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1. REPORT DATE (DD-MM-YYYY) 27-02-2012		2. REPORT TYPE Briefing Slides		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE AFRL's New Tool for HAZCOM Compliance at R&D Level: CHAMP (Chemical Hazard Analysis & Management Program)				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Ashwani Vij and Suresh Tennarangam				5d. PROJECT NUMBER	
				5f. WORK UNIT NUMBER 50260541	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Force Research Laboratory (AFMC) AFRL/RZSP 10 E. Saturn Blvd. Edwards AFB CA 93524-7680				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Air Force Research Laboratory (AFMC) AFRL/RZS 5 Pollux Drive Edwards AFB CA 93524-7048				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S NUMBER(S) AFRL-RZ-ED-VG-2012-048	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution unlimited (PA #12151).					
13. SUPPLEMENTARY NOTES For presentation at the 243 rd ACS National Meeting, San Diego, CA 25-29 March 2012.					
14. ABSTRACT This presentation is an overview of AFRL's new tool for HAZCOM compliance at the Research & Development level. The tool is called CHAMP (Chemical Hazard Analysis & Management Program).					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Dr. Ashwani Vij
Unclassified	Unclassified	Unclassified	SAR	29	19b. TELEPHONE NUMBER (include area code) N/A

AFRL

THE AIR FORCE RESEARCH LABORATORY
LEAD | DISCOVER | DEVELOP | DELIVER



AFRL's New Tool for HAZCOM Compliance at R&D Level:

C H A M P

Chemical Hazard Analyses & Management Program



Ashwani Vij, PhD¹ & Suresh Tennarangam²

Environment, Safety & Occupational Health

1. Air Force Research Laboratory, Detachment 7/SE

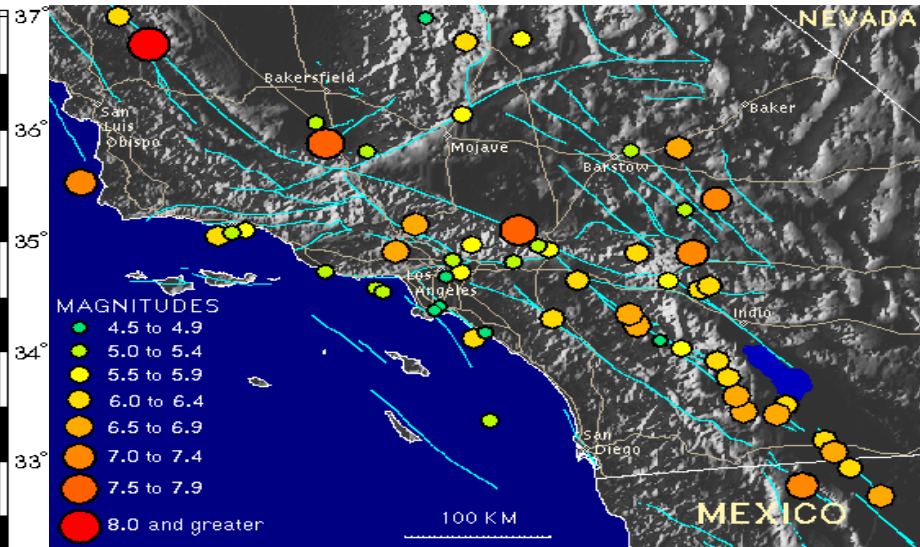
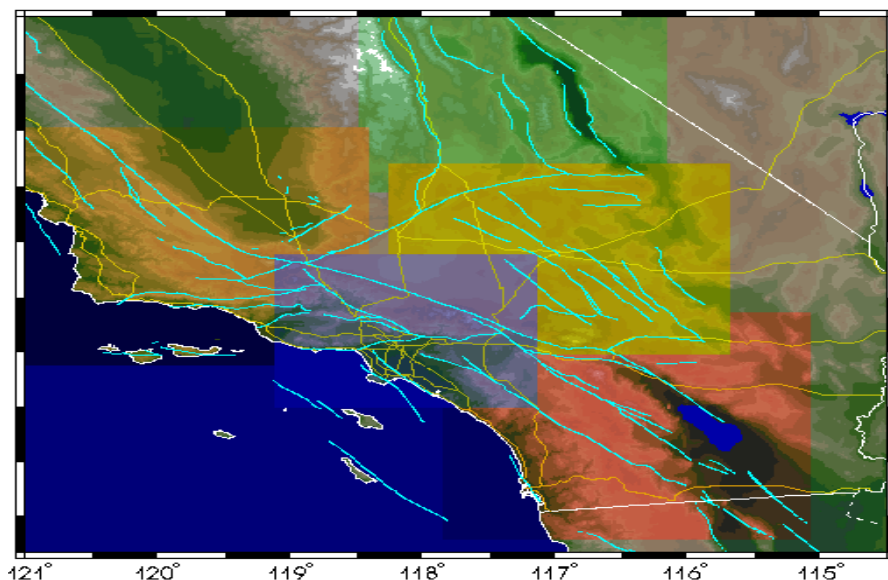
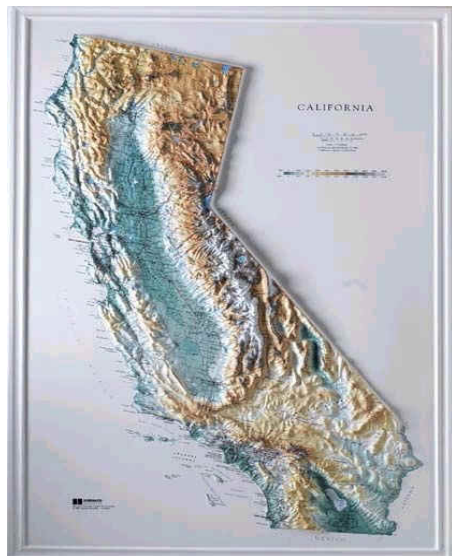
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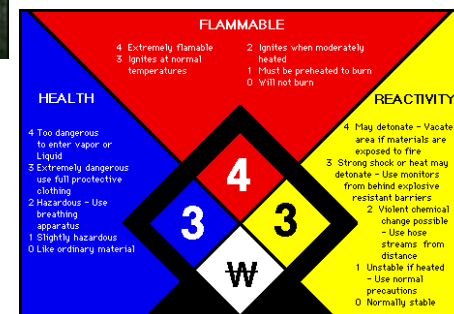


