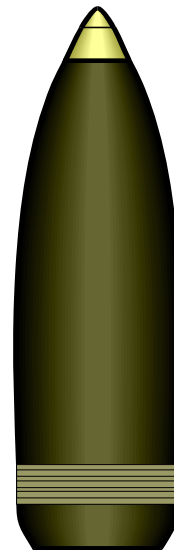


# In insensitive Munitions Analytical Compliance System (I-MACCS) Concept



**2007 In insensitive Munitions & Energetic Materials  
Technology Symposium  
Miami, FL  
October 16, 2007**

**CCS**

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# Insensitive Munitions (OSD & NATO)

*“...munitions which reliably fulfill their performance, readiness and operation requirements on demand, but which minimize the probability of inadvertent initiation and severity of subsequent collateral damage to weapon platforms, logistic systems, and personnel, when subjected to unplanned stimuli.”*

## BENEFITS

- Enhanced survivability of logistical and tactical systems
- Reduced risk of injury to personnel
- Applicability across services/platforms
- More efficient to transport, store and handle
- More cost effective

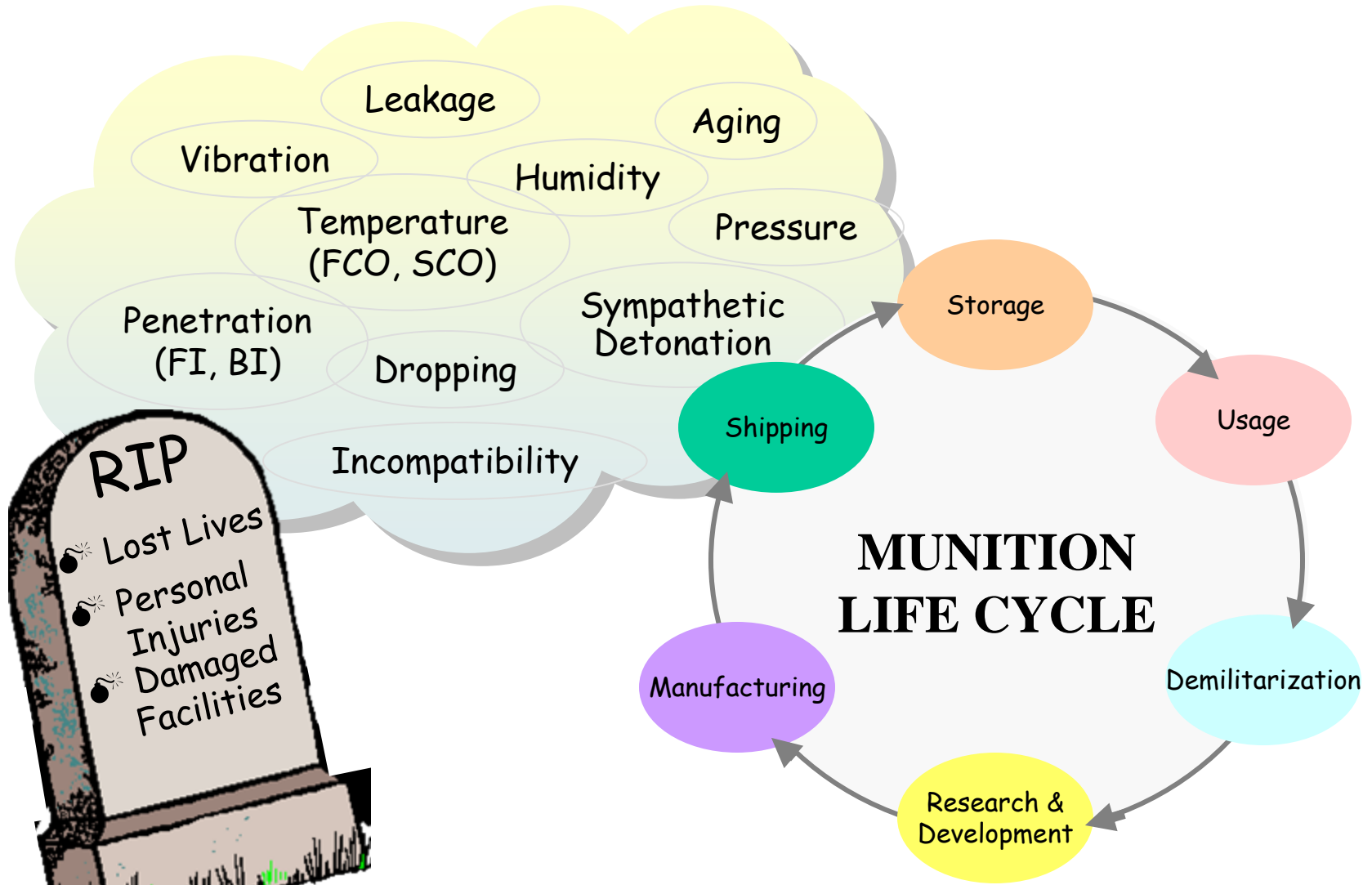
## Historic Incidences

(Four Aircraft Carrier Accidents in 1966, 1967, 1969 & 1981)<sup>a</sup>

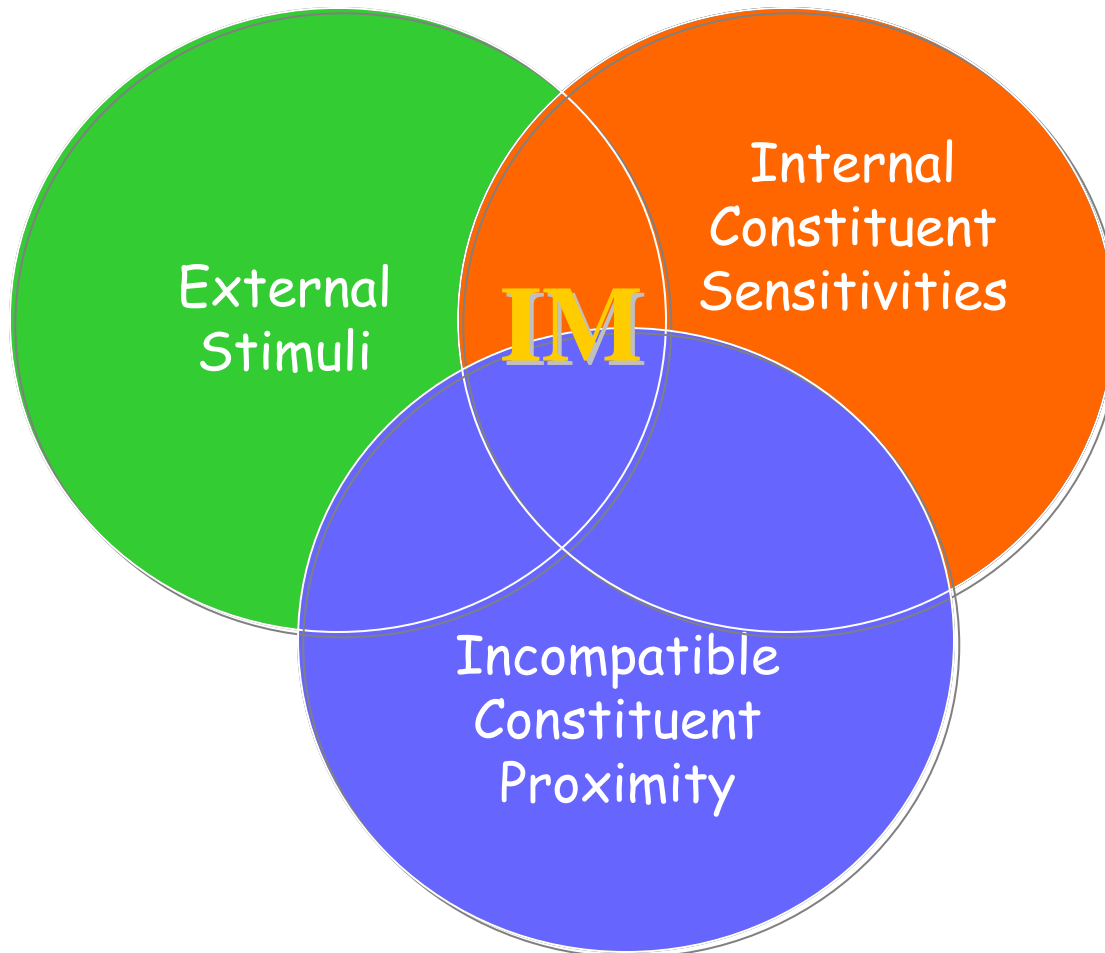
	<u>ACTUAL STATISTICS</u>	<u>IM MUNITION EST'D</u>	<u>% ↓</u>	<u>EST'D SAVINGS</u>
Lives Lost	220	72	67	\$148M
Injuries	709	132	81	577M
Aircraft Lost	42	10	76	32M
Aircraft Damaged	72	12	83	60M
Potential Total \$ Savings				<b>\$1.4B</b>

<sup>a</sup> From 1991 CNA Study

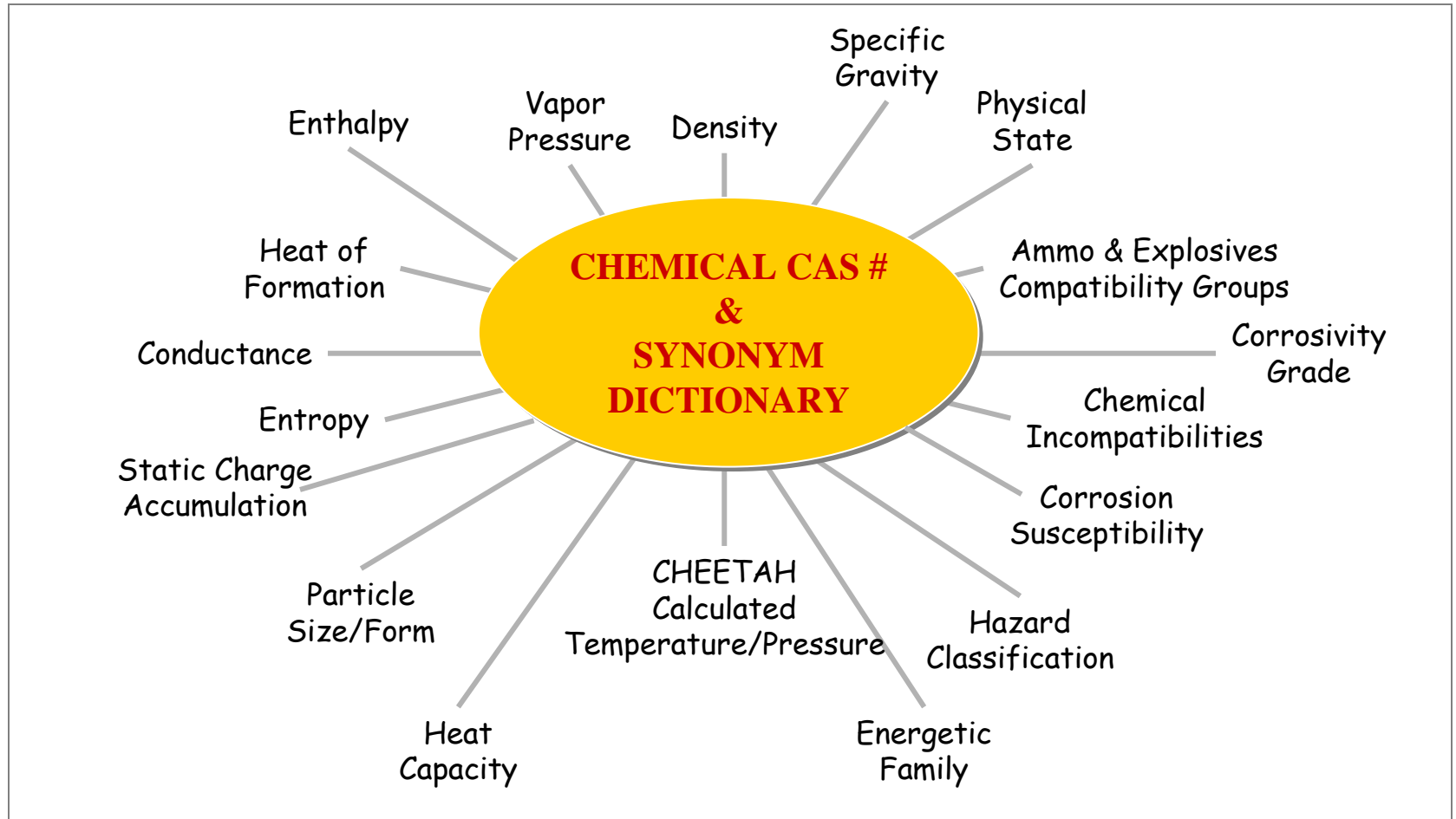
# Munitions Life Cycle Unplanned Stimuli



