2006 International Workshop on Pollution Prevention & Sustainable Development
Thursday, Nov 2 Session: *NASA/DoD Pollution Prevention*

Efforts of the DoD Services & NASA to Green Cleaning Operations

Joint Service Solvent Substitution Working Group (JS3WG)

Joint Group on Pollution Prevention

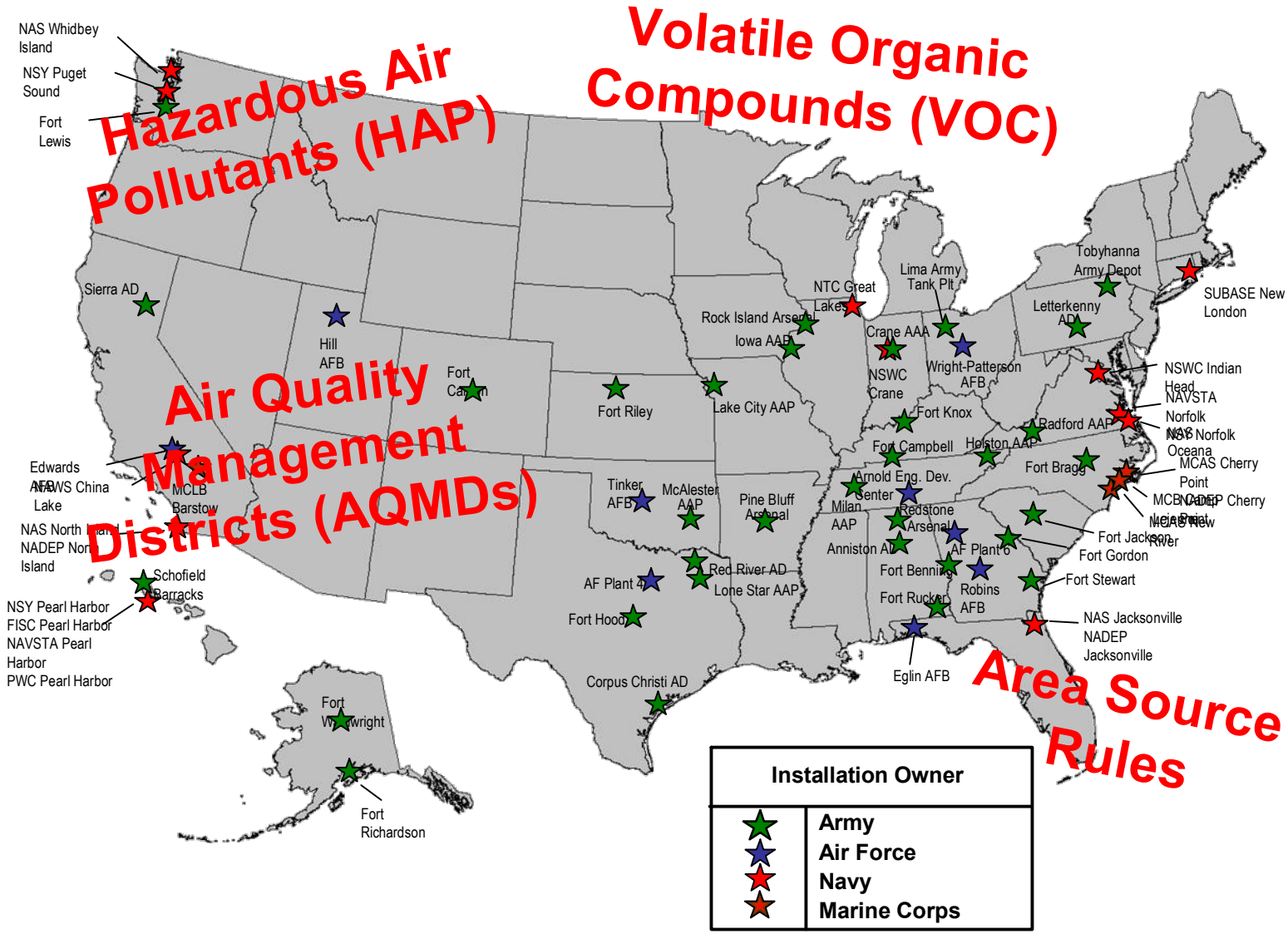
Chartered by Joint Logistics Commanders

Mr Wayne Ziegler
Materials Engineer
US Army Research Laboratory

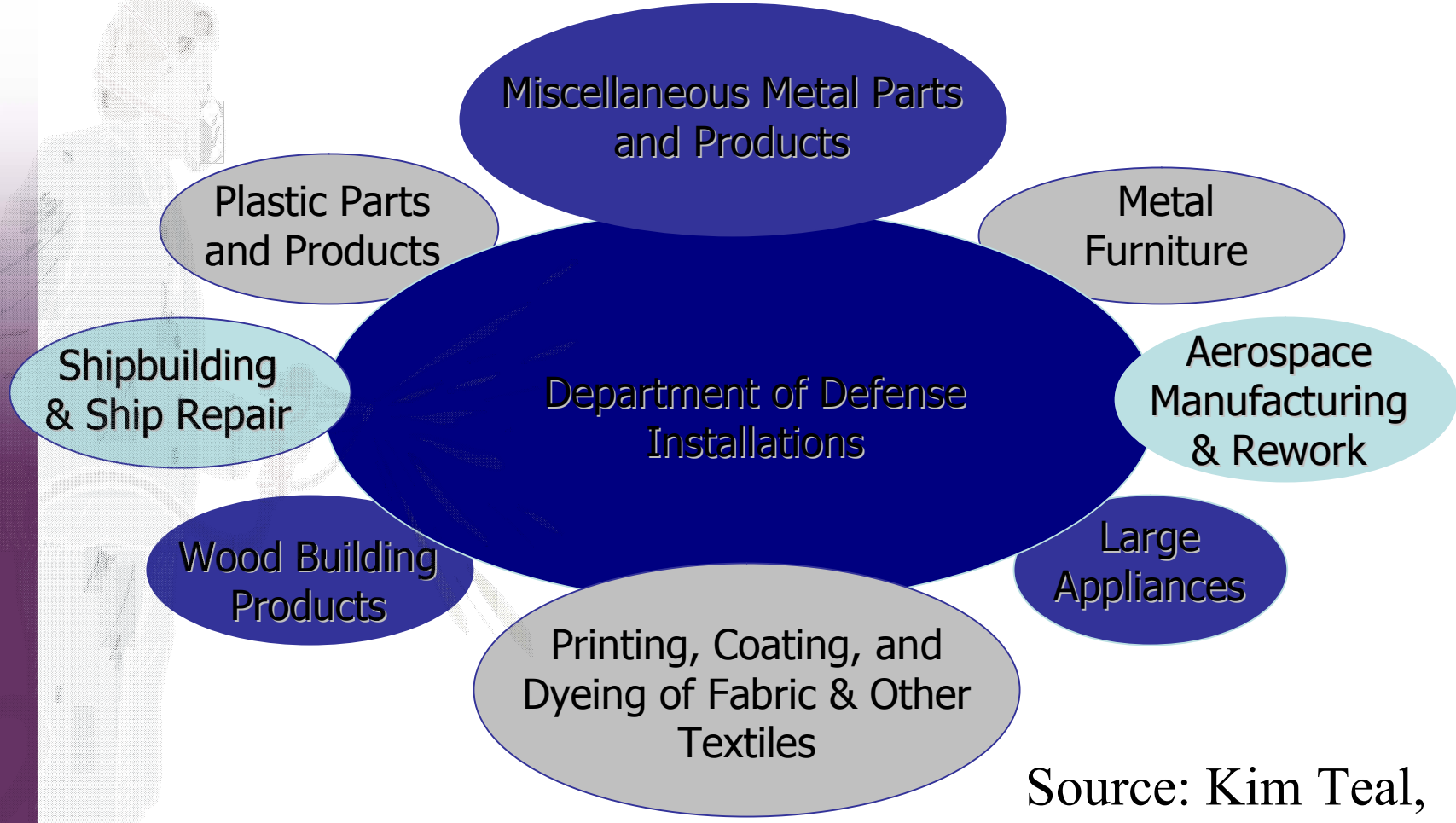
Outline

- Background
- JS3 Methodology
- JS3 Database
- Specific Alternative Cleaning Efforts
- JS3 Database Demonstration

DOD Major HAP Sources



Pre-2003 Coating NESHAP



Source: Kim Teal, CCPG EPA

What NESHAP is it?

Plastic Parts and Products

Aerospace Manufacturing & Rework

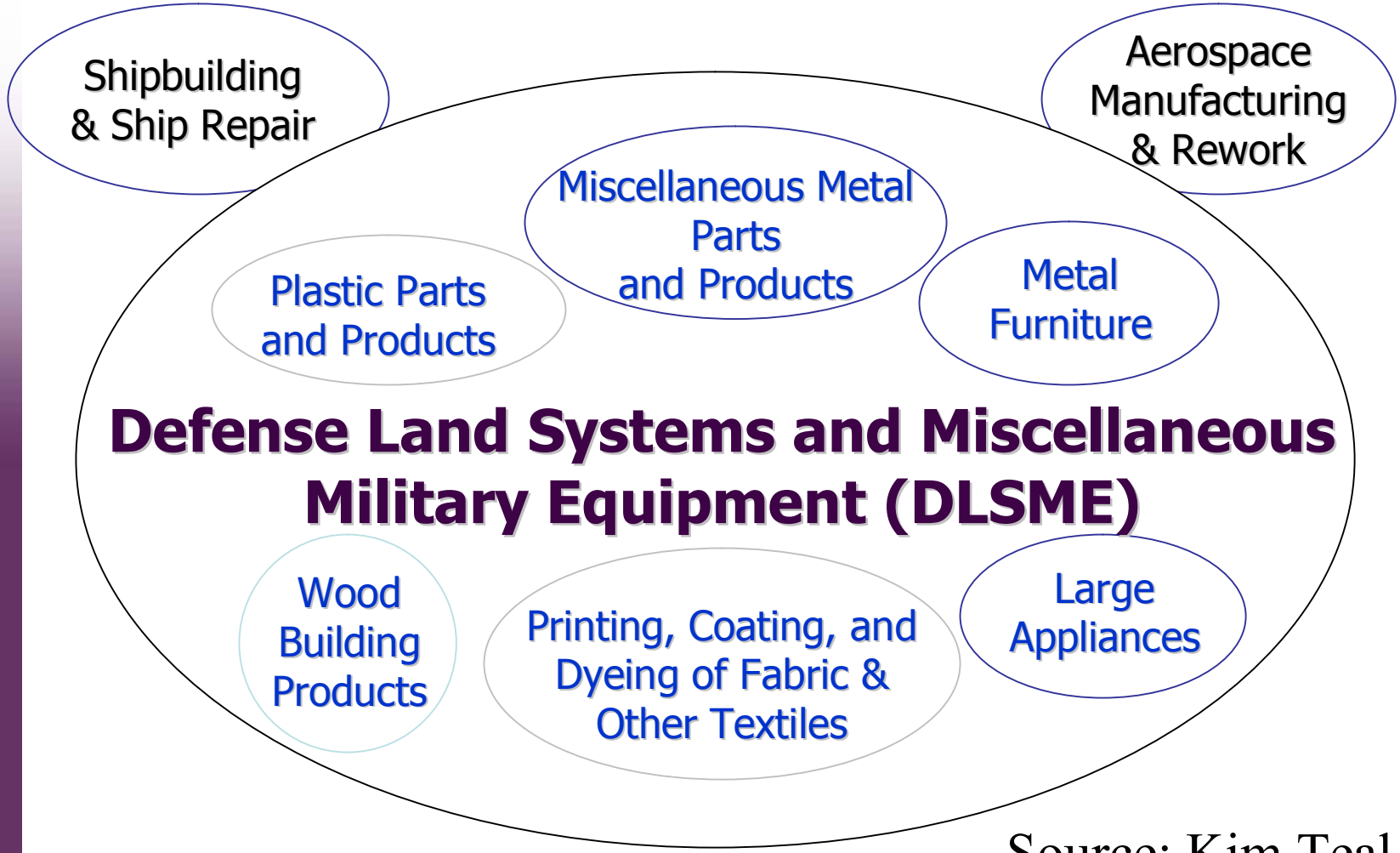
Large Appliances

Shipbuilding & Ship Repair

Miscellaneous Metal Parts and Products

Metal Furniture

Anticipated Regulatory Environment



Source: Kim Teal, CCPG EPA

The DLSME NESHAP

- Who will be affected?
  - Facilities owned or operated by the Armed Forces of the United States, National Guard, Coast Guard, NASA
    - Major Sources: All requirements listed below
    - Area Sources: Chemical depainting and motor vehicle and mobile equipment refinishing requirements only
  - All government and commercial facilities that coat military munitions
    - No other OEM facilities affected
- What will be the requirements?
  - Painting, coating, marking, stenciling, etc.
    - Limits on MIL-C-46168 Types II & IV, MIL-DTL-53039 Type I,
      MIL-P-53022 Types I & II, MIL-PRF-22750
    - Specifications will be revised to require compliant HAP contents
  - Solvent cleaning and thinning
    - Must be HAP-free unless authorized in Standardization Document, Equipment Publication or Technical Data