Geographic Attractions & Hazards





Chemicals Hazards





- ∞ Hazard Communication Standard (HAZCOM) 29 CFR 1910.1200 (h) (1) states that Employers provide their employees (at initial assignments and continuously)
- ∞ Training & Information
 - ∞ Hazardous chemicals
 - ∞ New physical or health hazard
 - ∞ Hazard Categories
 - ∞ flammability, carcinogenicity etc.
- ∞ **READILY AVAILABLE** chemical-specific information through hazard labels and (M)SDS
 - ∞ ***New (GHS) Hazcom waiting at OMB***
 - ∞ ***Adopted to UN Standards – revision after ~25 years***



Chemical Hazard Analysis

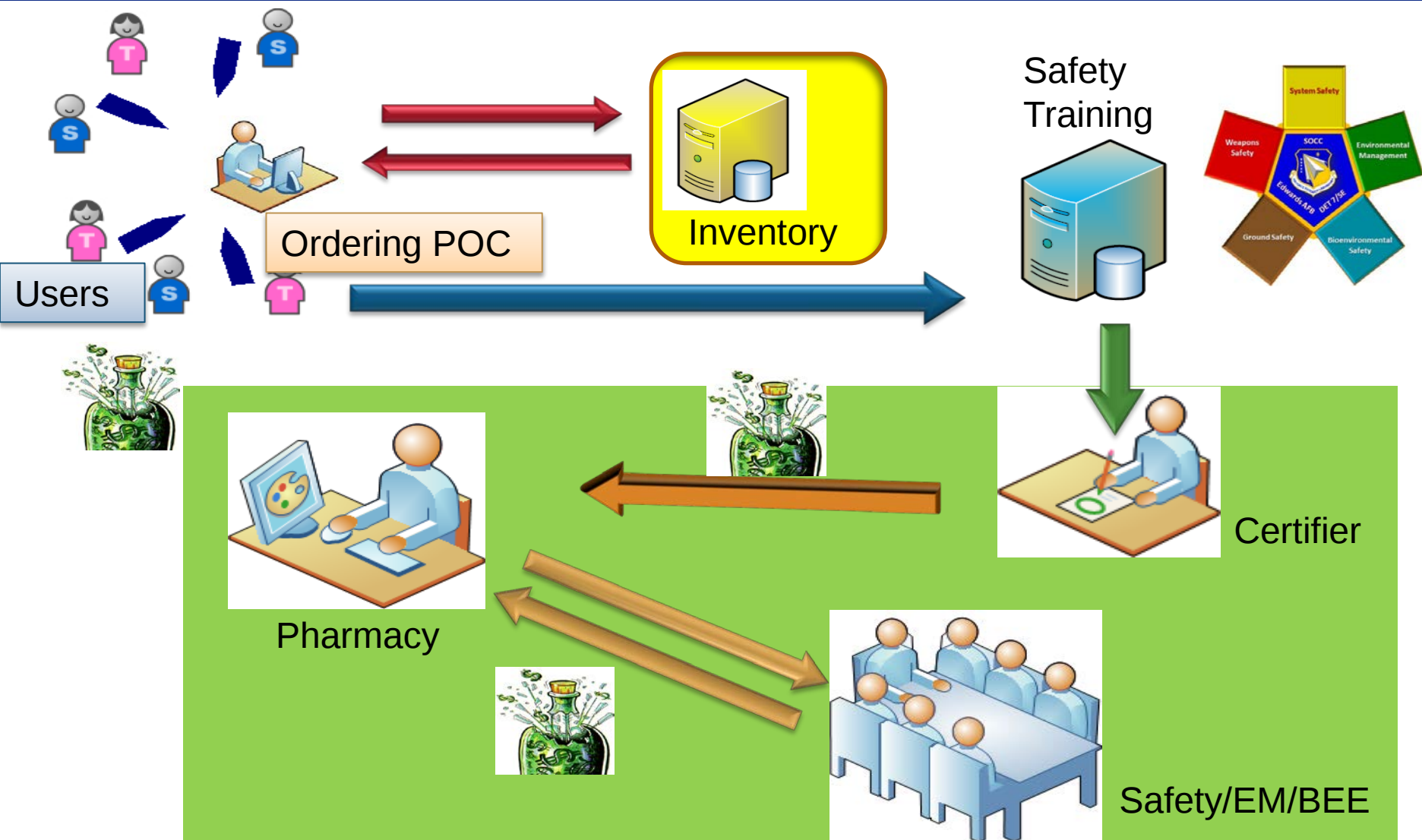
- Reactivity is an intrinsic property of a material
 - Understand the nature of the material
 - Training is very important
 - Use control measures
- Mitigating Flammability and Health Hazards
 - Engineering controls
 - Proper PPE
 - Removing ignition sources
 - Less important than Reactivity for Hazard classification?



Name of Material	
☐	HEALTH
☐	FLAMMABILITY
☐	REACTIVITY
☐	PROTECTIVE EQUIPMENT



Current Chemical Procurement Process





Need for a NEW SYSTEM

- **Researchers**
 - *Ordering & chemical procurement*
 - Current system too complicated – causes mission delays
- **Safety Office**
 - *Efficient processing of chemical licensing based on Hazard Rating Workflow*
- **Hazcom Program**
 - *Track the life-cycle of hazmat from conception to grave*
 - Ensure compliance with OSHA/EPA regulations
 - Avoid stockpiling of hazmat due to oversight/ multiple lab-wide inventory databases
- **First Responders/Fire Department**
 - *Emergency/disaster preparedness, quick information access on mobile devices*
- **Security Office**
 - *Tracking of explosives, munitions and chemicals of interest on the DHS and DEA lists*
- **Site Employees**
 - ***Right to Know (disclose hazards i.e., chemical, EM/X-ray radiation, laser etc.)***



Enterprise Business Model



∞ DoD

- ∞ NAVY - North Point CA

- ∞ Uses a single (Master) database managed by a contractor

∞ Industry

- ∞ Pharmaceuticals – BMS (New Jersey)