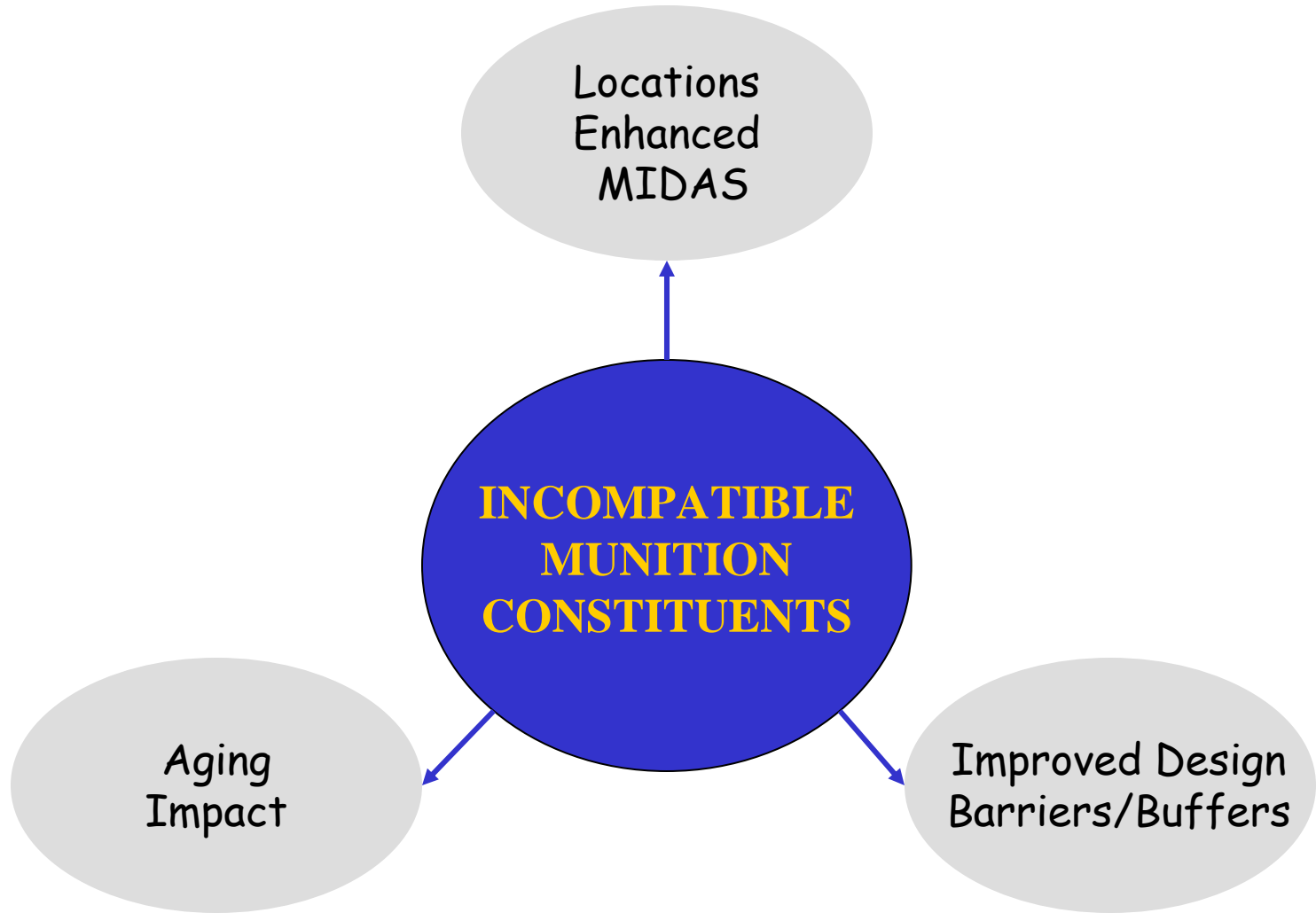
# Sources of Weapon System Vulnerabilities



# Sensitive Constituents Database Endpoints



# Incompatible Chemical Proximity Database



# Hurdles for Developing Insensitive Munitions

## “HURDLE”

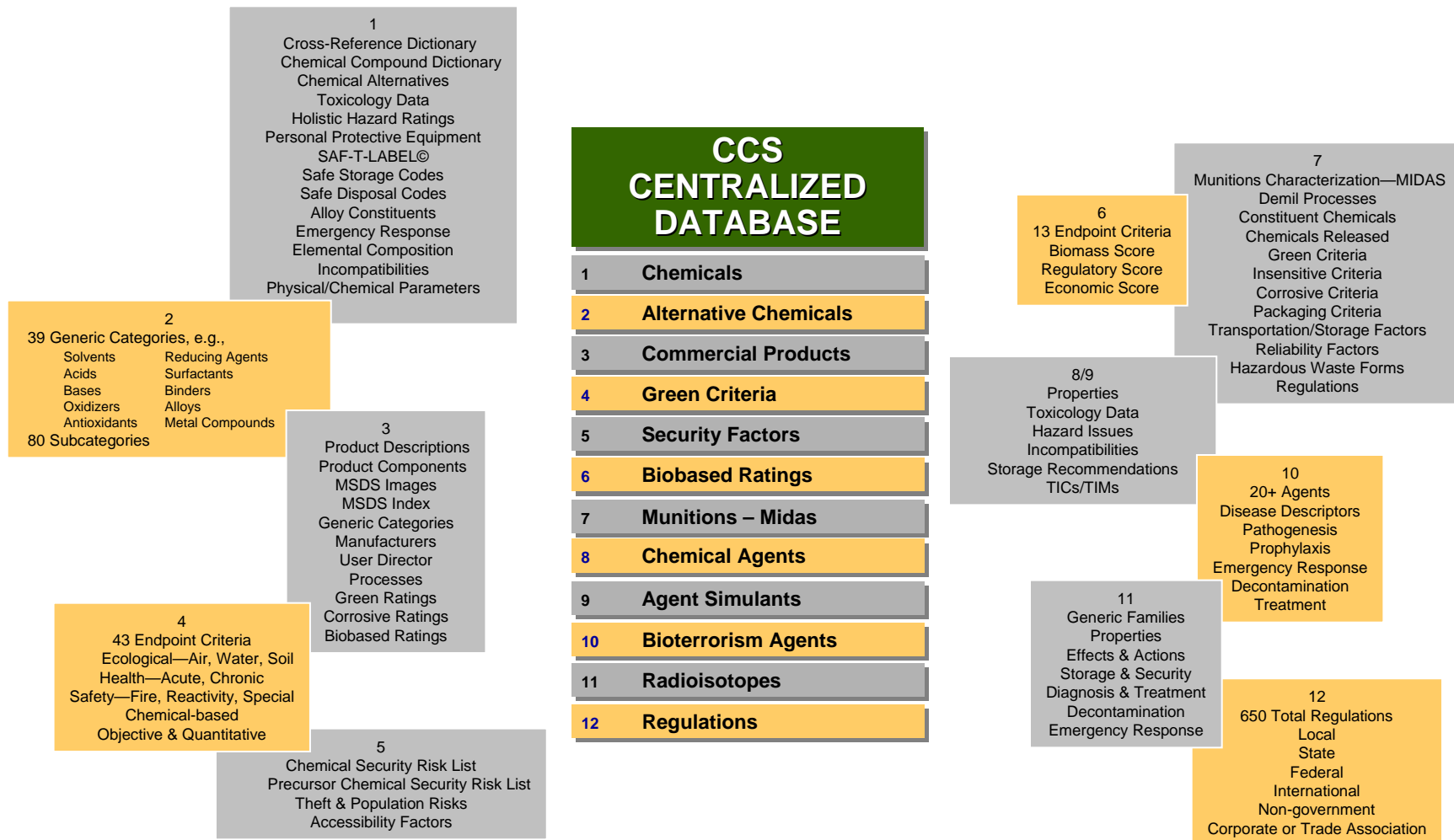
1. The problem is extremely complex
2. IM is only one of the problems
3. Some test protocols are not standardized
4. Some IM test results are not standardized, nor shared
5. IM Test Data must be secure
6. Incident “Root Cause” Analyses are not in a database