The DLSME NESHAP

- What will be the requirements (cont.)?
  - Chemical depainting
    - Existing large dip tanks must apply work practice standards (freeboard, cover, etc.)
    - New large dip tanks must be HAP-free
    - Organic HAP emissions outside of large dip tanks limited to 1,000 pounds / yr
  - Rubber-to-metal bonding
    - Numerical limit based on Army qualified products list
    - Not the same limits or units as promulgated in MMPP NESHAP
  - Motor vehicle and mobile equipment refinishing (i.e., non-tactical)
    - Requirements likely to focus on training / certification of painters
  - Military munitions coating, cleaning, depainting
    - No HAP limits due to performance criticality
- Where on a source will the requirements apply?
  - Operations not already subject to another NESHAP
  - Operations not performed for janitorial, building maintenance, personal use, or certain other “non-DLSME” purposes
  - Some DLSME operations related to aerospace equipment may comply with requirements of Aerospace NESHAP for simplicity

The DLSME NESHAP

- When will the regulation take effect?
  - Schedule indefinite due to EPA prioritization of Area Source rules
  - Draft DLSME could be published as early as fall-winter 2006
  - Effective date likely three years after final rule promulgated
- How will a source comply with the requirements?
  - Option 1: Use only compliant materials
  - Option 2: Meet facility-wide emission rate
  - Option 3: Use add-on controls to meet facility-wide emission rate
  - Alternative Emission Reduction Strategy
    - EPA may enter into an agreement with each Department or Agency HQ
    - Equivalent or better emission reductions w/o enforcement, penalties, etc.
- What is the bottom line for compliance?
  - Sources will be in compliance as long as they obtain paints conforming to latest MILSPEC revisions and follow TMs (or other controlling documents) for cleaning, thinning and paint removal

Other Regulatory Developments

- Vapor Degreasing NESHAP Residual Risk Review
  - More stringent restrictions on use of PCE, TCE, and methylene chloride
  - DoD committee has already identified several installations that will be affected
- MIL-PRF-680 revisions
  - 3.6 Hazardous Air Pollutants. The solvent shall contain no chemicals listed as Hazardous Air Pollutants (HAPs) (see 6.7). Any HAP components in the solvent in a concentration of 1.0 percent (%) or greater by weight (wt) or volume (vol) will be regarded as the presence of a HAP in the solvent. The product containing less than 1 % of HAP shall be considered as a HAP free solvent. For carcinogenic HAPs see 3.5.

Other Regulatory Developments (cont)

- Implications of MIL-PRF-680revB
  - All current operations specifying MIL-PRF-680 will be in compliance
  - “Known” entity in maintenance community – implementation of spec in operations with no governing document
  - Navy use of CID P-D-680
- Cleaning During Coating Operations Specification
  - Logistics control
  - User training is essential
  - Has been incorporated into Army implementation plan

Coordinated DoD/NASA Response

- Joint Service Solvent Substitution Working Group (JS3WG)
  - Established 2004
  - Chartered under Joint Group on Pollution Prevention (JGPP)
  - Includes principles representatives from each DoD service, Headquarters NASA
  - Supporting members from Defense Logistics Agency

