



OB & OD Munition Emissions Database Guidance

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Overview

Background Databases – MIDAS, R-CPD

OB/OD Emissions Database Origin & Evolution

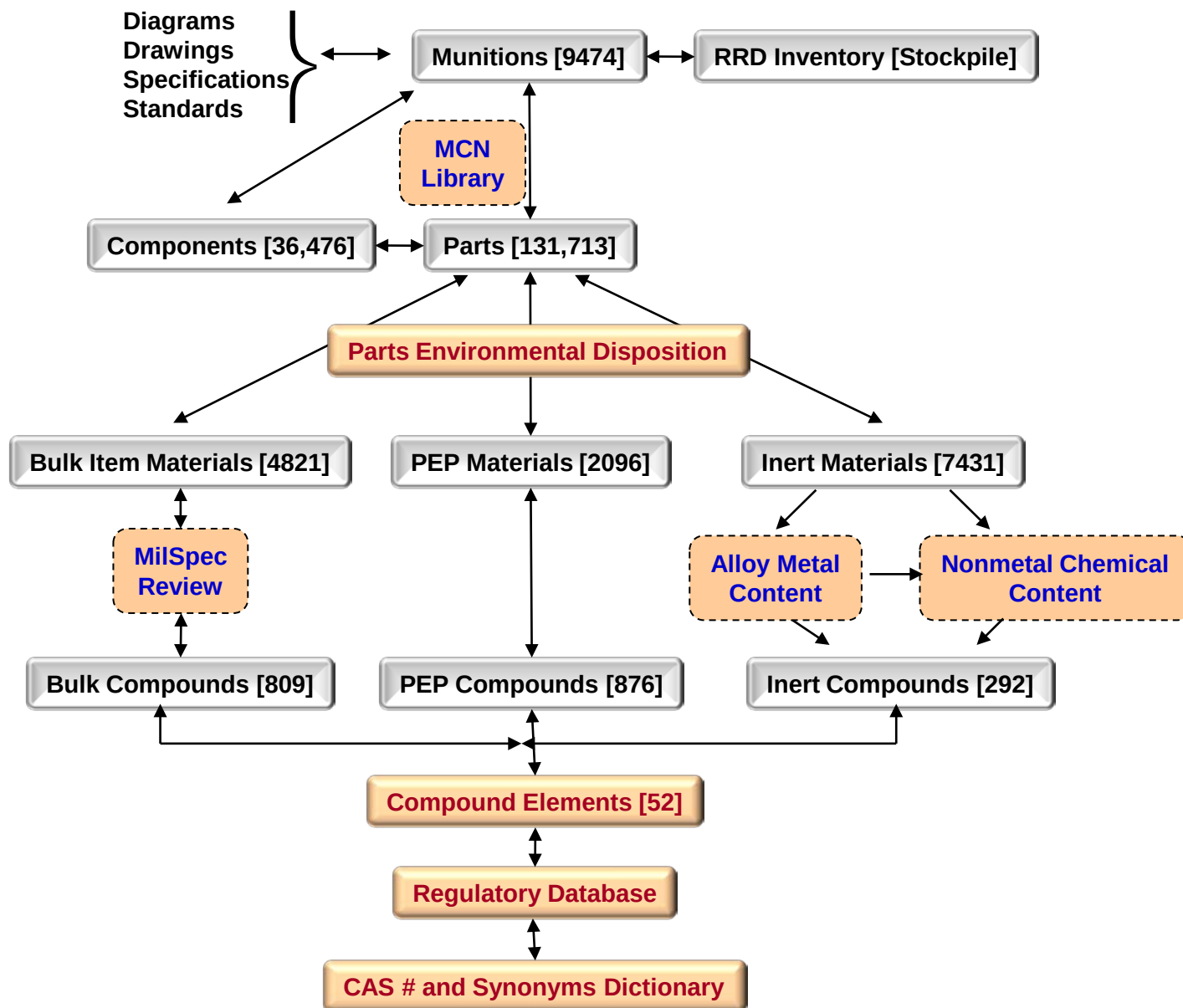
Current Guidance