- ∞ Tightest safety standards

- ∞ Risk of losing business

- ∞ Total accountability of ALL hazmat

∞ Academia

- ∞ USC, Los Angeles – CAPS

- ∞ Single database use with hazard information

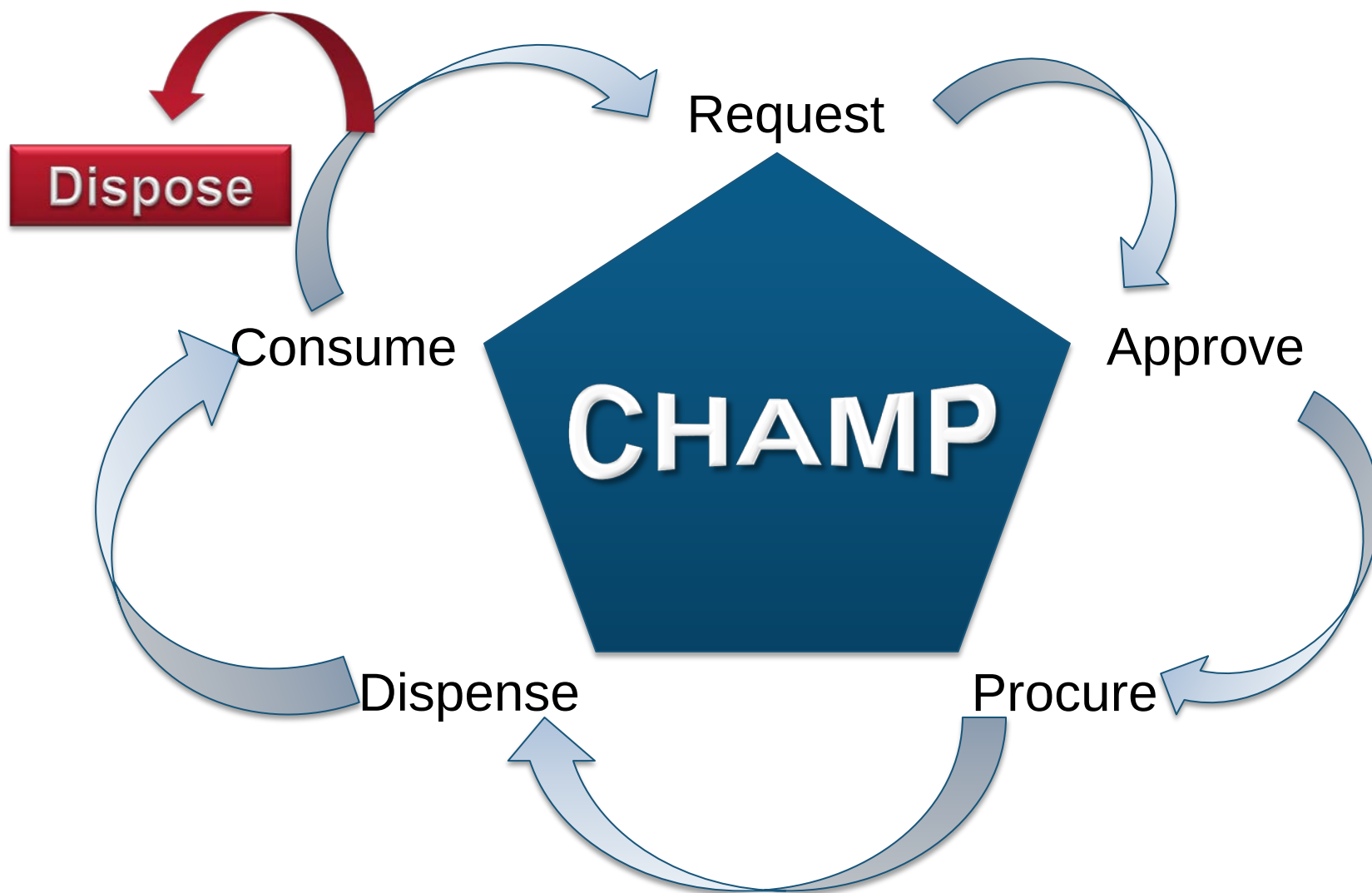


Proposed Solution

(CHAMP PROMO)



Ideal CHAMP Lifecycle





Measure of Chemical Hazards

- Use MSDS to determine the values associated with
 - Reactivity, Health, Flammability and Special properties
 - See if SPECIAL Property (Ox, Water Reactive) exists
 - Rate in the order
 - Reactivity > Health > Flammability



HAZARD RATING (HazRat) Proposal (single digit)

- Special weights (Can be customized based on Engineering Controls)?
 - Special – ALWAYS a review and elevates risk to **MAXIMUM**
 - $R = 0.65, H = 0.25, F = 0.10$ or $R=0.34, H = 0.33, F = 0.33$