## SOLUTION

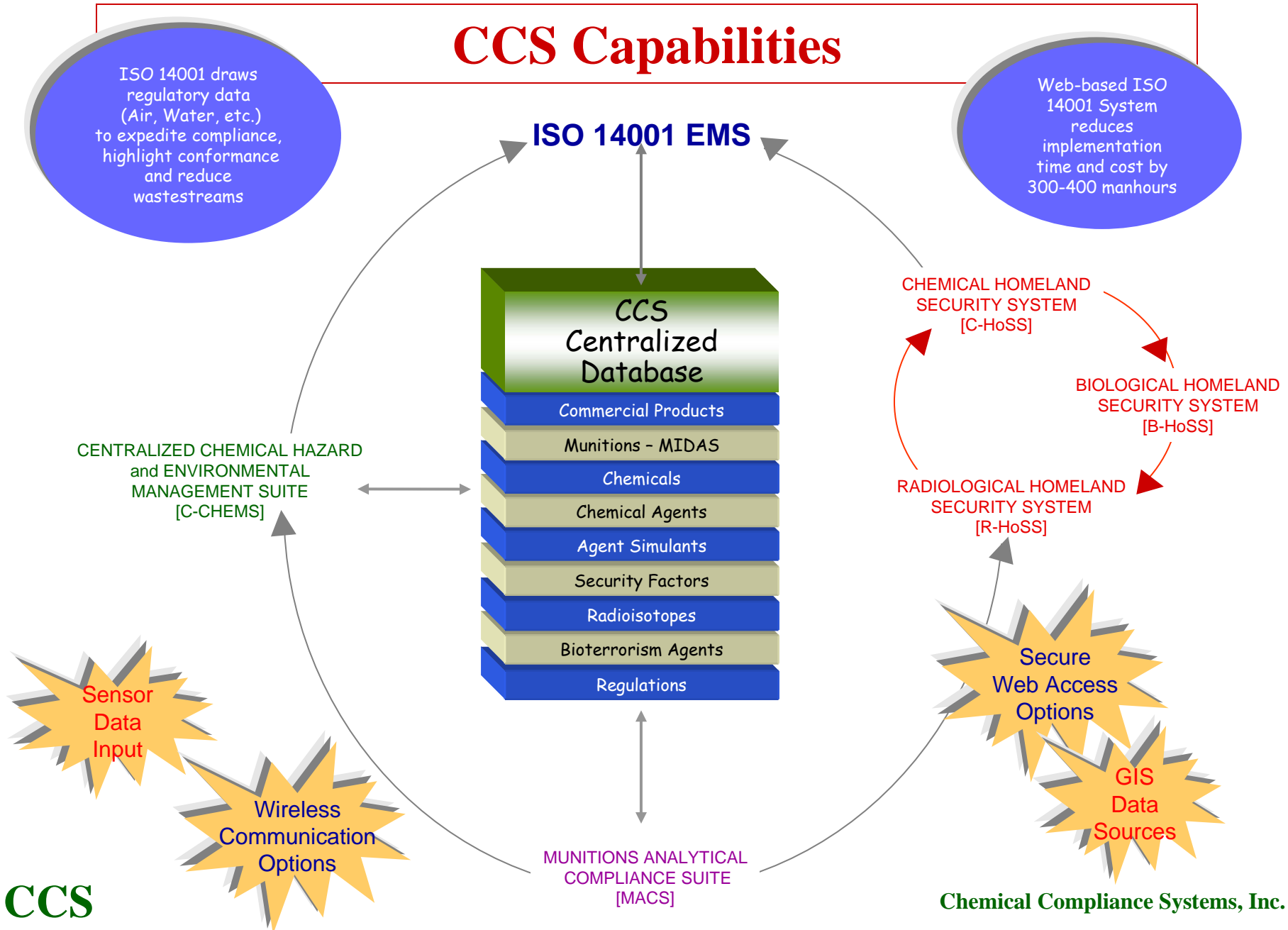
1. Utilize “outside the box” thinking
2. Start — Integrate — Enhance
3. Begin with a standardized data repository
4. Develop a Centralized Database--require submissions
5. Obtain DoD & NSA clearance for I-MACS Security
6. Develop a chemical-based “Root Cause” for each incident



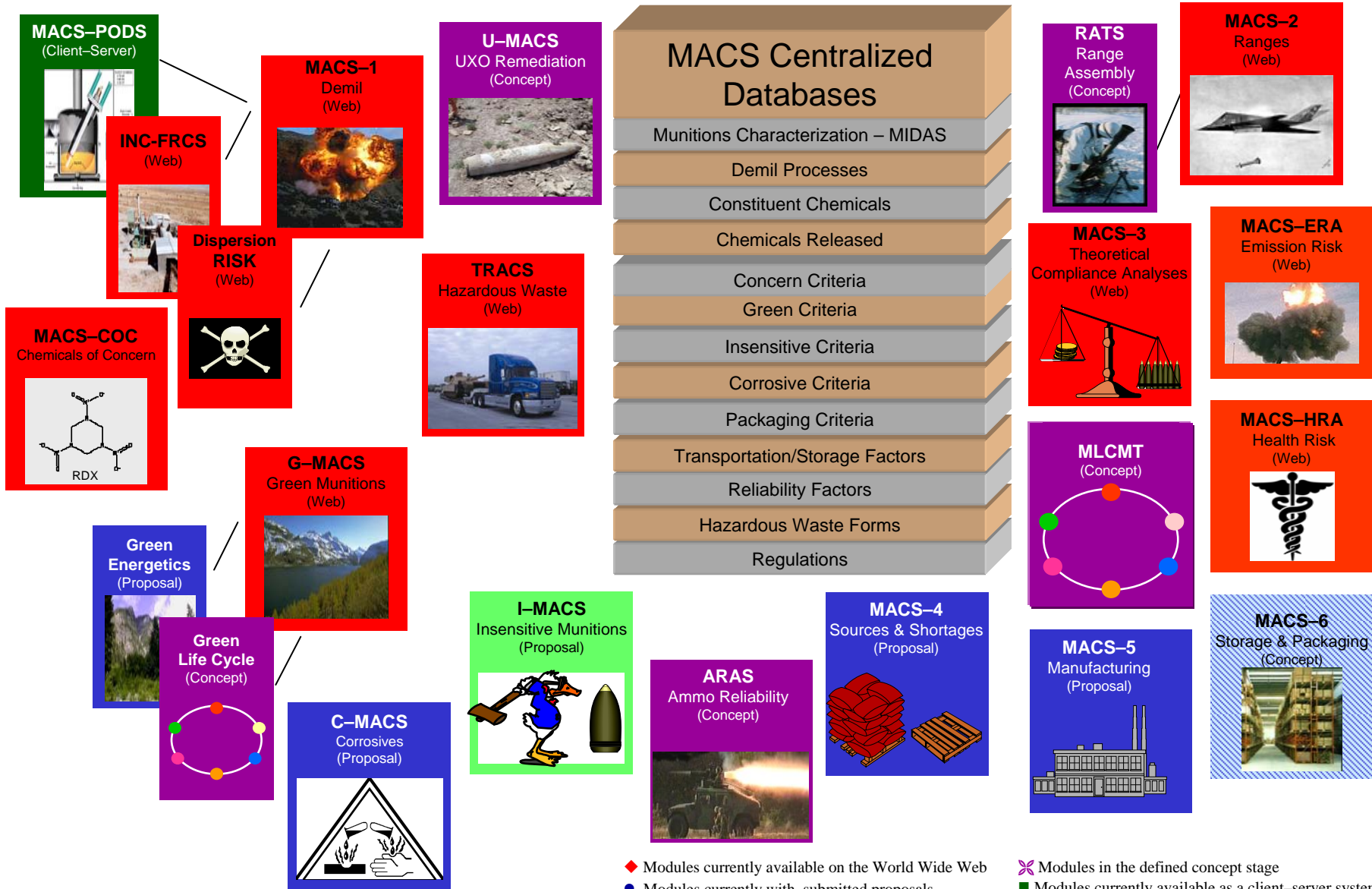
# The CCS Relational Chemical & Product Database (R-CPD)