OB/OD Emissions Impact

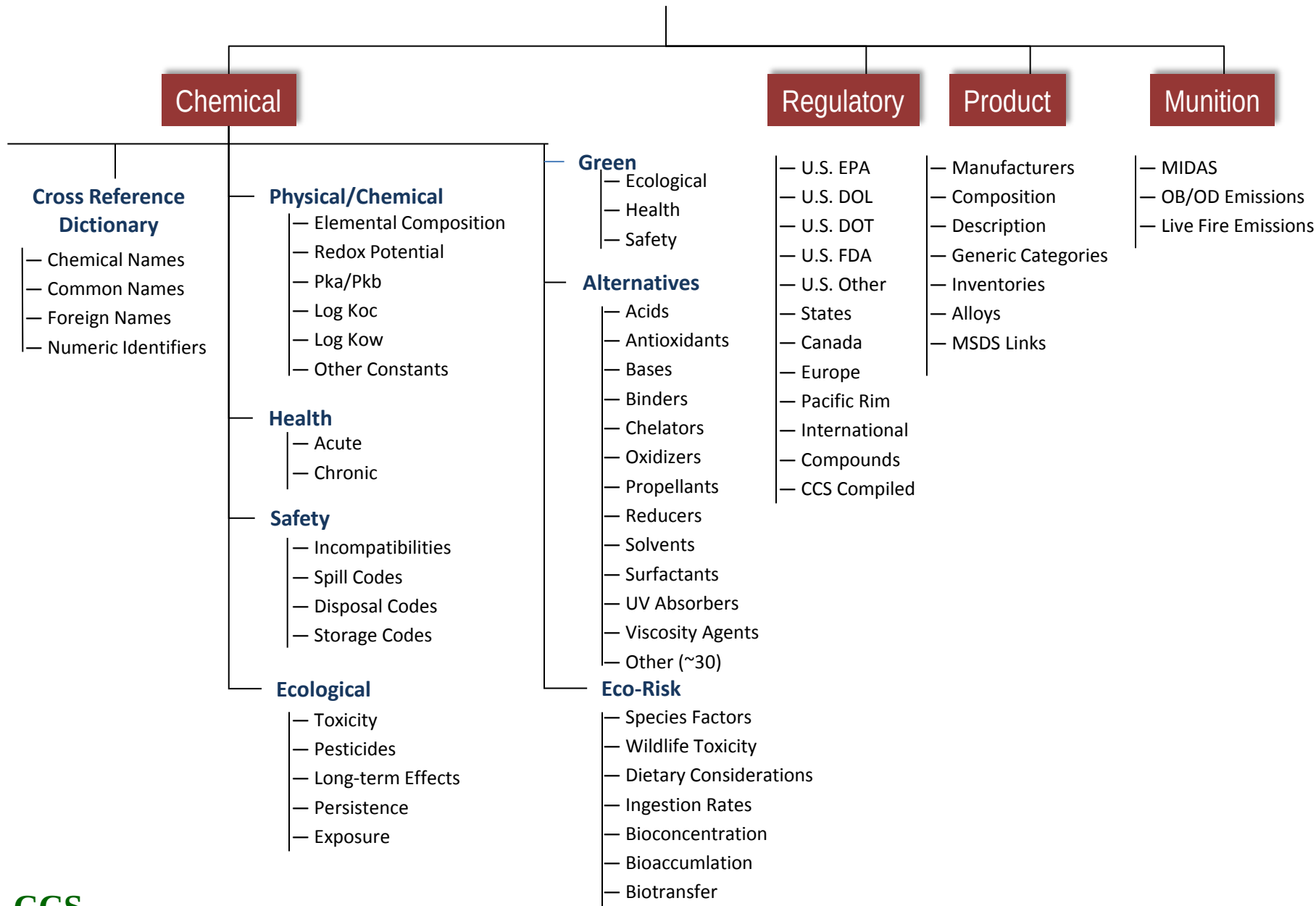
MACS Utilization

Future Programs

Available Resources – MIDAS Munition Characterization Database



Available Resources – CCS Relational Chemical and Product Database (R-CPD)