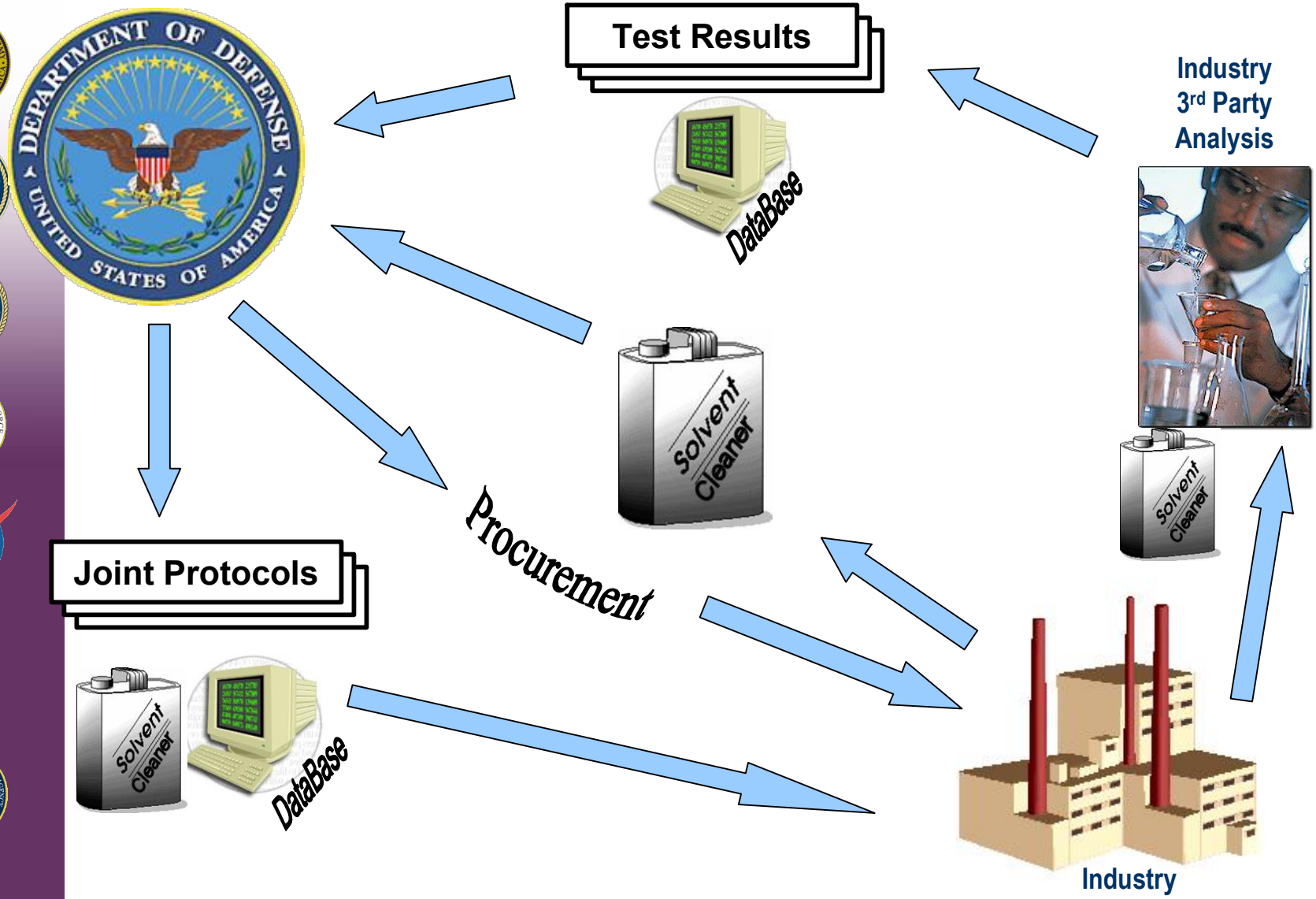
JS3WG Charter

- Purpose:

  Facilitate open communication, encourage collaboration and promote a well coordinated response to solvent issues related to NESHAP regulatory requirements

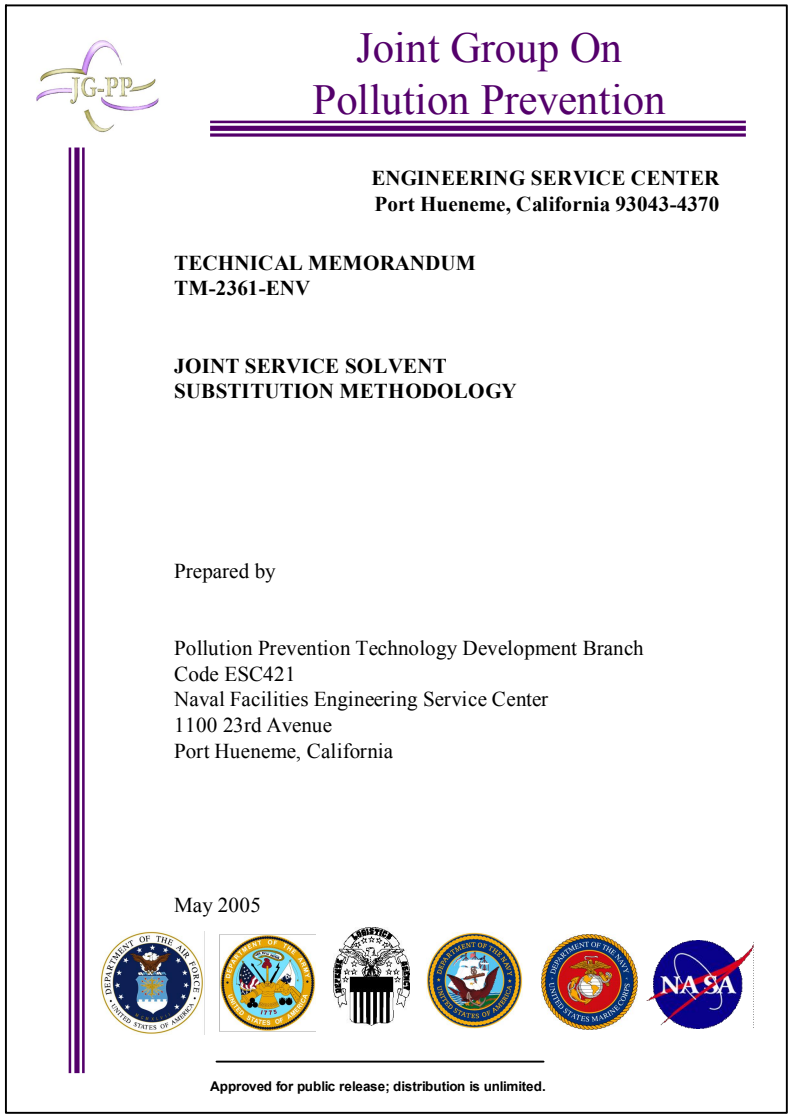
- Mission
  - Ensure coordination and facilitate solvent substitution information exchange
  - Establish a joint methodology
  - Develop and support a database to provide a mechanism for promoting and facilitating project coordination and information exchange
  - Validate & coordinate DoD solvent RDT&E efforts, serve as SMEs to regulatory and decision making agencies

DoD Solvent Substitution Vision



JS3 Methodology

- Information contained within Document:
  - Description of Methodology
  - Procedures to follow (Start to Finish)
  - Flow Chart
  - Acceptance Criteria
    - Environmental Parameters
    - Health and Safety Parameters
    - Solvent Characteristics
    - Compatibility Tests and Methods
    - Cleaning Efficiency Test Methods
  - Test Protocols