# CCS Capabilities



# Munitions Analytical Compliance Suite (MACS)

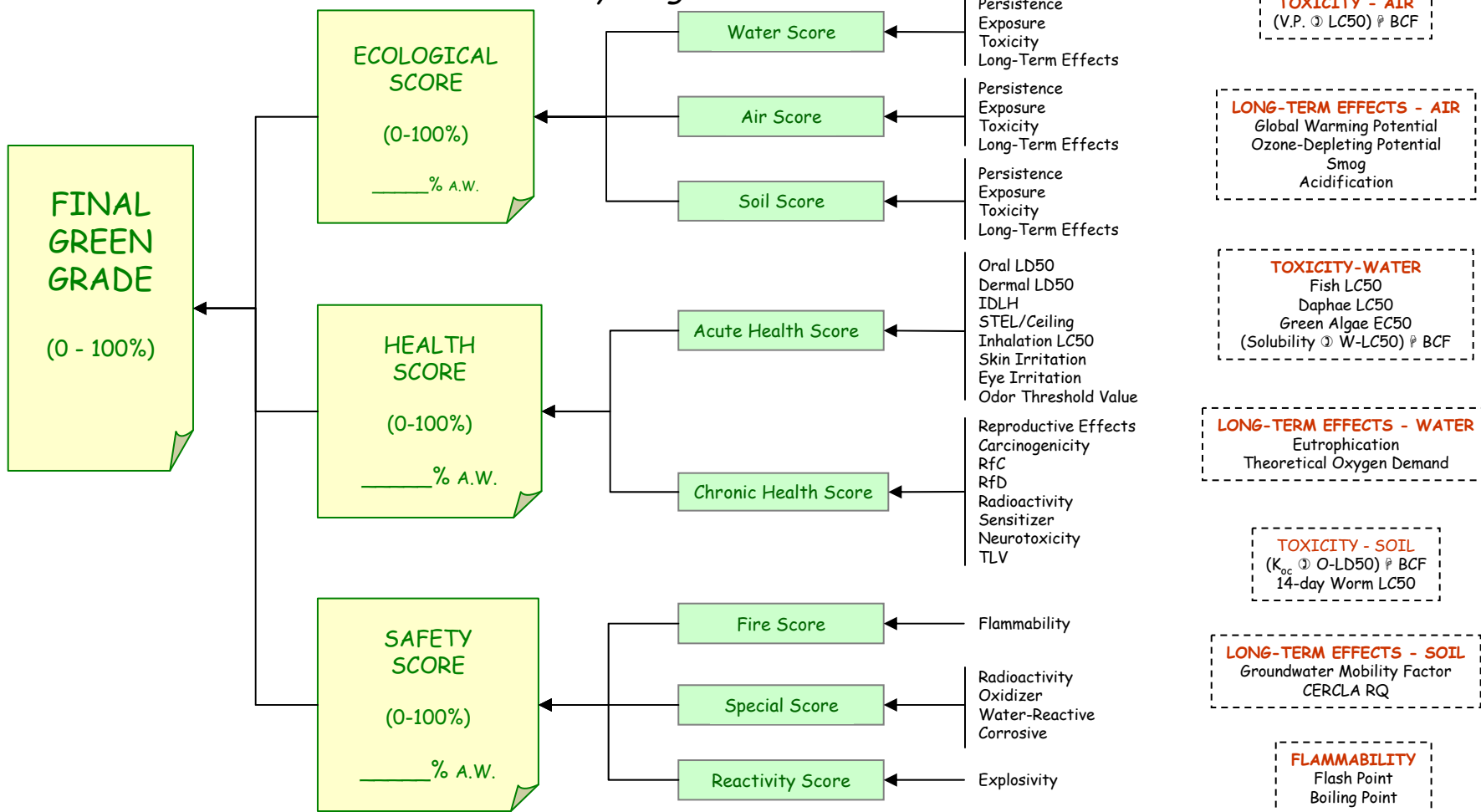


- ◆ Modules currently available on the World Wide Web
- Modules currently with submitted proposals

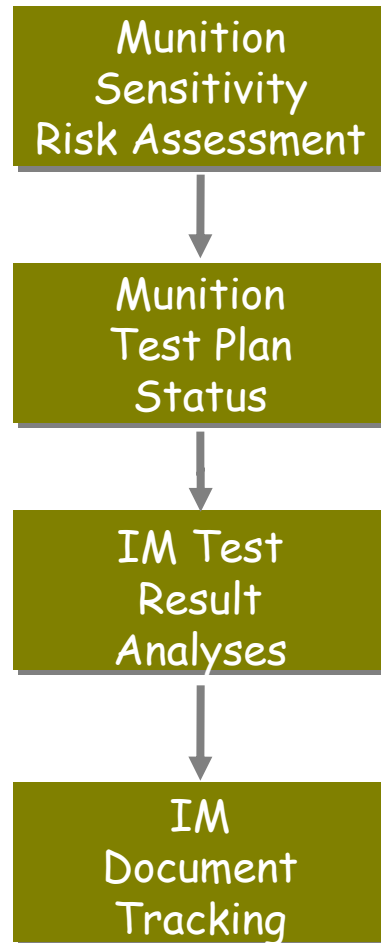
- ✕ Modules in the defined concept stage
- Modules currently available as a client-server system