HEADQUARTERS
U.S. ARMY ARMAMENT,
MUNITIONS AND CHEMICAL COMMAND

FINAL REPORT

**DEVELOPMENT OF
METHODOLOGY AND TECHNOLOGY
FOR
IDENTIFYING AND QUANTIFYING
EMISSION PRODUCTS
FROM
OPEN BURNING AND OPEN DETONATION
THERMAL TREATMENT METHODS.**

FIELD TEST SERIES A, B, AND C

VOLUME 1
TEST SUMMARY

JANUARY 1991

Maintenance Management Division
Demilitarization and Technology Branch
Rock Island, Illinois 61299-6000
DSN: 793-3980/5534
Commercial: 309-782-3980/5534



EPA/600/R-08/103

Emission Factors for the Disposal Of Energetic Materials by Open Burning and Open Detonation (OB/OD)

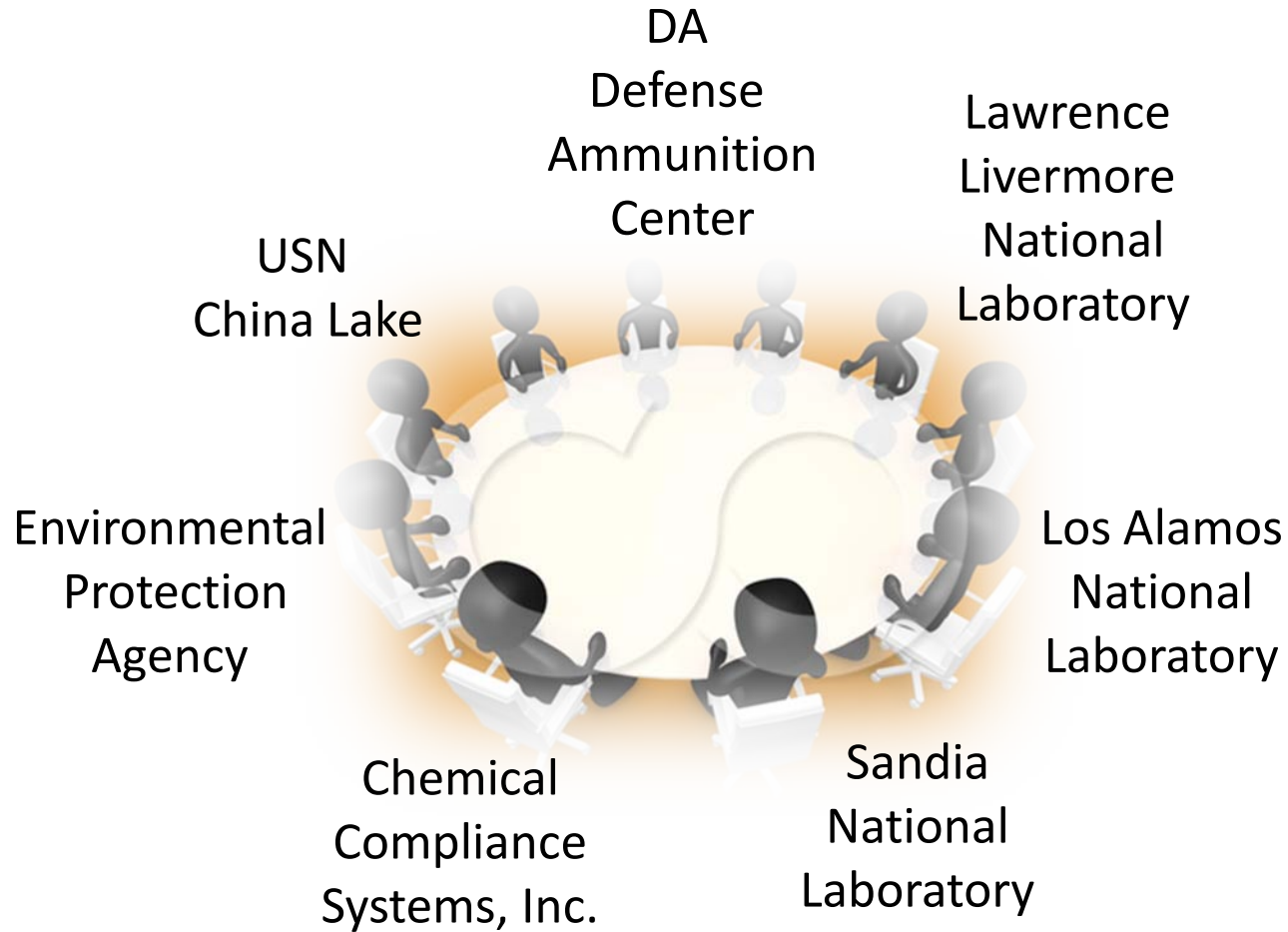
By

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AUGUST 1998

This emission factor database
was created using data collected
by the U.S. Department of Defense

