



# TACOM

Lethality, Survivability, Mobility and  
Sustainment for America's Army



## EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING

**U.S. Army Corrosion Summit 2003**  
**Clearwater Beach, Florida**  
**February 11-13, 2003**

**Samir Sarkar**

**Packaging & Engineering Support Division**

**Picatinny Arsenal, N.J.07806-5000**



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING

## OBJECTIVE:

**Identify, Test, and Evaluate Commercially  
Developed barrier materials to:**

- **meet military packaging requirements.**
- **provide longer shelf-life, and yet be cost-effective and environmentally-friendly.**



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING



## SUMMARY:

Barrier Materials/systems were identified in two groups:

- **Group-I Flexible barrier materials**  
currently fielded MIL-PRF-131 and VCI-coated materials, INTERCEPT material developed by Lucent Technologies  
Other materials recently identified ( TRANSHIELD, ENVELOPE, and VALERON).
- **Group-II Rigid Barrier Systems**  
Plastic-desiccant insert, and INTERCEPT-coated corrugated plastic.



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING



**SUMMARY continued**

**INTERCEPT characteristics:**

**Multi-protection measures are combined in one flexible material to protect multi-metal components. Impregnated Copper provides protection, no particle shedding/outgas, no cleaning of item is required; non-toxic, environmental friendly, and reusable; one-mil thickness protects multi-metal items for ten years; requires less frequent inspections, less labor costs, and elimination of additional material.**



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING

## SUMMARY continued

Following tests and analyses were conducted:

- **Water Vapor Transmission Rate (WVTR) test and Material Strength tests.**
- **Salt-fog test (with metal coupons).**
- **Rough Handling tests, Compatibility tests with energetics, and Field test (local weather).**
- **Accelerated aging for life prediction.**
- **Cost-benefit analysis.**



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING

## EVALUATION OF TEST RESULTS:

- **Material Strength Properties, and WVTR test results indicate that INTERCEPT is comparable to MIL-PRF-131 material.**
- **Salt-fog test results indicate that both INTERCEPT and plastic-desiccant-insert system provide longer corrosion protection than with MIL-PRF-131 barrier material.**



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING

Evaluation continued

## Salt-Fog Test Data Comparison

<<<<< Days of protection against corrosion >>>>>>

Metal coupon	Intercept	Intercept	VCI-126	MIL-PRF-131
	Static	Poly		
	4-mil	4-mil	4-mil	5-mil
Steel	58	102	28	62
Aluminum	58	130	59	91
Brass	58	130	28	91
Zinc	91	97	59	77



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING

## EVALUATION continued

- **Rough handling and Field test results indicate INTERCEPT yield similar results as with MIL-PRF-131 material.**
- **INTERCEPT-static foil was found compatible with several energetics. Avoid using INTERCEPT with detonators having Lead Azide.**
- **Accelerated aging test results indicate acceptable level of deterioration in heat seal seam strength.**



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING



## EVALUATION continued

- **Cost analysis components are: Material, Labor, and Miscellaneous.**
- **Material cost varies from \$150.0 (MIL-PRF-131) to \$350.0 (INTERCEPT) for a roll of 3 feet x 600 feet. Labor cost is \$70.0 per hour--- most expensive. Miscellaneous cost is item specific.**
- **Although material cost is higher for new materials, total packaging cost will be lower, and with longer shelf life for new materials.**



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING



## CONCLUSIONS:

- This evaluation shows extent of various efforts involved.
- New materials and systems performed better in corrosion protection than with MIL-PRF-131 material. Total cost of packaging would be cost effective, without compromising performance. Rigid barrier systems have item specific contour applications and were not evaluated beyond sat-fog test.
- Difficulties were encountered to pursue user qualification tests (funding, procurement of military items).



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING



## Potential applications of INTERCEPT :

- Packaging of electronic assemblies, circuit cards.
- Inter-plant shipment/temporary storage of metallic parts.
- Packaging engine blocks.
- Packaging of fuses and ammunitions to eliminate any out-gassing/reactive situation.
- Raytheon (DoD contractor) for packaging radar systems.
- Intercept coated ammunition boxes for the US Army.
- Soldier Biological Chemical Command (SBCC, ECBC Packaging team) is interested in using Intercept for military packaging.



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING

## ON GOING EFFORT:

- M16 rifles, packed with different barrier material bags (including INTERCEPT and other recently identified materials ), are scheduled for testing/evaluation in FY03
- Engineering Change Proposal (ECP) has been initiated at TACOM-ARDEC for packaging electronic cards assemblies with INTERCEPT.



# EVALUATION OF BARRIER MATERIALS FOR MILITARY PACKAGING

## FUTURE WORK:

- **Advanced barrier materials will become available as technology progresses to protect materiel for longer shelf life. Government and Industry need to collaborate effectively to track these future developments.**
- **Subsequently develop mechanisms (ECP, Specifications) for timely insertion of advanced barrier materials in military packaging to support the soldier in field.**