# Managing ESOH in R&D’s – An Air Force Research Laboratory’s Approach

## Abstract
This presentation is an overview of how Environment, Safety, and Occupational Health (ESOH) is managed in the research and development atmosphere of the Air Force Research Laboratory.

## Subject Terms

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<td>a. REPORT</td>
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An Air Force Research Laboratory Approach To ESOH Risk Management

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Greetings from the Mojave desert

DISTRIBUTION STATEMENT A. Approved for public release; distribution unlimited.
Where living can be hazardous
But today, let's talk about Chemical Hazards.
Chemical safety in academia

Texas Tech Accident

ICEBERG TIP A CSB accident investigation at the Texas Tech chemistry building could lead to a national examination of school lab safety.

One student, Preston Brown, 29, was seriously injured in the Jan. 7 accident and remains in critical condition, according to Eric Finley, a spokesperson with University Medical Center in Lubbock. Brown is being treated in the hospital’s burn center, where he has been since the accident. Initially, press accounts said two students were injured; however, university officials say only one was hurt.

Brown received severe burns and lacerations to his face and hands when a mixture of nickel hydrazine perchlorate exploded during the afternoon accident in Texas Tech’s chemistry building, according to a police report. University officials told CSB the accident involved the detonation of a high-energy metal compound. Texas Tech, the board reported, has an agreement with Northeastern University in Boston to study high-energy materials for the Department of Homeland Security.

UCLA Accident

Negligence Caused UCLA Death

State safety and health agency faults university for training lapses, unsafe practices

Negligence of lab safety by the department of chemistry and biochemistry at the University of California, Los Angeles, led to the Dec. 29, 2008, accident and subsequent death of researcher Shahrbanoo (Sheri) Sangi, says the state agency charged with investigating the incident.

In particular, the California Division of Occupational Safety & Health (Cal/OSHA) cited the department in a report released on May 4 for lacking both safety training and training documentation; failing to ensure employees wore appropriate personal protective equipment (PPE), such as lab coats; and failing to correct unsafe conditions and work practices identified in an Oct. 30, 2008, laboratory safety inspection.

Among the findings of the October lab inspection was that PPE was not fully used in the lab in which the 29-year-old Sangi worked. She was not wearing a lab coat in December when pyrophoric material she was handling sparked and ignited her clothing.

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• Charges first of its kind in US
  – Potential 4.5 years in prison
  – Potential $4.5 million fine to institution

• Reference:
  – Antelope Valley Press, Thursday, December 29, 2011
Research approval process

- Research Project
- SAFETY REVIEW
  - INTERNAL INDEPENDENT PEER REVIEW
  - Senior Scientists
  - Independent Experts
  - Safety
  - Environmental MGT
  - Occupational Health MGT
  - Fire Department
- RISK APPROVED
  - Y: EXECUTE
  - N: CHANGE
    - INTERNAL INDEPENDENT PEER REVIEW

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Risk Management

- Identify hazards
- Assess risk
- Develop & make control decision
- Implement risk controls
- Accept risk by appropriate authority
- Supervise and manage the change
Hazard Assessment

• Hazard Assessment – a deeper insight into dangers
  – Health (Carcinogens, mutagens, teratogens, irritants etc.)
  – Flammability
  – Reactivity (explosives, peroxide formers, etc.)
  – Special Properties (corrosives, pyrophoric, water-reactive etc.)
  – Cryogenics (cold burns etc.)
  – Rupture (Over pressure, glass vs. metal reactors etc.)

• Have you considered any hazards not listed above?
  – Unintentional oversight, complacency, overconfidence in subject

Consider Hazard consequences, your control measures and residual risk – Low/Med/High
Facility Evaluation

• Evaluate Facility for:
  – Electrical safety
  – Fire safety
  – Chemical safety
  – Hazardous Waste
  – Lab structure

• Do you have effective Engineering Controls?
  – Fume/bio hoods
  – Eye wash/showers
  – Fire extinguishers/suppression devices
  – Warning lights/signs
  – Emergency signs

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• **Personal Protective Equipment (PPE) and Clothing**
  - Face/Eyes (safety glasses, goggles, shields)
  - Body protection (shield, apron, fire retardant coverall/labcoat)
  - Respiratory system protection
  - Feet protection (absolutely NO sandals and flip flops, hard-toe if needed)
  - Hand protection (type of gloves – know the limitation of glove materials)
  - Hearing protection (ear plugs, mugs, etc.)

**Resources:** MSDS, NFPA, OSHA, ERG, Experts
Procedures & Training

• Procedures
  – Lab Manual
  – Standard
  – Operating Instruction
  – Chemical Hygiene Plan (CHP)
  – Emergency and protocols

• Class room training and CBTs
  – CPR/AED/First aid
  – Fire extinguisher
  – LOTO
  – Confined Space
  – Safe handling of chemicals
  – Emergency evacuation/disaster management

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## Risk Assessment Matrix

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<thead>
<tr>
<th>HAZARD PROBABILITY</th>
<th>Catastrophic-I</th>
<th>Critical-II</th>
<th>Marginal-III</th>
<th>Negligible-IV</th>
</tr>
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<tbody>
<tr>
<td>Frequent-A</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Probable-B</td>
<td>2</td>
<td>5</td>
<td>9</td>
<td>16</td>
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<tr>
<td>Occasional-C</td>
<td>4</td>
<td>6</td>
<td>11</td>
<td>18</td>
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<tr>
<td>Remote-D</td>
<td>8</td>
<td>10</td>
<td>14</td>
<td>19</td>
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<tr>
<td>Improbable-E</td>
<td>12</td>
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### Risk Levels:

#### HIGH RISK (RHI 1-4)
- Requires HQ AFRL/CC Commander’s approval (Institution Owner)

#### MEDIUM RISK (RHI 5-9)
- Requires no lower than Division Chief’s approval (Institution Manager)

#### LOW RISK (RHI 10-20)
- Requires no lower than Branch Chief’s approval (Department Head)

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Research approval process

Research Project → SAFETY REVIEW → RISK APPROVED
- Y: EXECUTE
- N: CHANGE → INTERNAL INDEPENDENT PEER REVIEW

- Safety
- Quality Assurance
- Environmental MGT
- Occupational Health MGT
- Fire Department

• Senior Scientist
• Independent Experts

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Managing Change

- Track hazards and validate risk
- Changes
  - Process
  - Equipment
  - Location
  - Personnel
  - Chemical

  Human Factor
  - Time is pressing
  - Budget is low
  - Outcome product is almost there

- Manage Change is a process
  - Important and Challenging
  - Oversight/Supervision
  - Establish Internal Protocols

- Annual review and safety permit expires
Lesson Learned

• Potential liability to individual and institution

• Establish safety practices and processes
  – Evaluation of PPE
  – Training
  – Procedures/Manuals
  – Management Oversight/Supervision

• ESOH is an Institution/Management’s Program

• Risk management is part of the research culture.
Acknowledgments

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