Munition Emissions Advisory Group (MEAG) - 2001



Initial OB & OD Chemical Release Databases

Parameter	OB-CRD	OD-CRD
No. Test Materials Included	19	29
No. Plumes Characterized	52	122
Explosive Weights Characterized (NEW)	1-7000 lbs	0.3-2000 lbs

Summary Statistics for the OB Emission Data Sets

EP/EP Category	Units	N	Mean	RSD(a)	Quality Rating
PM-10	lb/lb NEW	13	1.5E-01	1.89	B
Carbon Dioxide	lb/lb C	15	3.5E+00	0.13	A
Carbon Monoxide	lb/lb C	15	7.8E-03	1.46	B
Sulfur Dioxide	lb/lb NEW	8	3.0E-04	1.31	B
Nitrogen Oxides	lb/lb N	13	3.5E-02	0.71	A
Hydrogen Chloride	lb/lb Cl	2	8.9E-01	0.07	B
Energetic Compounds	lb/lb Energetic	4	1.0E-09	0.32	B
SVOCs	lb/lb SVOC	6	1.9E-07	1.93	B
Benzene	lb/lb C	11	1.2E-04	1.93	B
TNMHC	lb/lb C	13	5.0E-04	1.24	B
Acetylene	lb/lb C	7	1.4E-04	1.49	B
Ethylene	lb/lb C	4	2.2E-05	0.22	B
Isobutene	lb/lb C	5	1.1E-05	1.78	C
Propylene	lb/lb C	4	5.8E-06	0.64	B
Naphthalene	lb/lb C	4	1.1E-07	1.27	C
Metals from elemental metal particles in the energetic	lb/lb Metal	2	4.2E-02	0.43	C
Metals from metal compounds in the energetic	lb/lb Metal	2	6.7E-01	0.09	C

Summary Statistics for the OD Emissions Data Sets					
EP/ EP Category	Units	N	Mean	RSD(a)	Quality Rating
PM-10	lb/lb NEW	5	7.7E+00	0.47	D
Carbon Monoxide	lb/lb C	23	7.1E-02	0.81	B
Carbon Dioxide	lb/lb C	22	3.5E+00	0.09	B
Sulfur Dioxide	lb/lb NEW	12	4.8E-04	0.88	B
Nitrogen Oxides	lb/lb N	19	2.9E-02	0.69	B
Energetic Compounds	lb/lb Energetic	5	4.5E-07	1.95	C
SVOCs	lb/lb SVOC	All Values BDL (Lowest MDL = 2E-08 lb/lb SVOC).			
Benzene	lb/lb C	23	2.0E-04	0.82	B
TNMHC	lb/lb C	23	7.7E-03	1.03	B
Acetylene	lb/lb C	18	7.7E-04	0.80	B
Ethylene	lb/lb C	18	7.1E-04	1.05	B
Methylene Chloride	lb/lb C	18	6.2E-04	1.05	B
Propylene	lb/lb C	18	1.3E-04	1.08	B
Toluene	lb/lb C	17	6.7E-05	0.85	B
Naphthalene	lb/lb C	5	2.7E-06	5.6E-01	C
Metals from elemental metal particles in the energetic	lb/lb Metal	3	9.8E-02	0.47	D
Metal alloy particles from casings and other metal alloys, including solder	lb/lb Alloy	35	3.1E-02	1.35	D
Metals from metal compounds in the energetic	lb/lb Metal	10	2.6E-01	1.04	D
Metals from painted and plated parts	lb/lb Metal	1	Summary statistics cannot be calculated because there is only one EF (3.8E-03 lb/lb Metal)		D

