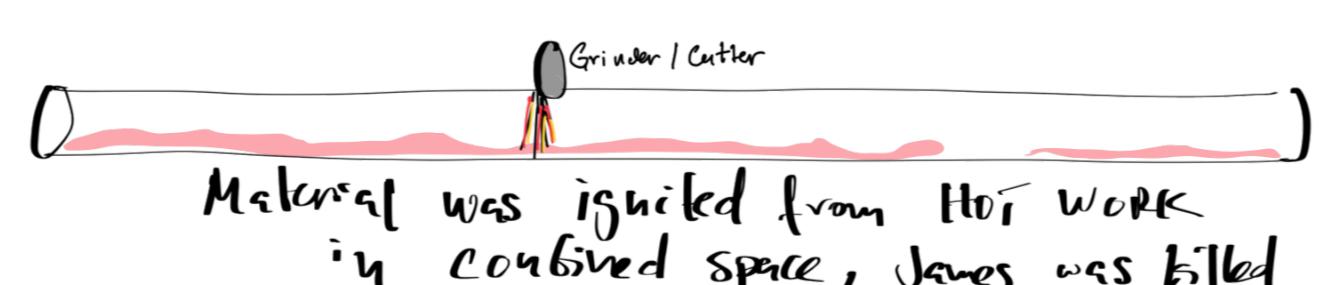


GEM 63 solid rocket motor tested in Promont...  
youtu.be

Sources:  
<https://www.sfgate.com/bayarea/article/rocket-fuel-blast-levels-building-pratt-2562082.php>  
<https://www.recordnet.com/story/news/2003/09/13/second-blast-in-month-kills/50718463007>  
<https://www.legacy.com/us/obituaries/eastbaytimes/name/james-spotts-obituary?id=27651977>  
<https://countyda.sccgov.org/united-technologies-corporation-convicted-labor-code-violation>

### Incident #2 Sept 2003

James Franklin Spotts, 47, died



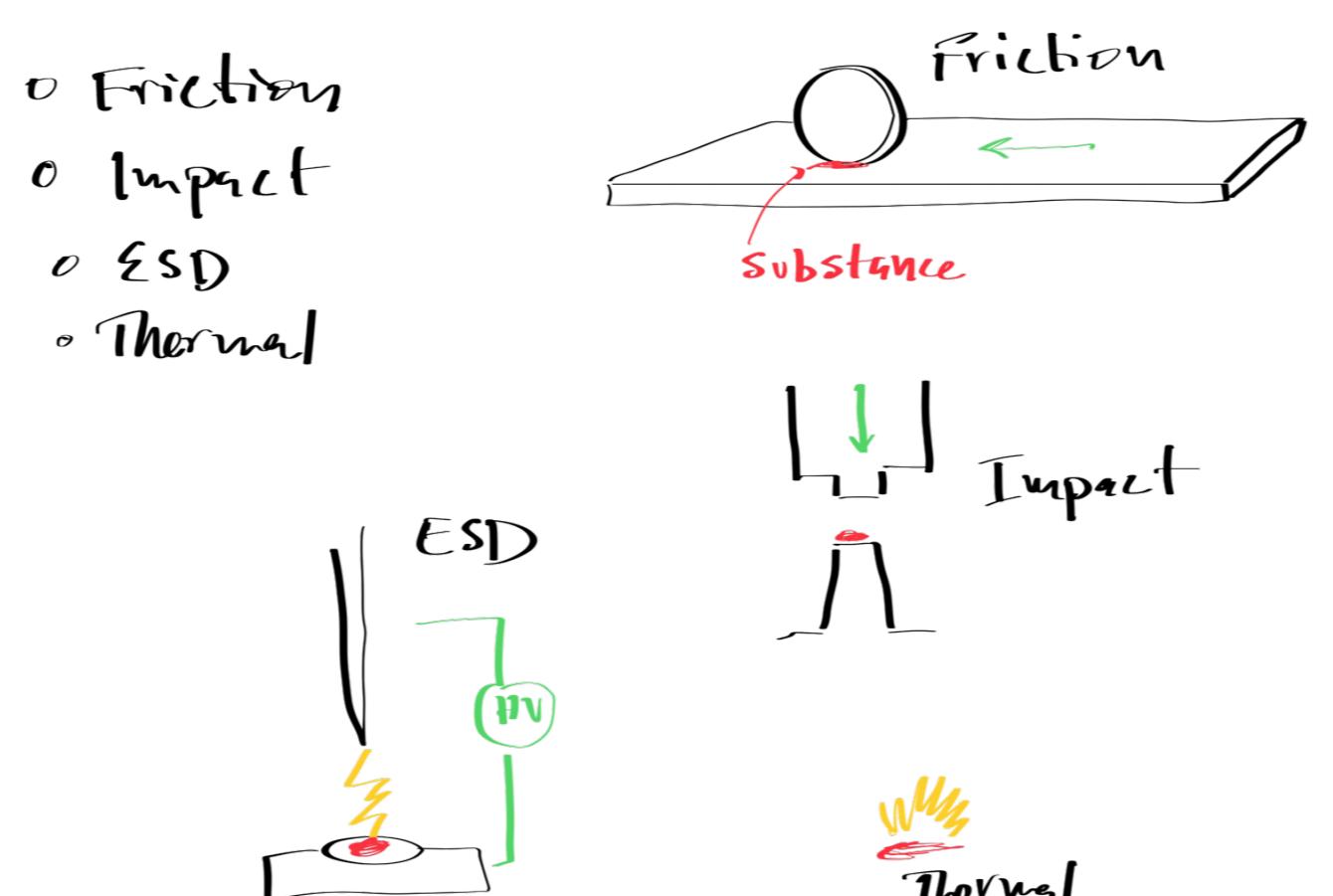
Material was ignited from hot work  
in confined space; James was killed