Joint Group On
Pollution Prevention

ENGINEERING SERVICE CENTER
Port Hueneme, California 93043-4370

TECHNICAL MEMORANDUM
TM-2361-ENV

JOINT SERVICE SOLVENT
SUBSTITUTION METHODOLOGY

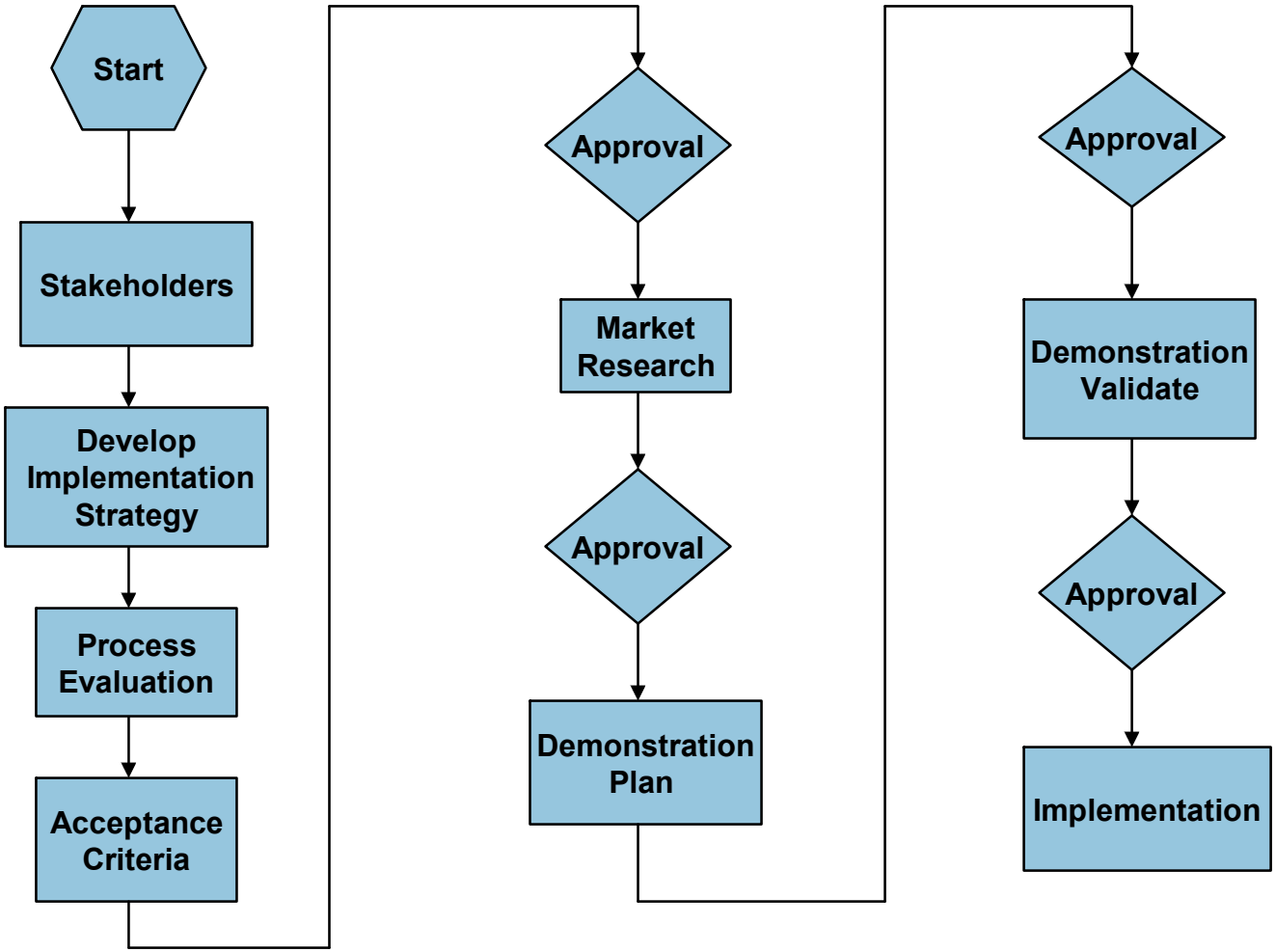
Prepared by

Pollution Prevention Technology Development Branch
Code ESC421
Naval Facilities Engineering Service Center
1100 23rd Avenue
Port Hueneme, California

May 2005

Approved for public release; distribution is unlimited.

JS3 Methodology Schematic



JS3 Database

- Database Requirements:
  - Web Based
  - Store Information
    - Efforts
    - Developed Acceptance Criteria/Protocols
    - Historical Information
    - Cleaner information
  - Retrieve Information
- Database Objective:
  - Facilitate coordination between DoD services
  - Serve as conduit to Industry

Where is it?

What's New | What is JG-PP | Contacts | Projects | Publications | P2 Links | Calendar | Glossary | Search

Good Morning!

Welcome to the Joint Group on Pollution Prevention web site!

JG-PP Charter

How can we help you?

System Program Manager
Maintenance and Repair Facility
Original Equipment Manufacture
Resource and Academia

www.jgpp.com

Contact Us

Joint Service Solvent Substitution (JS3) Database**

This site last updated September 30, 2005

Send all questions and comments to jgpp@ctc.com

JS3 Database Welcome Page

Joint Service
Solvent Substitution
Database

Partnering for Progress

Home

View Information | Enter Site | Register | FAQ | Help | SiteMap

Welcome

The **Joint Service Solvent Substitution (JS3) Database** was developed to capture all Department of Defense (DoD) information on solvent substitution. Information includes, but is not limited to, completed and ongoing efforts, documentation, and most importantly cleaner requirements for specific DoD cleaning operations. This web site will efficiently disseminate data and prevent duplication of efforts DoD wide. In addition, this information is made public so that solvent manufacturers can obtain DoD requirements and solicit their products that meet DoD requirements via the web site.

DoD personnel, DoD contractors, and solvent manufacturers are encouraged to register for a login name and password.

Registered DoD personnel and DoD contractors can enter this web site and input information on their solvent substitution efforts, while registered solvent manufacturers can input information on their prospective cleaners for DoD review.

Please make a selection from the menu below

Press Here to ... **View Information - No Login Required**

View Information on the JS3 Database.
(No Login Name / Password Required)

Press Here to ... **Enter Site - Login Required**

Enter the JS3 Database web site in order to input information for DoD review.
(Login Name / Password Required)

Press Here to ... **Complete a User Registration Application**

Register for a JS3 Database User Login Name and Password.

Do you have a question or comment? Click here.

Read the **General FAQ**.

DoD Warning Statement | Privacy and Security Notice | General Disclaimer

User Registration Required

User Registration Application

Please complete this application form (below) to apply for a JS3 Database login name and password .

To Register:
1) Fill in the Registration Form (below), 2) Press the SUBMIT APPLICATION button.