Metals Emissions From the Open Detonation Treatment of Energetic Wastes

by

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OCTOBER 2004

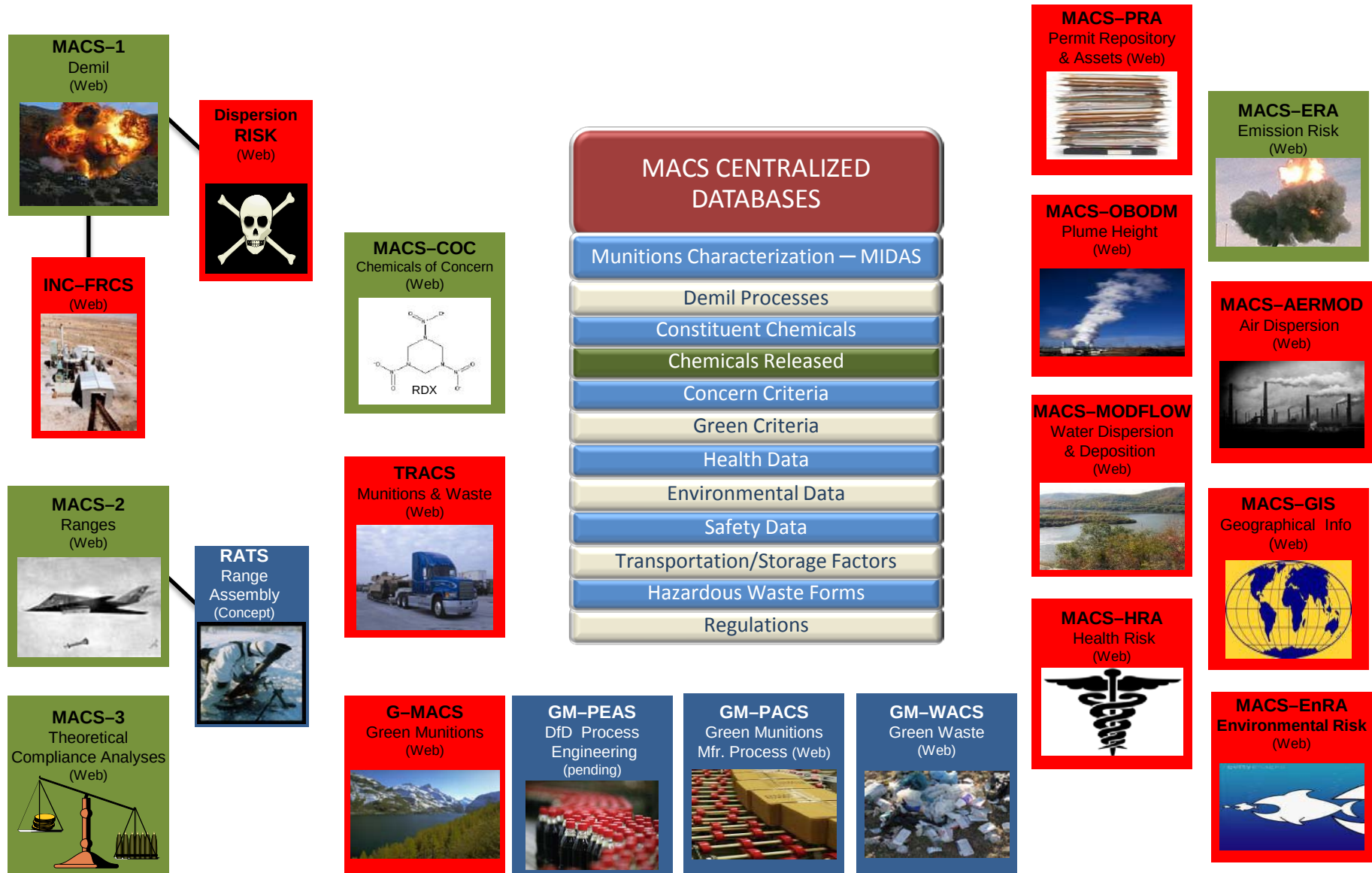
NAVAL AIR WARFARE CENTER WEAPONS DIVISION
CHINA LAKE, CA 93555-6100