2006 - 2009  
Ventura, CA, others worked to  

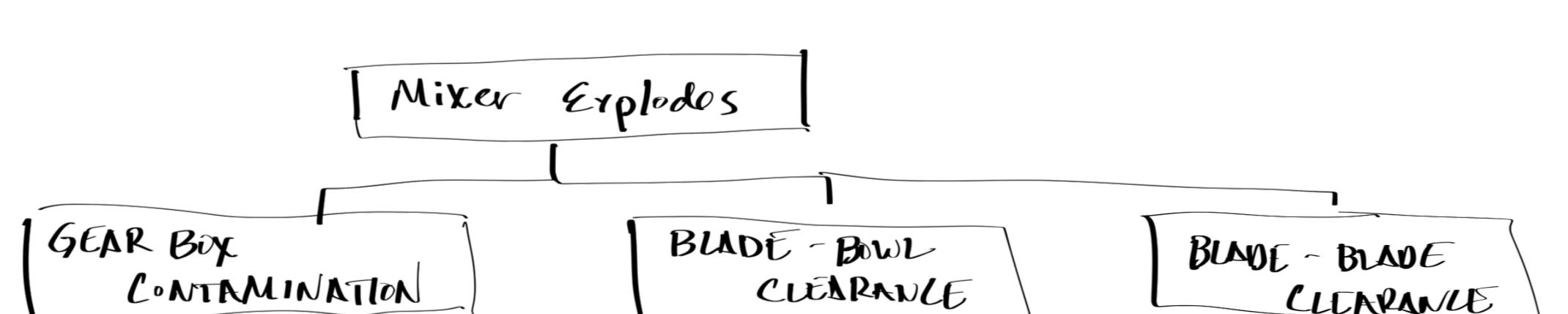
- Decommission
- Demolish

200+ Contaminated Buildings

### Failure Modes for Mixer Incident



### FAULT TREE ANALYSIS 400 gallon mixer



Operation	Failure Mode	Description	Consequence	Safe guards	Risk Rank	Recommendations
Mixing	Friction					