Prefix:	
First Name:	(First Name is Required)
Last Name:	(Last Name is Required)
Type of Organization (select one) :	

	Type of Organization	Organization Definition
◉	**DOD Employee**	Directly employed by DOD (not including Contractors)
○	**DOD Contractor**	Civilian individual / firm working under DOD direction
○	**Manufacturer**	Solvent / cleaner producer
○	**Vendor**	Sales representative of various solvents / cleaners
○	**Consultant**	Civilian individual / firm providing professional services

JS3 Database Management

***CTC* – Database Manager**

- **NFESC Database Administrator to Provide Maintenance as Required**
- **JG-PP Execution Committee to Provide Ongoing Recommendations for Data Management Improvements**

JSSSWG Tracking Database

Operations

Data Population

- ***CTC* to assist all Agencies and Vendors as Needed**
  - **Agency Project Engineers/Others**
  - **Industry/Vendors**

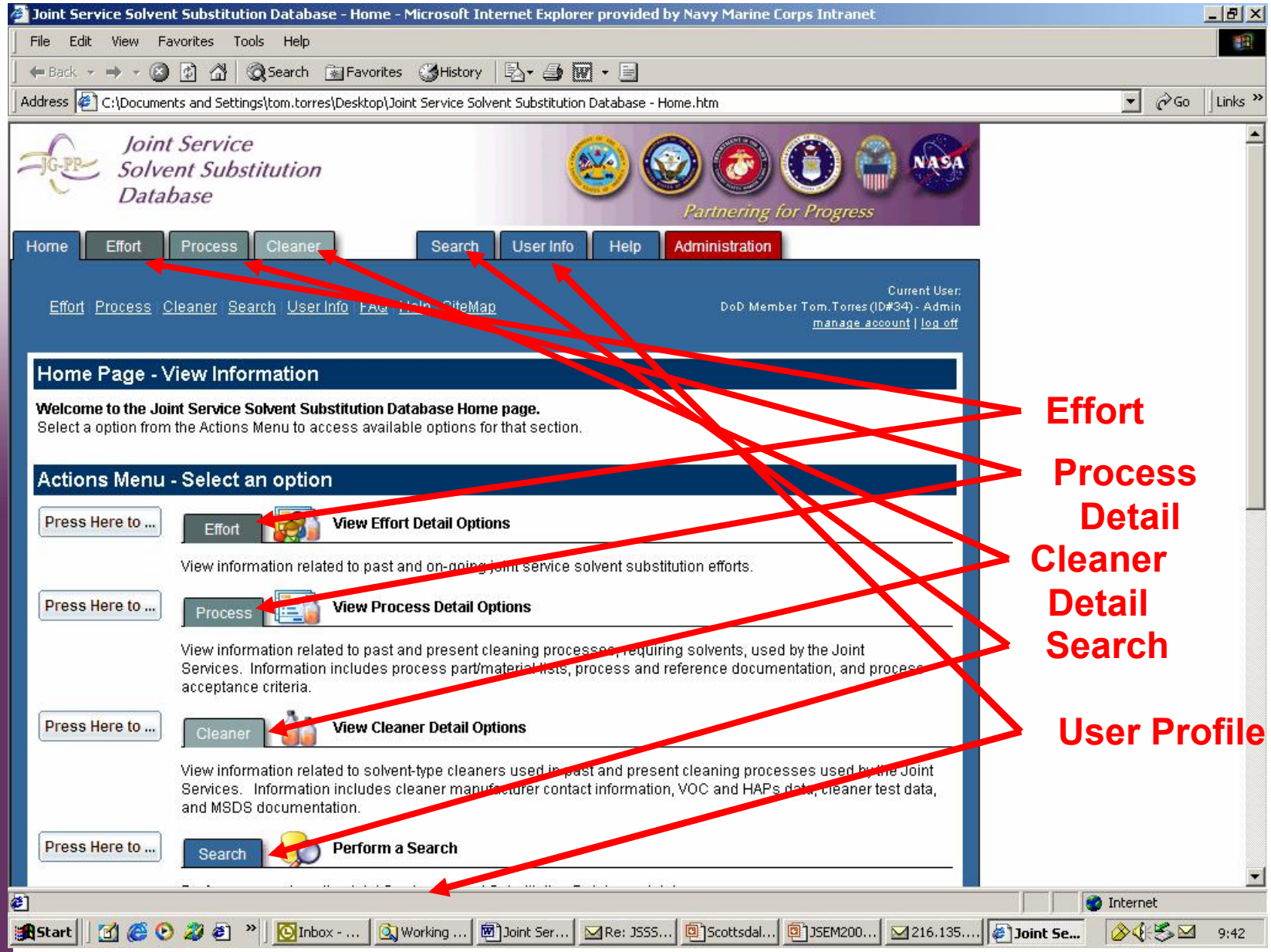
Data Validation

- ***CTC* Administrators to coordinate data validation with all Agencies/Vendors**
  - **Agency Administrators to validate respective Agency data**
  - ***CTC* Administrators to validate industry data**

Data Output

- ***CTC* Administrators to analyze data and provide updates to JG-PP Execution Committee**
- **Agency Administrators to identify high priority needs**
- **Agency Managers to review project status and cost savings**
- **Industry/Vendors to view requirements**