$$HR \text{ (HazRat)} = R*0.65 + H*0.25 + F*0.10 \text{ (HMIS)}$$

$$HR \text{ (HazRat)} = R*0.34 + H*0.33 + F*0.33 \text{ (NFPA)}$$

Can be tuned based on engineering controls, trainings, PPE



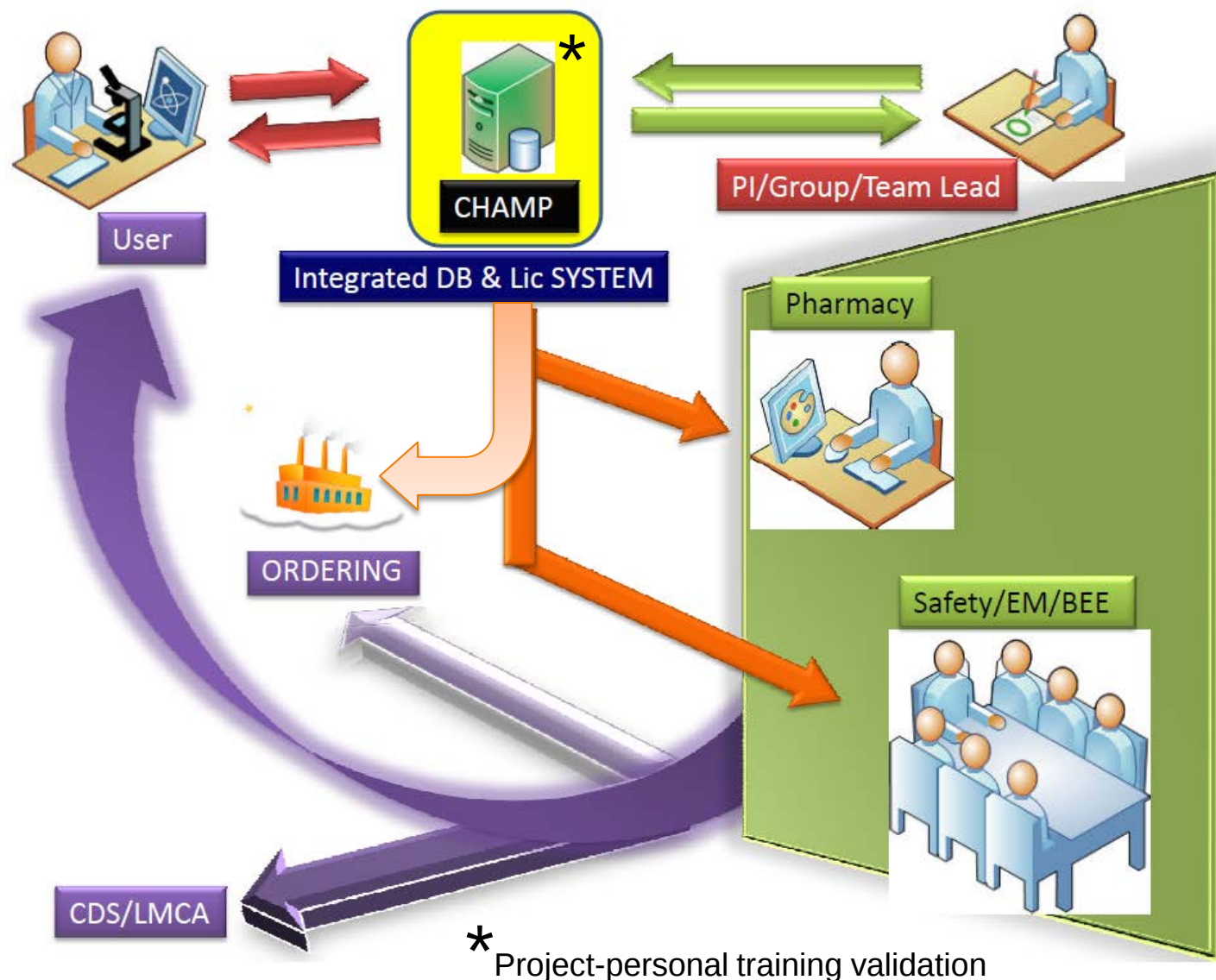
Hazard Rating (HazRat) Based Workflow



- Make it convenient for researcher or the research facility to obtain a blanket license based on the HR number
- HR ≥ 2 all in the **RED ZONE**
 - *Mandatory review by Safety office*
- HR ≥ 1 BUT < 2 will be in the **YELLOW ZONE**
 - *Discretionary review*
- HR < 1 will be in the **GREEN ZONE**
 - Safe(r) stock chemicals/solvents
 - May qualify for blanket permit



Proposed Process Streamlining





CHAMP – Under the Hood

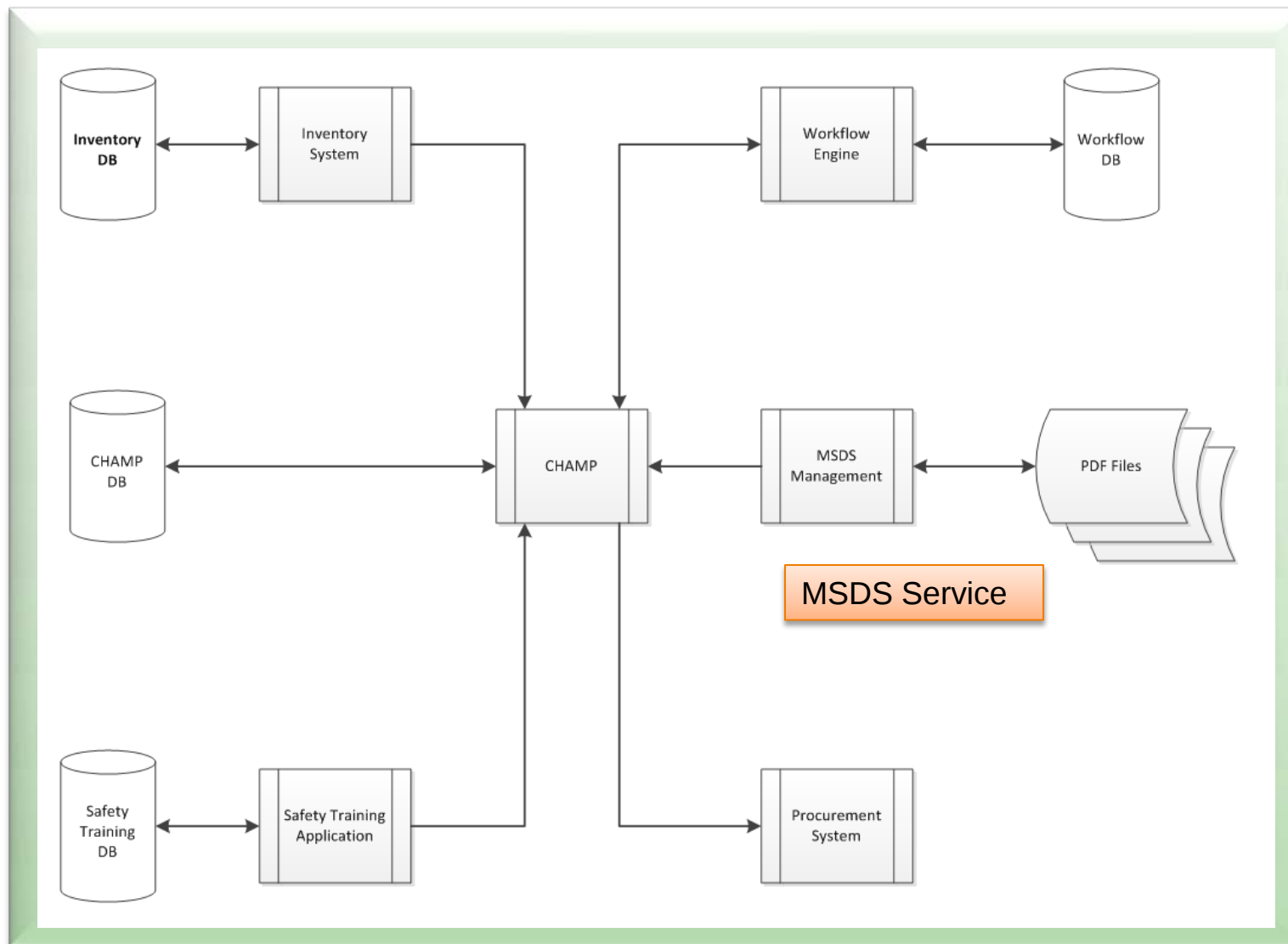


The New Web Based CHAMP System is:

- USAF Compliant platform (.NET/SQL2008)
- Interoperable with current DoD/NIH/NLM systems
- IT standard/compliant web technology
- Request using web forms
- Web-service capabilities ensuring data integrity
- Ensuring form completion before submittal
- Intelligent workflow based on “Hazard Rating”
- Integration into SharePoint/Outlook workflow

