18005: Air Force Risk Management Approach to REACH

Mr Ken Dormer US Air Force Support Contractor

Executive Summary

 EU's Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) regulation applies to industry differently than the US DoD

- Industry places products into commerce DoD does not
- To participate in the European marketplace, companies themselves or their importers/representatives in Europe must comply with REACH
- Nevertheless, REACH creates a regulatory environment and supply chain risks that DoD must manage
- AF uses a data-driven approach to manage risks from REACH; otherwise
 - Tough to determine right management priorities from among innumerable potential risks
 - Driven to manage dramatic "worst case scenarios" without understanding probabilities
- Air Forces Europe REACH-related risks currently appear low and manageable
 - Types of maintenance AF performs in Europe very different from US
 - USAFE REACH chemical usage is small (~1%) compared to overall AF chemical usage
 - 99% of USAFE chemical usage avoids REACH restriction/authorization requirements
 - Substitute evaluation and implementation underway for most of the products that don't
 - Other REACH-related risks appear to have achievable administrative solutions

Industry - DoD REACH Compliance Differences

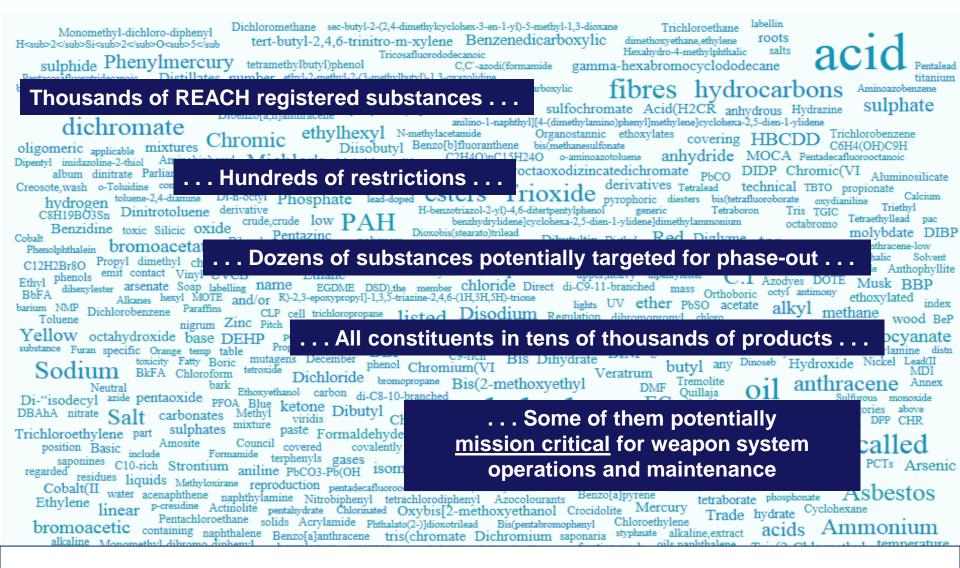
- 2010 DoD REACH Strategic Plan indicates the differences between
 DoD and inductors
 - **DoD and industry**
 - "As an EU regulation, REACH is not a compliance issue for the DoD"
 - "For purposes of REACH, DoD does not import equipment or supplies into the EU when it is providing such items in direct support to its forces stationed in the EU nor when transporting such items through the EU on military transportation"
- However: NATO SOFA Common Article II requires "respect" for host nation (HN) laws

Background DoD REACH Risk Management

- Although REACH may not be a DoD compliance requirement, the 2010 DoD REACH Strategic Plan identifies risks that DoD must manage
 - Supply chain
 - Product availability
 - Product reformulation
 - Challenges with shipping certain products <u>between</u> bases in Europe
 - Interoperability with NATO partners (they must comply with REACH)
 - Foreign military sales (FMS)
- 2010 Plan establishes a monitoring and risk management framework
- Defense Security Cooperation Agency's 2015 REACH FMS policy memo is aligned with the 2010 Plan
- The AF's REACH chemical risk management approach is also based on the framework in 2010 DoD REACH Strategic Plan