Casing
Hazardous Constituents
NOT Released

Recommended EFs for OB and OD Events

EP/EP Category	Units	OB	OD	
			Unconfined	Buried and Soil-Covered
PM-10	lb/lb NEW	1.5E-01	7.7E+00	1.1E+01
Carbon Monoxide	lb/lb C	7.8E-03	7.1E-02	2.0E-01
Carbon Dioxide	lb/lb C	3.5E+00	3.5E+00	3.0E+00
Nitrogen Oxides	lb/lb N	3.5E-02	2.9E-02	4.8E-02
Sulfur Dioxide	lb/lb S	2.0E+00	2.0E+00	2.0E+00
Hydrogen Chloride	lb/lb Cl	8.9E-01	NA	NA
Energetic Compounds	lb/lb Energetic	1.0E-09	4.5E-07	2.0E-06
SVOCs	lb/lb SVOC	1.9E-07	1.0E-08	2.0E-08
Benzene	lb/lb C	1.2E-04	2.0E-04	4.0E-04
TNMHC	lb/lb C	5.0E-04	7.7E-03	3.4E-02
Acetylene	lb/lb C	1.4E-04	7.7E-04	1.8E-03
Ethylene	lb/lb C	2.2E-05	7.1E-04	2.3E-03
Methylene Chloride	lb/lb C	NA	6.2E-04	1.5E-03
Isobutene	lb/lb C	1.10E-05	NA	NA
Propylene	lb/lb C	5.8E-06	1.3E-04	4.1E-04
Toluene	lb/lb C	NA	6.7E-05	1.3E-04
Naphthalene	lb/lb C	1.1E-07	2.7E-06	3.8E-06
Metals from elemental metal particles in the energetic	lb/lb Metal	4.2E-02	9.8E-02	7.5E-02
Metal alloy particles from casings and other metal alloys, including solder	lb/lb Alloy	NA	3.1E-02	1.5E-02
Metals from metal compounds in the energetic	lb/lb Metal	6.7E-01	2.6E-01	5.2E-01
Metals from painted and plated parts	lb/lb Metal	NA	3.8E-03	3.8E-03

Munitions Analytical Compliance Suite (MACS)



Demil Chemical of Concern (COC) Analysis

- 11 Years of MACS-1 Data (1999-2009)
- 13 Demil Sites Combined
- 173,000,000 lbs PEP & Bulk Chemicals Demil'd
- 300 Unique Chemicals in PEP & Bulk Materials
- 30 Chemicals Accounted for 98% of Total Poundage
- 28/30 Large Volume Chemicals from PEP
- 2/30 Large Volume Chemicals from Bulk (Zinc Chromate & Zinc Phosphate)
- 63,000,000 lbs Nitrocellulose Processed – 0.06 lbs Released by OB
- 33,000,000 lbs RDX Processed – 66 lbs Released by OD

OB & OD Emission Testing Data Gaps

OB Data Gaps	OD Data Gaps
Metals in energetic – as compounds & particulate	Ordnance metal location – energetic, coating, components
Energetics	Respirable particulate composition
SVOCs/POMs in energetics	Energetics
	SVOCs/POMs in energetics
	Perchlorate & chlorine emissions
	Buried detonation emission – differences
	OD source configuration

Ongoing 4-Phase Detonation Chamber Testing Program

- PHASE I** – Develop Reproducible Chamber Testing Procedure
 - Validate for Metal & Energetic Emissions

- PHASE II** – Assess Emission Variability for Various Energetics
 - Correlate Emission Ratios With Elemental Content
 - Determine Emissions for Various Metal Sources (*Cartridge, Energetics, Coatings*)
 - Compare Emissions for Pure Energetic vs. Complex Munition

- PHASE III** – Evaluate Factors Affecting Sulfur & Chlorine Emissions

- PHASE IV** – Open Field Tests
 - Evaluate Factors Potentially Affecting Detonations
 - (*Donor Placement, Stacking Geometry, “Quenching”*)