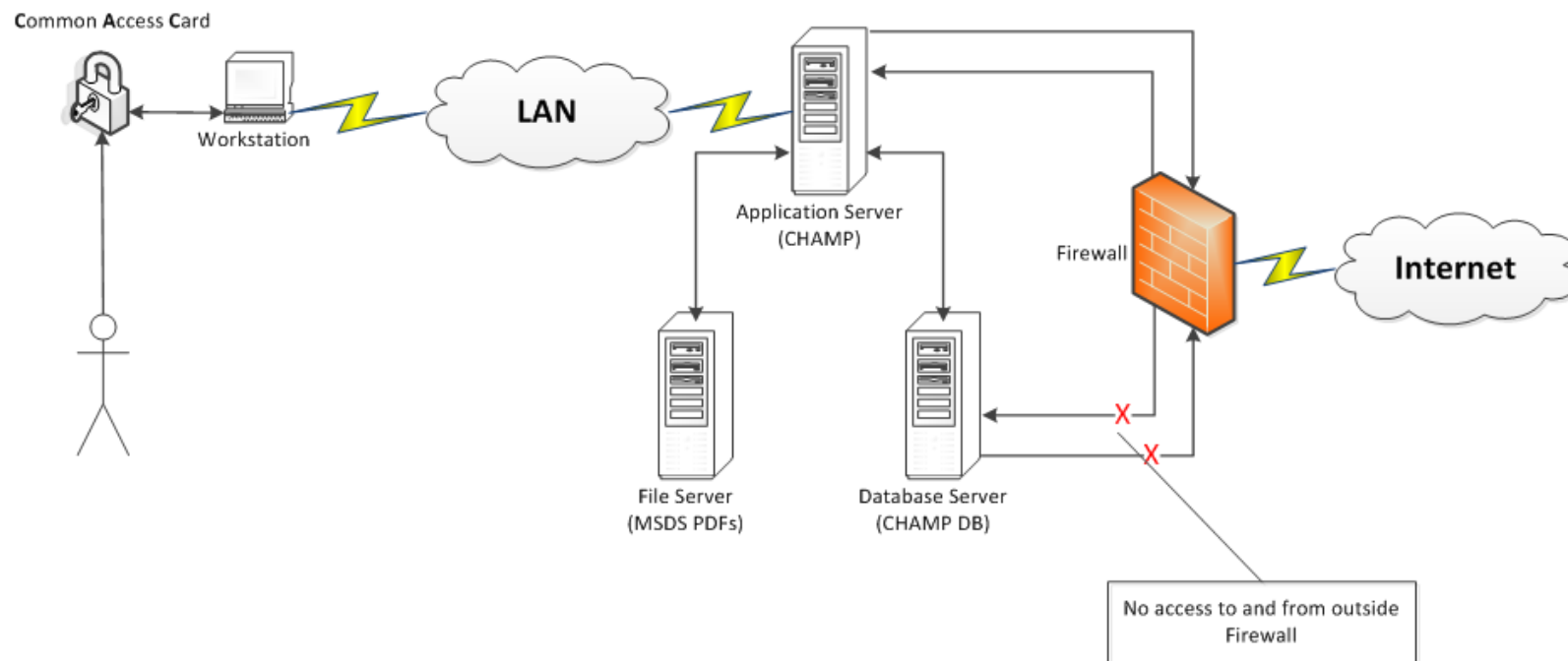


CHAMP System Architecture





CHAMP System Diagram



Stringent DoD network requirements – could be more flexible in academia



Login Information Capture



Use of technology to validate user training, authorization to used specialized chemicals etc.

ASP.NET Framework for smooth integration with current Windows applications

http://localhost:2...rl=%2fdefault.aspx

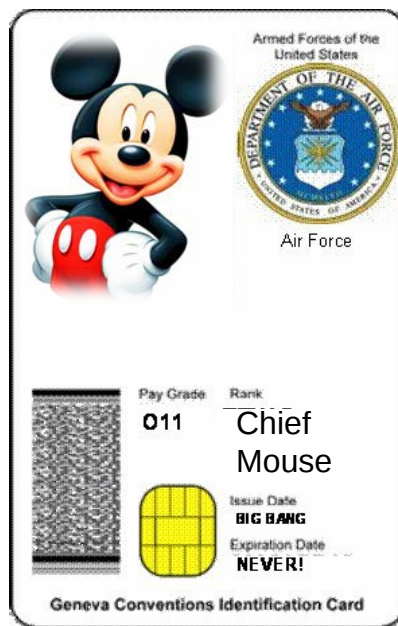
Log In

User Name:

Password:

Log In

Login required for each employee to check inventory, order chemicals – Meets USAF IT compliance requirements



- ∞ Capture User Info
 - ∞ Name
 - ∞ Contact Info
 - ∞ Location
 - ∞ Project No
 - ∞ Task No
 - ∞ Trainings
 - ∞ Supervisor
 - ∞ Work Location
 - ∞ Roles



HazRat/HazInfo in Action



PyroTec

Chemical Hazard Analysis & Management Program - CHAMP



Welcome: Mickey Mouse

Logout

Home Search Request Approval Authorization Emergency Maintenance

PyroTec
Chemical Hazard Analysis & Management Program - CHAMP

Welcome: Mickey Mouse Logout

Home Search Request Approval Authorization Emergency Maintenance

Search Inventory

Location (Building/Lab): 121 1 Search

Sortable Fields

CAS No.	Compound Name	Building	Lab	NFPA Health	NFPA Fire	NFPA Reactivity	NFPA Special	Hazard Rating (HR)
7702-65-2	Germane	121	1	4	4	3		3.67
1-115-113	Diethylaluminum chloride	121	1	3	4	3	W	3.34
1-115-114	Diethylzinc	121	1	3	4	3	W	3.34
107-02-8	Acrolein	121	1	4	3	3		3.33
71327-12-3	Nickel Carbonyl	121	1	4	3	3		3.33
1-115-171	Ethylaluminum dichloride	121	1	3	3	3	W	3.00
630-08-0	Carbon Monoxide	121	1	3	4	0		2.35
1-115-148	P-dioxane	121	1	2	3	1		2.01
1-115-151	Diisobutylamine	121	1	3	3	0		2.01
1-115-199	Mesityl Oxide	121	1	2	3	1		2.01
1-115-129	Decanol	121	1	0	2	0		0.68
76-22-2	Camphor	121	1	0	2	0		0.68
1-115-176	Diethanolamine	121	1	1	1	0		0.67
1-115-131	Hexadecane	121	1	0	1	0		0.34
1-115-138	Triethyl citrate	121	1	0	1	0		0.34

Quick sort of "bad actors" based on HazRat

Location (Building/Lab): 121 1 Search

Details Summary Contacts

Hazard Rating

HR 3.55

PPE requirements

PPE icons: Goggles, Gloves, Respirator, Hood, Boots, etc.