# ("Green" Munitions Analytical Compliance System) G-MACS "Green" Score Scheme

*Significance of each sub-score can be individually weighted*



# I-MACS System Components



# Main Menu Screen

MACS-1  
Analytical  
Input Results

Munition  
Sensitivity  
Risk  
Assessment

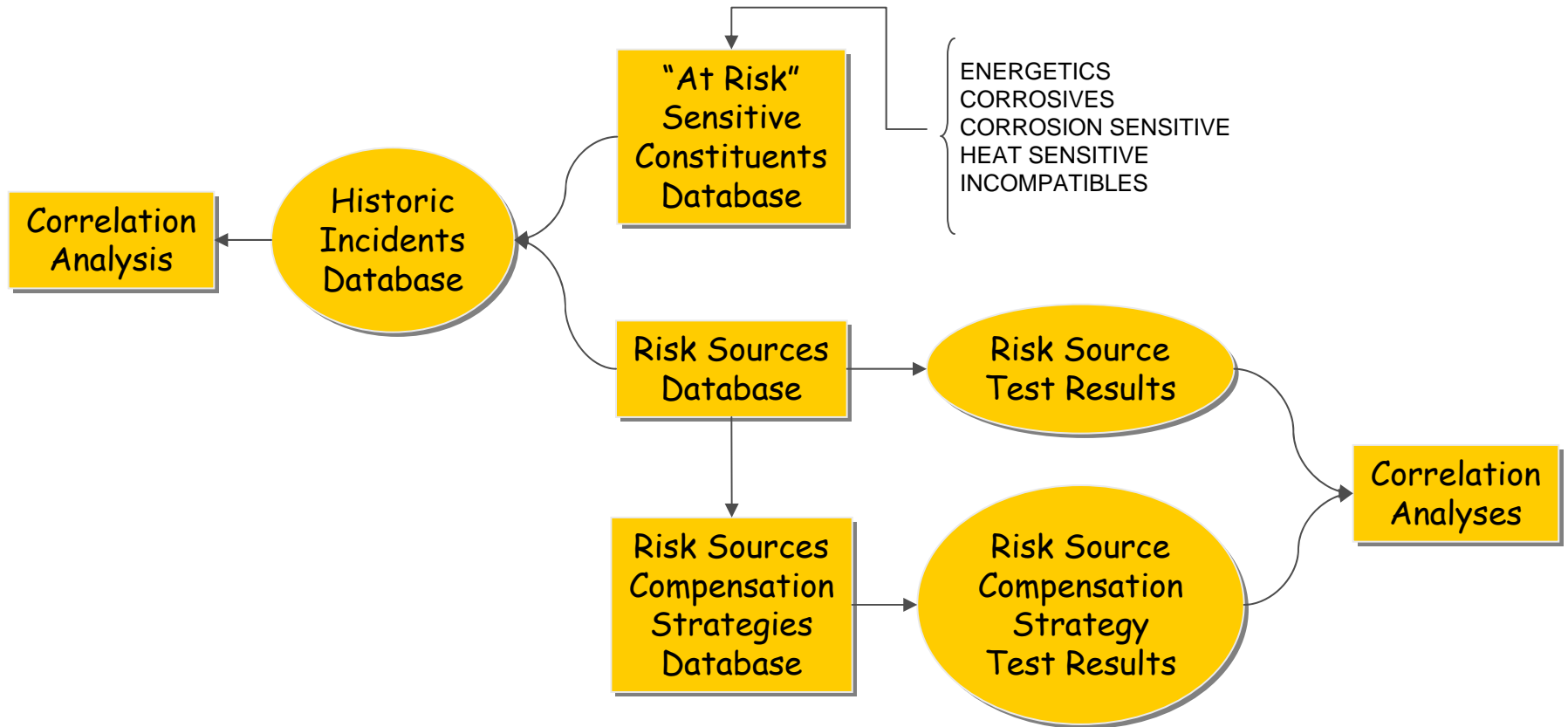
IM  
Test Plan  
Status

IM  
Test Result  
Analyses

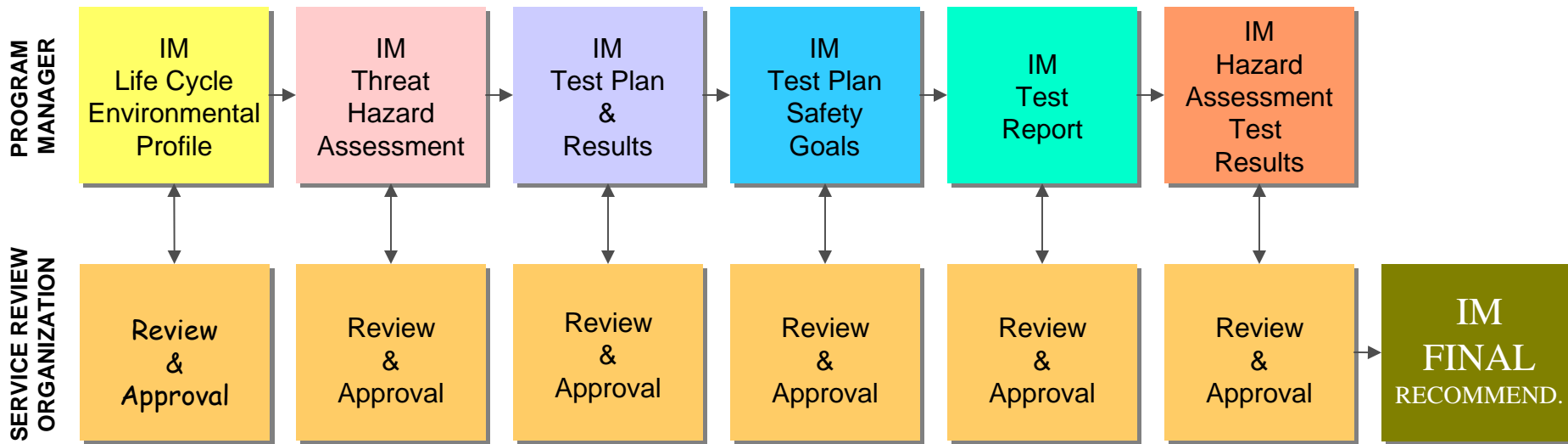
IM  
Document  
Tracking

I-MACS  
Analytical  
Results Output  
(to G-MACS)