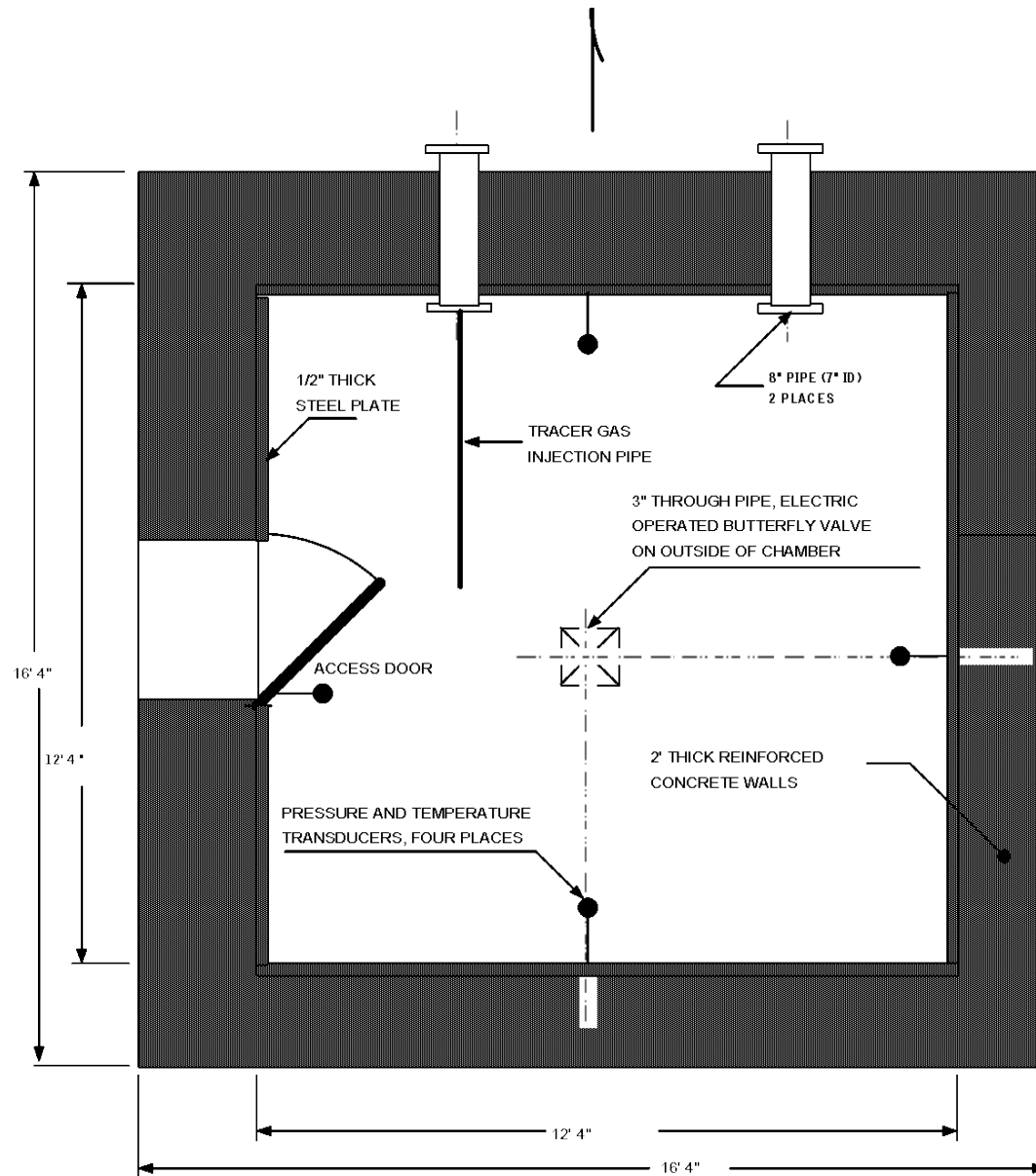
“The Flyer”

EPA-developed
Field Sampling Device

CCS



Schematic of the USN Detonation Chamber



Conclusions

- Credible emissions data for OB & OD have been compiled
- Ongoing research will fill identified data gaps
- 5 Automated and Web-based MACS modules use the existing emissions data
- Alloy constituent chemicals are NOT released into the environment
- OB & OD are proven safe by application of emissions data

OB & OD Munition Emissions Database Guidance

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