Location (Building/Lab): 121 1 Search

Details Summary Contacts

Emergency Contact Information

Building	Primary Contact	Phone	Secondary Contact	Phone
121	Mark Kelly	666-1111	Mickey Mouse	555-2222
122	Ashwani Vij	661-555-1212		
134	Suresh Tennarangam	555-3333		



Source support for Emergency Responders



PyroTec

Chemical Hazard Analysis & Management Program - CHAMP



Welcome: M...ouse

Logout

[Home](#) [Search](#) [Request](#) [Approval](#) [Authorization](#) [Emergency](#) [Maintenance](#)

[NIOSH Pocket Guide To Chemical Hazards](#)

[CHAMP 2 Min Promo](#)

[DOT Emergency Response Guide](#)

NIOSH / Pocket Guide to Chemical Hazards - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://localhost:2111/Content/Static/Niosh/nioshdb/npg/npgd0000.h

PyroTec

NIOSH The National Institute for Occupational Safety and Health

NIOSH Pocket Guide to Chemical Hazards

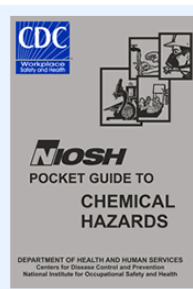
INDEX of Chemical Names, Synonyms and Trade Names

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

SEQ	CHEMICAL NAME	CAS No.	RTECS No.
0017	AA	107-18-6	BA5075000
0007	2-AAF	53-96-3	AB9450000
0007	AAF	53-96-3	AB9450000
0589	Abate®	3383-96-8	TF6890000
0001*	Acetaldehyde	75-07-0	AB1925000
0007	2-Acetaminofluorene	53-96-3	AB9450000