# Munition Sensitivity Risk Assessment Algorithms



# Test Plan Status & Document Tracking





# Test Plan & Results

28-Day Temperature & Humidity Test	Vibration Test	4-Day Temperature & Humidity Test	12-Meter Drop Test
Fast Cook-Off Test	Slow Cook-Off Test	Bullet Impact Test	Fragment Impact Test
Sympathetic Detonation Test	Shaped Charge Jet Impact Test	Spall Impact Test	Specialty Test
Specialty Test	Specialty Test	Specialty Test	Specialty Test

### 5.2.1 I-MACS Fast Cook-Off Test Results

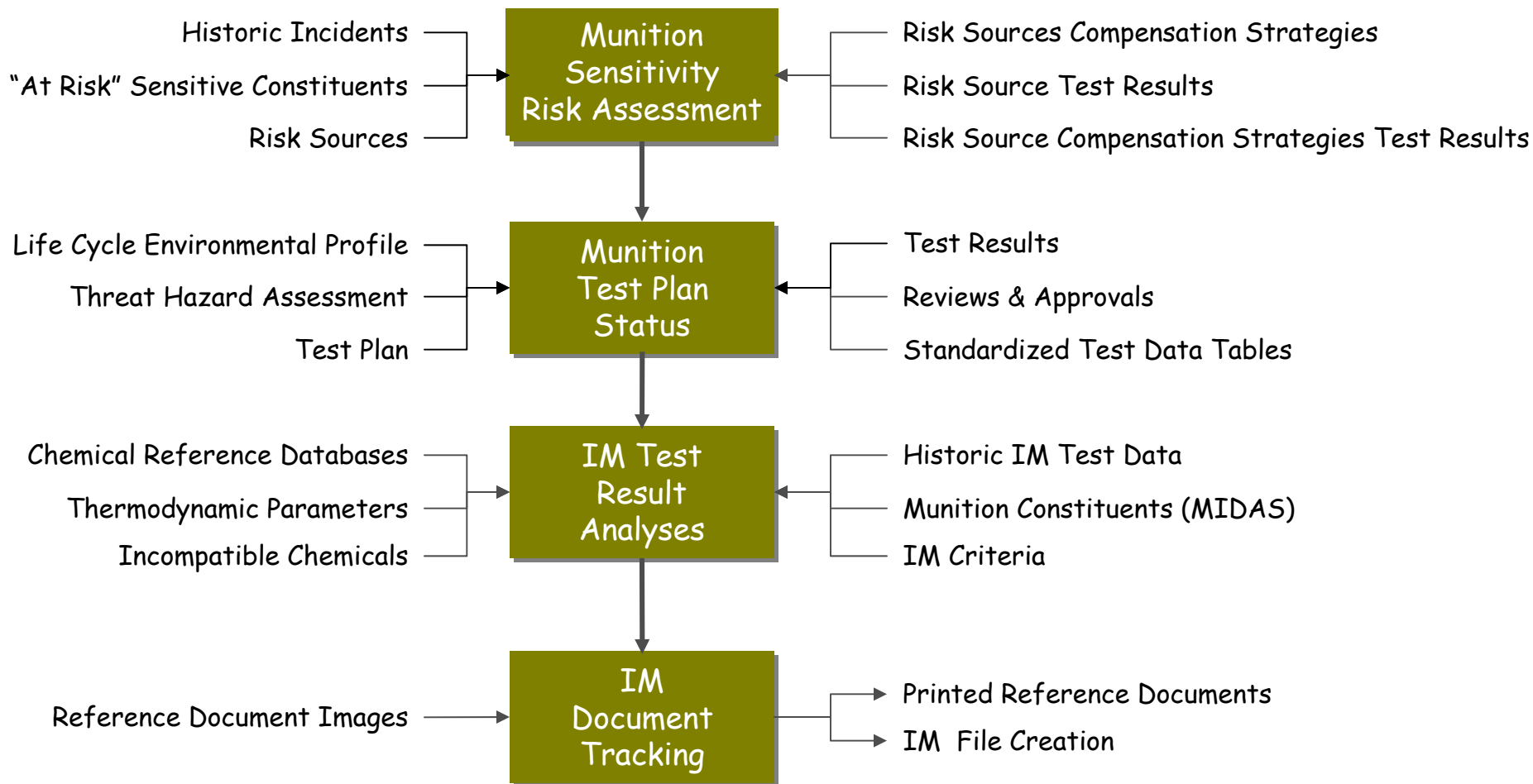
ITEM NO.	<i>Engulf at least two test items in the flame envelope (complete engulfment).</i>
Visual Inspection	Normal _____ Abnormal ( <i>describe</i> ) _____ _____ _____ _____
Radiographic Inspection	Normal _____ Abnormal ( <i>describe</i> ) _____ _____ _____ _____
Position	Major Axis Horizontal _____ Most Probable Attitude ( <i>describe</i> ) _____ _____ _____ _____
Distance from Fuel Basin	(Item Centerline to Fuel Surface) _____ mm
Restraining Method	
Suspension Method	
Fuel Type	
Flame Temperature Rise Time (time to reach 540°C-1000°F)	

AVERAGE FLAME TEMPERATURE: _____ °C (±870°C = 1600°F)	
PHOTOGRAPHY:	[1] Still _____ Pretest _____ Post-Test _____ [2] Videotape w/sound _____

TEST RESULT SUMMARY
1. Type 1 (Detonation Reaction)
2. Type 2 (Partial Detonation Reaction)
3. Type 3 (Explosion Reaction)
4. Type 4 (Deflagration Reaction)
5. Type 5 (Burning Reaction)