JS3 Database Main Page

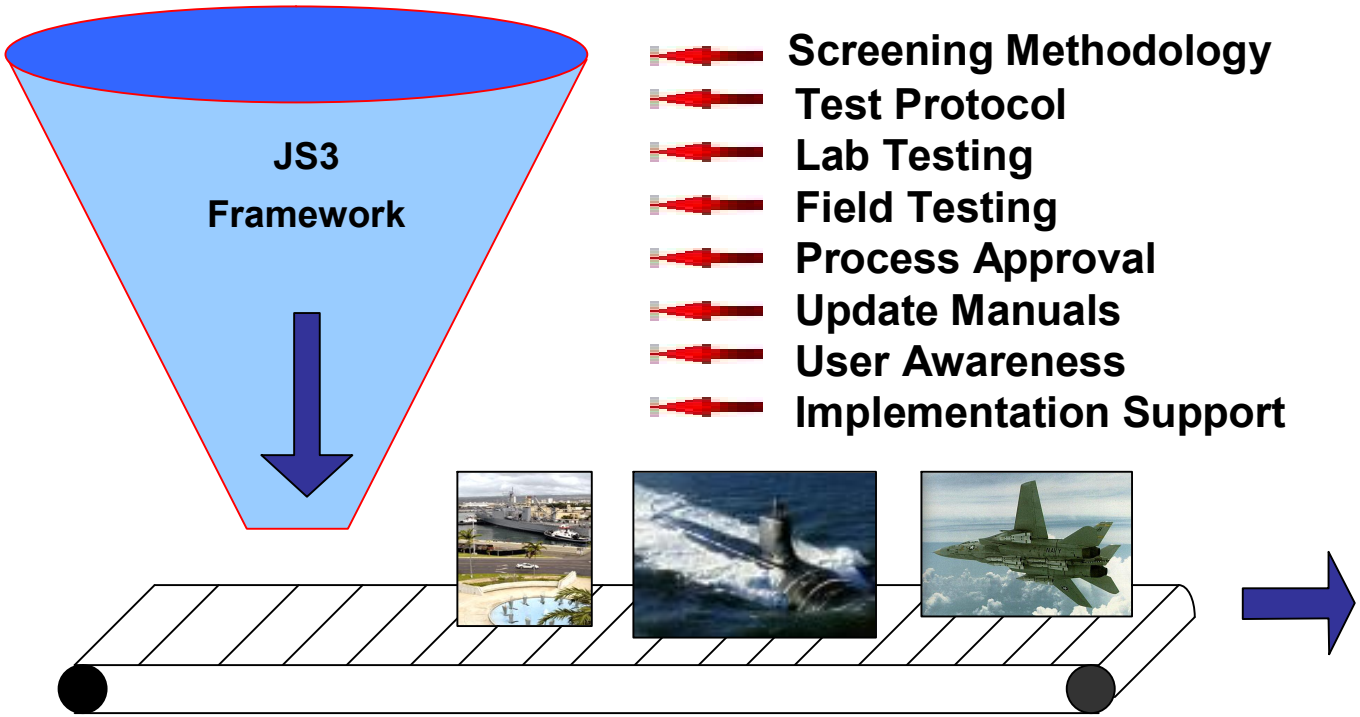


The JS3 Process

Targeted Processes
- Aircraft Maintenance
- Ship Maintenance
- Facility Maintenance
- Etc.

Candidate Solutions
- Aqueous Cleaners
- Biobased Solvents
- Ozone
- Etc.

Partners
- NAVSEA
- NAVAIR
- Marine Corps
- Army
- Air Force
- NASA



Processes not requiring extra record keeping & control measures

Review of Ongoing DoD Efforts

- Army Sustainable Painting Operations for the Total Army (SPOTA)
- Navy T-10 Thinner Replacement Project
- Air Force Engine Depot Cleaning Strategy
- ESTCP Bearing Rinse Project
- ESTCP TBAC for cleaning

Issues

- Engaging DoD industrial base
- Implementing and controlling logistics for alternative products and processes
- Technical component of implementing change is only one factor in the success or failure of an alternative

Summary

- Effective solvent substitution programs are critical to the sustainability of DoD operations
- JS3WG through the JS3 Methodology and the JS3 Database will ensure a coordinated DoD effort
- DoD is actively pursuing HAP-free alternatives for cleaning operations

Contact Information

JS3WG Co-Chairs

Mr. Wayne Ziegler
US Army Research Laboratory
410-306-0746
wziegler@arl.army.mil

Mr. Tom Torres
Naval Facilities Engineering
Service Center
805-982-1658
tom.torres@navy.mil

JS3 Database

Access through the Joint Group on Pollution Prevention (JGPP) website

www.jgpp.com

Back Up Slides

On-Going DoD Efforts

Army SPOTA Program

Sustainable Painting Operations for the Total Army

- The Army strategy for addressing issues related to NESHAPs
- Army's #1 Priority under Army Environmental Requirements and Technology Assessments (AERTA)
- Army Environmental Quality Technology (EQT)
- ESO Lead
- Purpose – to ensure continued operations at impacted Army facilities

NAVSEA Cleaning Solvent Uses

Objectives

- Establish baseline of solvent usage
- Identify specific products most utilized
- Target products with significant VOCs and HAPs
- Identify process categories for these products
- Target “common” process categories at Navy Shipyards
- Identify Stakeholders

NAVSEA Cleaning Solvent Uses

Previous Reports

- Cleaning Solvent Usage at NAVSEA Activities for Calendar Year 2001 – Survey Report December 2002
- Cleaning Solvent Processes and Usage at NAVSEA Activities for Calendar Year 2002 - Phase 2 Report April 2004

Navy T-10 Thinner Replacement

Summary and Conclusions

- Technical Requirements
  - Traditional Use
  - Navy Ships Technical Manual (NSTM) CH 631- T-10 Thinner
- No low VOC solvents currently being used
- Target T-10 Thinner for substitution on painting, multiple operations (ID-05-00)

Engine Depot Cleaning Strategy

Objective

Develop a standard methodology for qualifying weapon system cleaners

Approach

- Develop AF engine cleaning qualification process
- Develop general cleaning qualification processes

TBAC ESTCP

- “Demonstration /Validation of Tertiary Butyl Acetate for Hand Wipe Cleaning Applications”
- TBA laboratory testing is being conducted during ongoing SPOTA alternatives testing
- Tox clearance issues by CHPPM

TBAC ESTCP

Proposed Dem/Val Efforts

- Norfolk Naval Shipyard
  - Paint equipment cleanup replacement for T10 Thinner
- CCAD
  - Pre-paint tack wipe solvent as a solvent conforming to Type MIL-T-81772 thinner
- MCLB Maintenance Center Albany
  - Paint equipment clean up
  - Thinner alternative to MIL-T-81772

Back-up Slides

JS3 Database

JS3 Database Demonstration

Joint Service
Solvent Substitution
Database

Partnering for Progress

Home | Effort | Process | Cleaner | Search | User Info | Help | Administration

Add | View | Search | FAQ | Help | SiteMap

Current User:
Admin Tom.Torres (ID#4726) - Admin
manage account | log off

Efforts Home Page

Welcome to the JS3 Database Efforts Home Page.
Select an option from the Efforts - Actions Menu to access available actions.

Please make a selection from the menu below

Press Here to ... Effort **Add an Effort**

Add new information related to a DoD solvent substitution Effort.

Press Here to ... Effort **View an Effort**

View information related to a DoD solvent substitution Effort.

Press Here to ... Effort **Perform an Effort-Related Search**

Search the JS3 Database for a DoD solvent substitution Effort.

Press Here to ... Effort **Get Effort-Related Help**

View Help pages related to JS3 Database Effort page functions.
Read answers to Effort-Related frequently-asked questions and/or ask a question about Efforts in the **FAQ**.
Contact the JS3 Database **Help Desk**.

Do you have a question or comment? Click here.

Read the **Effort FAQs**.

Glossary Terms

Read the **Glossary**.