Done 00:00



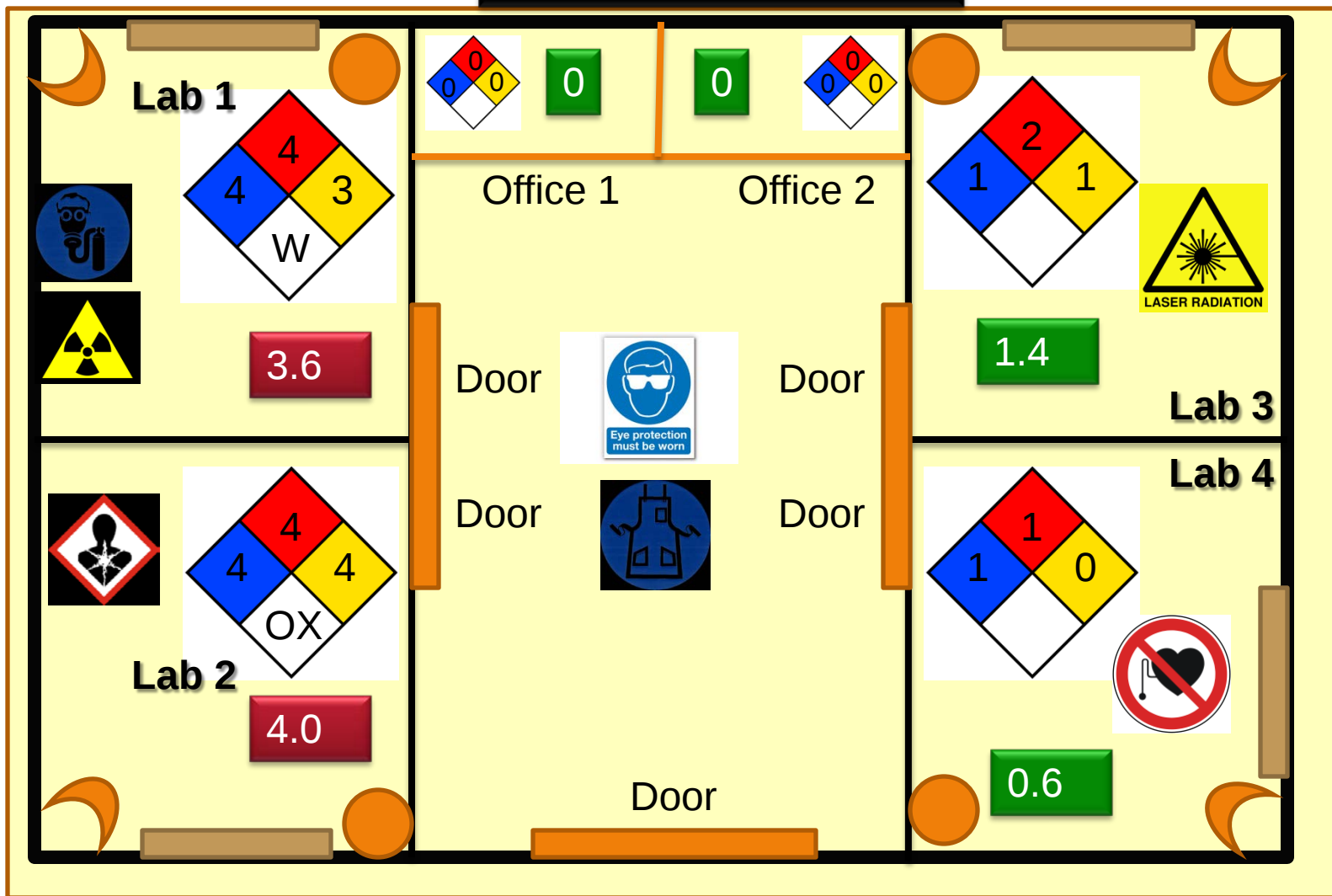
Emergency Response Guidebook





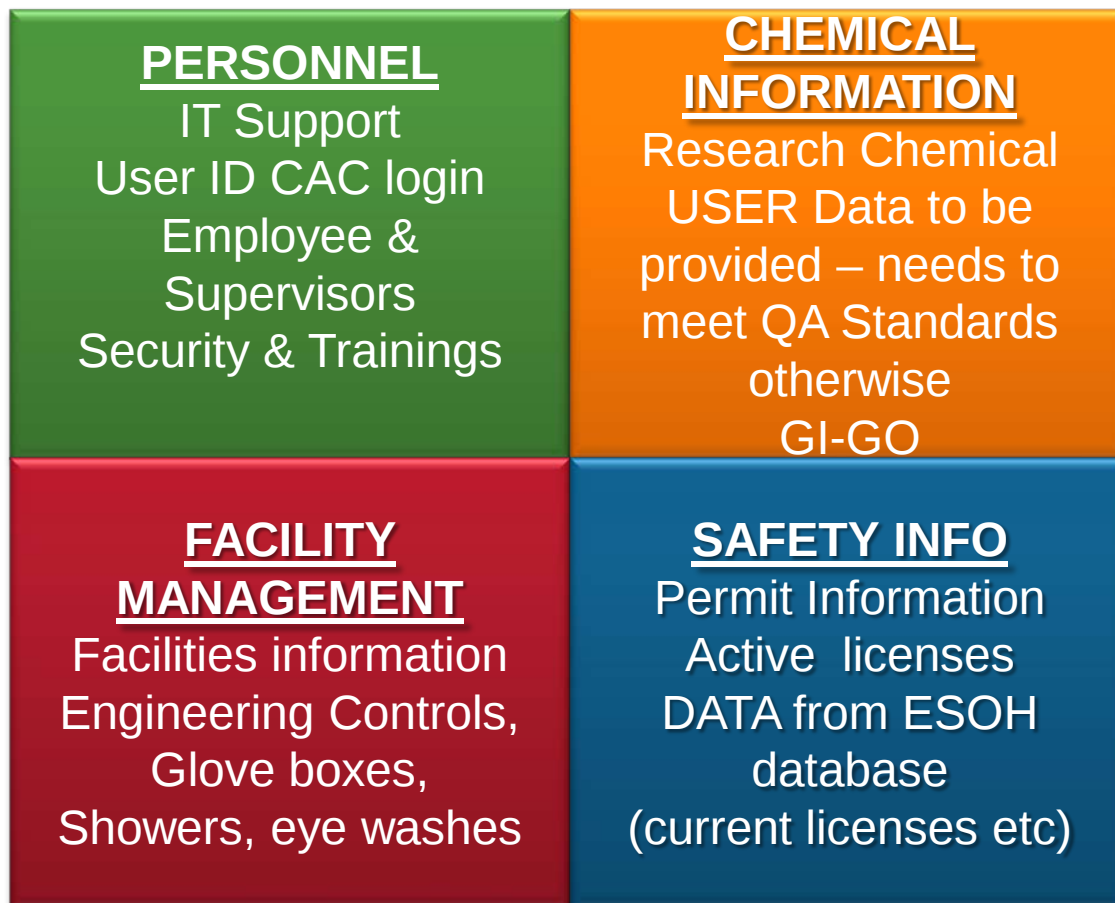
“GIS” mapping of facility

Floor Map of Bldg XYZ





Centralization & System Integration





Application Benefits

- Prevent Inadvertent Chemical Exposure
- Prevent Personal INJURY due to inadequate risk evaluation
- Prevent injury to First Responders (Fire/Medics)
- Reduce disposal cost from stockpiling
- Increase productivity, boost morale
- Allow R&D to stay mission focused
- *Process leaning will help save over 0.5M over next 5 years*