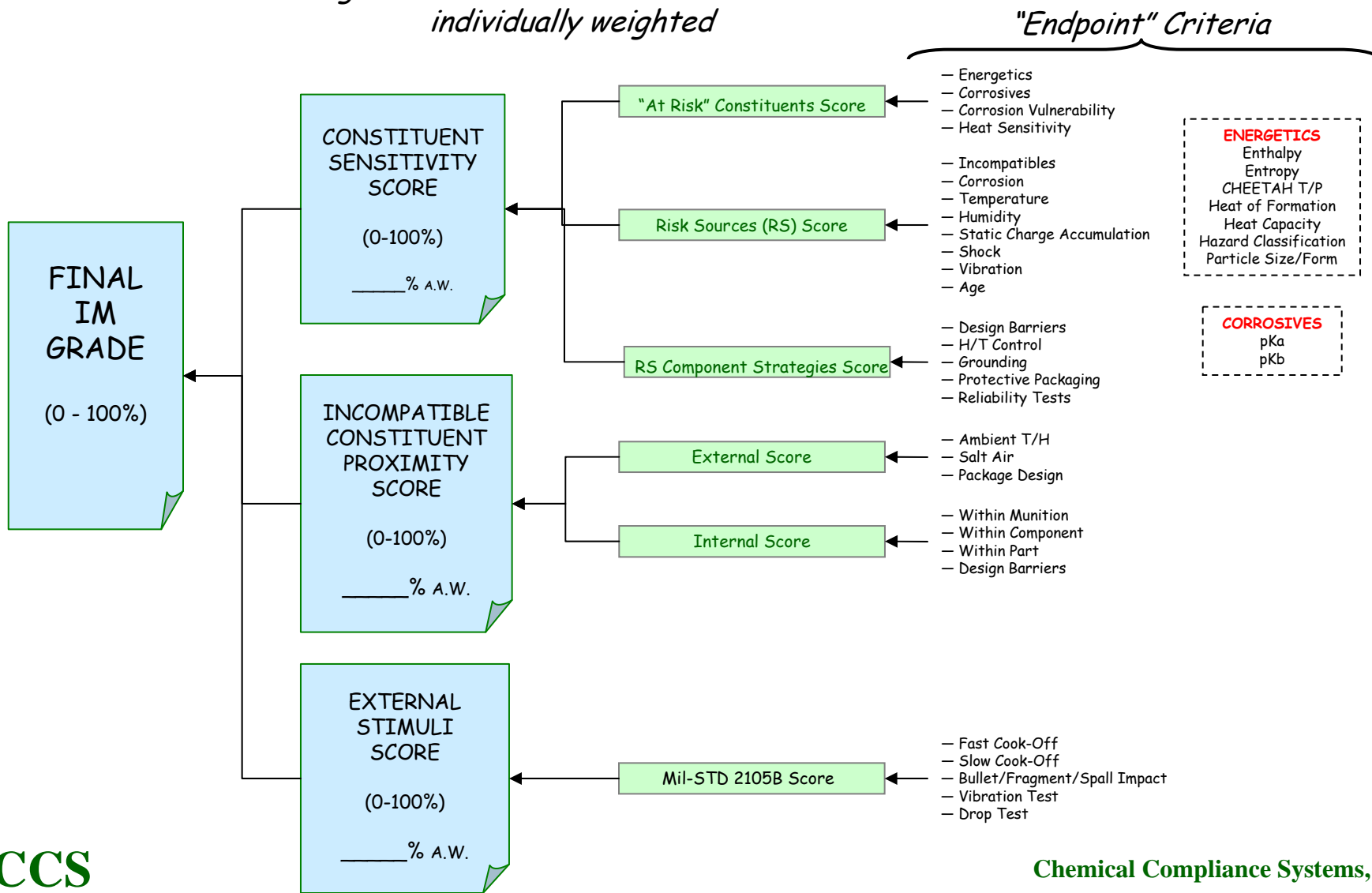
Thermal Couple Readings @:	2 * I TC1	TC2	TC3	TC4	Bore Pressure
2s					
4s					
6s					
8s					
10s					
12s					
14s					
16s					
18s					
20s					
22s					
24s					
26s					
28s					
30s					

# System Components

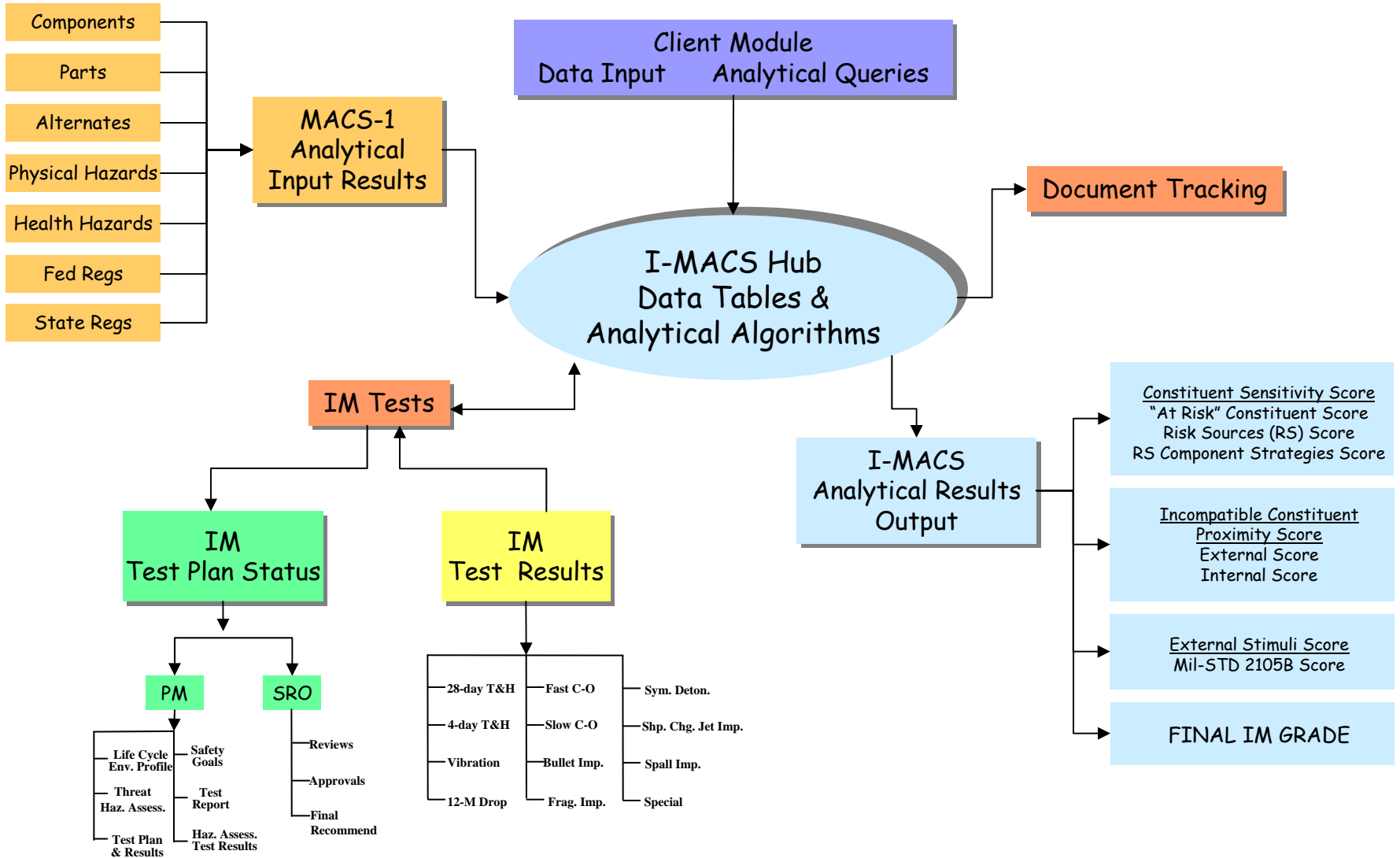


# I-MACS Report Card & Scoring Scheme

*Significance of each sub-score can be individually weighted*



# Data Acquisition & Analytical Report Capabilities



# Insensitive Munitions Analytical Compliance System (I-MACS)



*For more information on I-MACS,  
or a remote demonstration of  
other MACS modules,  
please contact . . .*

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