DoD Warning Statement | Privacy and Security Notice | General Disclaimer

Home | Effort | Process | Cleaner | Search | User Info | Help | Administration

Add | View | Search | FAQ | Help | SiteMap

Current User:
Admin Tom.Torres (ID#4726) - Admin
manage account | log off

Add an Effort - Overview

Adding an Effort to the JS3 Database has eight steps:

1. Add General Information including Effort Title, Description, Effort Start Date and Projected Finish Date.
   Designate the Effort as "Proposed" or "Funded"
2. Add the Target Process of this Effort
3. Add Proposed Alternative Cleaners
4. Add Effort Regulatory or Policy Drivers
5. Add Project Objectives and Milestones Tasking
6. Add Project Accomplishments To Date related to Project Objectives and Milestones Tasks
7. Add Funding Source, Fiscal Year Funding Amounts and Expenditures, and Estimated Cost Avoidance
8. Add References and Effort-Related Documents

Press Here to Add an Effort

Home | Effort | Process | Cleaner | Search | Help

View | Search | FAQ | Help | SiteMap

Current User:
Anonymous User (Read only)
Login

View an Effort

Select an Effort Title from the table to view the Effort.

Records 1 to 2 of 2

Effort Title	Effort Status	Period of Performance		Cleaner Acceptance Criteria
		Start Date	End Date	
Alt's to High VOC Solv's in Aero Antifrict Bearing	Funded	10/1/2003	12/31/2006	View Detail
NAVSEA T-10 Thinner Replacement Project	Proposed	10/25/2002	12/31/2006	View Detail

Do you have a question or comment? Click here.

Read the **FAQ**.

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Back Up Slides
Army SPOTA Program
Laboratory Test Results

1.2.1 FLASH POINT per ASTM D 56 and D-92

Results(C^0)																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
>93	>93	77	77	77	77	97	>149	77	>100	99	101	77	77	101	>93	>100

1.2.2 VAPOR PRESSURE per ASTM D 2879

Results (mm Hg)																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
25.5	30.0	25.3	24.8	48.1	25.3	25.3	27.9	.52	23.8	23.8	23.3	26.4	624	30.0	15.5	32.1

1.2.3 NONVOLATILE RESIDUE per ASTM D-1353

Results (mg/100ml)																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
9.60	14.79	19.9	4.79	.02	9.8	14.88	n/a	.051	9.39	19.72	9.30	3.49	.04	14.86	.32	17.6

1.3.1 SOIL CLEANING or RELATIVE SOLVENCY per MIL-PRF-680

Results																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

1.3.3 EFFECTS ON SEALANT PEEL STRENGTH per ADS 61

Material	Results (met/not met)																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Al 2024 primed with MIL-P-23377																	
Al 2024 primed with MIL-P-85582																	

1.3.4 PAINT ADHESION

per FED STD-141, Test Method 6301.2

MATERIAL	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
AL 2024 T3 bare(anodized per MIL-A-8625, Type I; w/ MIL-P-23377 primer and MIL-C-85582 top coat																	
AL 2024 T3 clad(conversion coated per MIL-C-5541, w/ MIL-P-23377 primer and MIL-C-85285 top coat																	
AL 2024 T3 bare(anodized per MIL-A-8625, Type I; w/ MIL-P-85582 primer and MIL-C-85285 top coat																	
AL 2024 T3 clad(conversion coated per MIL-C-5541, w/ MIL-P-85582 primer and MIL-C-85285 top coat																	

1.3.5 FLUORESCENT PENETRATION INSPECTION per ADS-61

Panel	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
JAP																	
TAM																	

1.3.6 WATER BREAK FREE per ASTM F-22-65 and ASTM D-6361

Results																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

1.4.1 TEMPERATURE STABILITY per ADS-61A

Results																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

2.1.1. Total Immersion Corrosion tested per ASTM F-483

Material	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Titanium																	
St A 36																	
St 1020																	
St 4340																	
MG																	
Brass																	
C-250																	
13-8 PH																	
Zinc																	
Al 7075																	
AM 355																	
CAD																	
Al 5083																	

2.1.2 ELEVATED TEMPERATURE CORROSION/STOCK LOSS per SAE ARP 1755-00

Material	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
MG																	
7075																	
TI 4911																	
1020																	
4340																	
AM355																	
13-8																	
C-250																	

2.1.3 HYDROGEN EMBRITTLEMENT per ASTM F-519

Results (Type 1d coupons)																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
													m		m	

2.1.4 SANDWICH CORROSION per ASTM F-1110

Material	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
MG																	
7075																	
TI 4911																	
5083																	
4340																	
AM355																	
13-8																	
C-250																	
A366																	

2.1.5 TITANIUM STRESS CORROSION per ASTM F-945

Material	Results (met/not met)																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4911																	
4916																	

2.1.6 STRESS CORROSION per ASTM G-44

Material	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
MG																	
7075																	
TI 4911																	
5083																	
4340																	
AM355																	
13-8																	
C-250																	
7039																	

2.1.7 LOW – EMBRITTLING CADMIUM PLATE CORROSION per ASTM F-1111

Results																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

2.1.8 COPPER CORROSION per ASTM D-130

Exposure	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
3 hr @ 100°C																	
3 hr @ 49°C																	
24 hr @ 100°C																	
24 hr @ 49°C																	

2.2.1 EFFECTS ON PAINTED SURFACES per_ASTM F-502

Coatings	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
23377w/ 22750																	
23377w/ 46168																	
23377w/ 85285																	
23377w/ 14105																	
53022w/ 64159																	
53022w/ 53039																	

2.2.2 EFFECTS ON UNPAINTED SURFACES per ASTM F485

Material	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
MG																	
7075																	
TI 4911																	
5083																	
4340																	
AM355																	
13-8																	
C-250																	
A242																	

2.3.1 EFFECTS ON POLYSULFIDE SEALANTS per AD- 61A-PRF

Material	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
81733																	
8802																	

2.3.2 EFFECTS ON ACRYLIC PLASTICS per ASTM F-484

Materials	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
5425																	
8184																	
25690																	

2.3.3 EFFECTS ON POLYCARBONATE PLASTICS per ASTM F-484

	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

2.3.4 EFFECTS ON SHEET MOLDING COMPOUND (RIDGID PLASTICS) per ASTM D-2583

Results																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

2.3.5 EFFECTS ON RUBBER per ASTM D-471

Material	Results																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0235																	
0135																	
P-12																	
T107 W/S																	
0149																	
T107 G/S																	
3217/ 3B																	
3217/ 2B																	
RW																	

2.3.6 EFFECTS ON POLYMIDE WIRE per ADS 61A-PRF

Results																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17