Acknowledgments



Col. Michael Platt,
Commander AFRL Det 7

Dr. Shawn Phillips,
Deputy RZS

Ms. Debra Fuller,
Chief of Safety

Dr. Pertti Hakkinen
NIH/NLM

Mr. Tuong Chu,
System Safety Engineer

\$\$

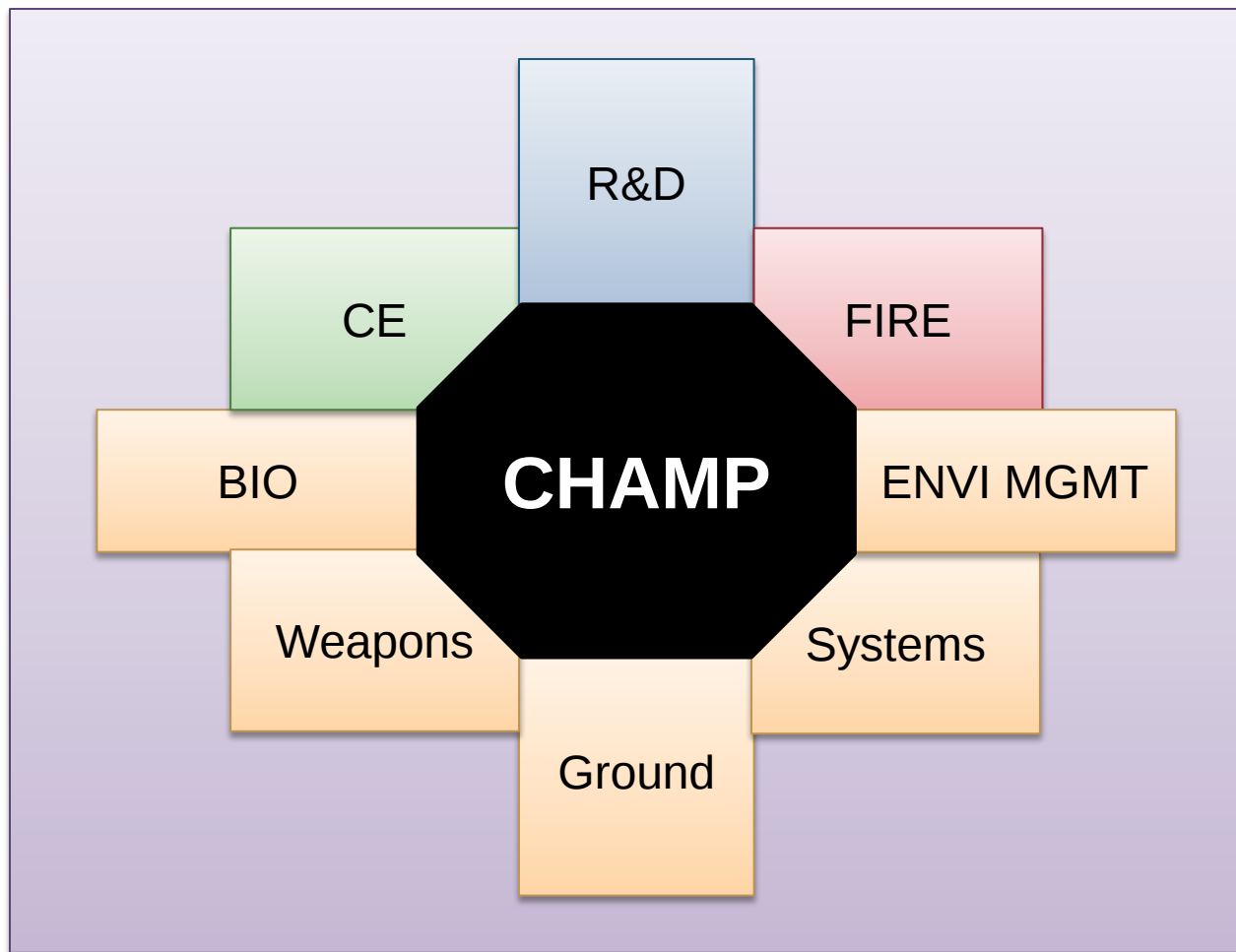
Air Force Research Laboratory, Edwards



Backup



Why a new system



Cross-functional Setup

R&D

FIRE

CE

Systems

Ground

Weapons

BIO

Environ-
mental



Wiser-CHAMP integration



Chlorine X +

Chlorine CAS RN: 7782-50-5

Protective Distance Map

- Provide web-services for hazards
- Assist in predicting protective distances using DoD Google Earth maps
- Provide customized and quality data to AF first responders (3 sources)
- Help evaluate hazards of newly developed materials in R&D
- Address chemical compatibilities
- Many other benefits not determined yet

Spill Location
☒ Address ☐ Lat/Long
7075 Samuel Morse Drive Columbia, SC 29206 Submit

Wind Direction
N
W E S
Point the compass into the wind

Spill Size
☒ Large ☐ Small
☒ Day ☐ Night

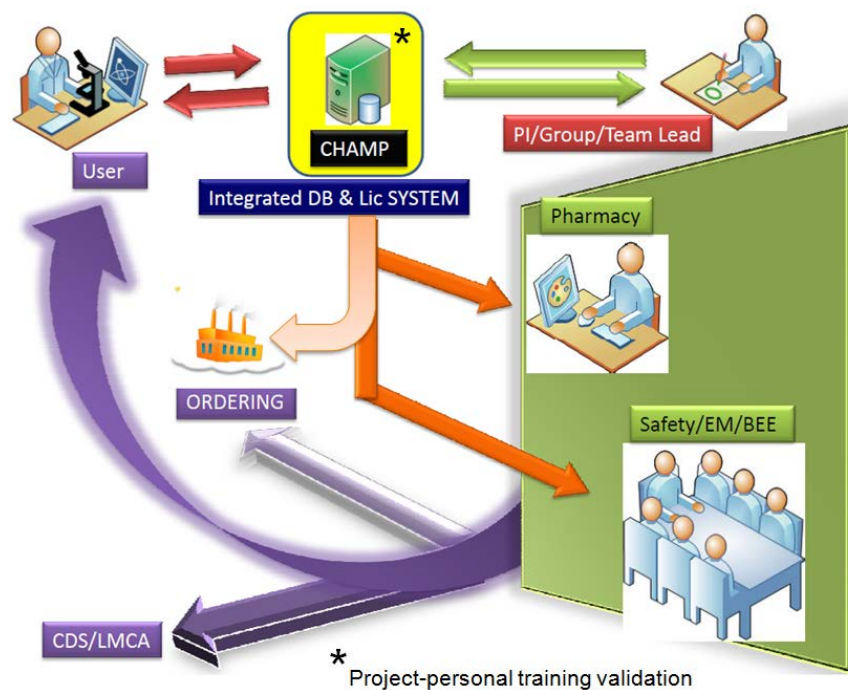
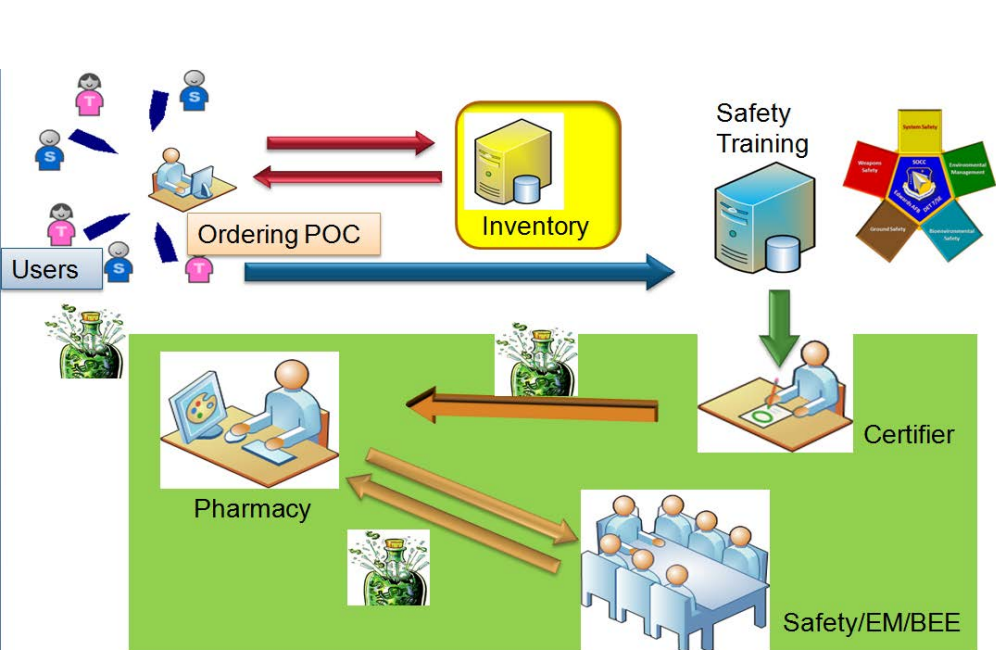
Display Units
☐ Hide unit labels on map

[Change map preferences](#)
[Learn more about protective distances](#)

First ISOLATE 2000 ft in all directions, then PROTECT downwind 2.2 mi ([View protective distance data](#))



Side by side comparison of process





Location Based Hazard Risk

Same chemical may pose different hazards based on location/personnel



R&D Lab

- Handled by SMEs
- Fume hoods
- PPE
- Engineering controls



Hazmat Stockroom

- Handled by hazcom trained employees
- May or may not have fume hoods
- PPE



Receiving Office

- NO Fume hoods
- PPE use?
- Handled by logistics employees



Transportation* – spills & leaks



Each phase should have it's unique risk mitigation strategy

* DOT compliance
for transportation