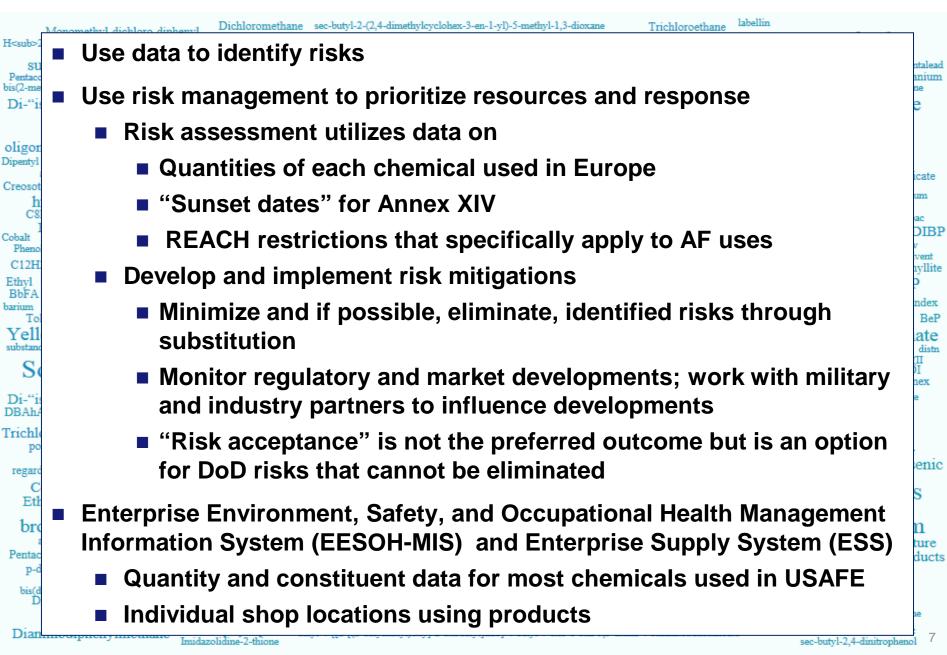
AF REACH-related Risk "Heat Map"

AF RISK	PRIMARY DRIVERS	SOLUTION STATUS
USAFE usage of chemicals that REACH "Restricts" or "Authorizes" in EU market	REACH	Completed 20-month analysis; Established clear targets to minimize risks; Monitoring regulatory and marketplace changes
Requirement to have current, accurate Safety Data Sheets (SDS) associated with hazardous products	UN Globally Harmonized System (GHS), HAZCOM	~30% GHS SDS accuracy at AF bases <u>worldwide</u> – not just USAFE; Implementing fixes & monthly metrics
Proper classification, labeling, packaging (CLP) and manifesting for intra-base commercial shipments of HAZMAT in EU	EU CLP Regulation; other agreements, laws, regulations	USAFE CDGA implementing management/administrative measures; HAF HMMP team offering data assist
Tailored labeling and HAZCOM procedures for local national workplaces	CLP, DoD HAZCOM, International Agreements, REACH	USAF School of Aerospace Medicine and HAF HMMP team developing tailored USAFE GHS Factsheet



Challenge: How to effectively manage so many potential risks?

Diaminodiphenylmethane Imidazolidine-2-thione ethyl-4-[[2-[(2-ethylhexyl)oxy]-2-oxoethyl]thio]-4-octyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate



labellin Dichloromethane sec-butyl-2-(2,4-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane Trichloroethane Monomethyl-dichloro-diphenyl tert-butyl-2,4,6-trinitro-m-xylene Benzenedicarboxylic roots dimethoxyethane,ethylene H₂Si₂O<sub>5</sub acid Pentalead salts Hexahydro-4-methylphthalic Tricosafluorododecanoic sulphide Phenylmercury tetramethylbutyl)phenol C,C'-azodi(formamide gamma-hexabromocyclododecane Pentacos bis(2-meth Data-driven risk assessments can turn thousands of Di-"ise potential problems . . . oligom Dipentvl Dichloroethene combination hydroxyoctaoxodizincatedichromate PbCO DIDP Chromic(VI album dinitrate Parliament DBBT Aluminosilicate technical TBTO propionate Calcium sote, wash o-Toluidine concentration DNOP fraction hydrogen toluene-2,4-diamine Di-n-octyl Phosphate following C&H19BO3Sn Dinitrotoluene derivative Benzidine toxic Silicic OXIde crude, crude low PAH Creosote, wash o-Toluidine concentration DNOP fraction Triethyl C8H19BO3Sn Dinitrotoluene derivative octabromo Tetraethyllead pac Benzidine toxic Silicic Oxide crude,crude low PAH Dioxobis(stearato)trilead Dihexyl Pentazinc Dibutyltin Diethyl Red Diglyme tar Monomethyl anthracene-low molvbdate DIBP Phenolphthalein bromoacetate C12H2Br80 Propyl dimethyl chain category coal Various flammable Dibutyltin Diethyl Ked Diglyme tar Monomethyl anthracene-low C12H2Br80 Propyl dimethyl chain bromow de dipicrate C7-rich horate polymers C12H2Br80 Propyl dimethyl chain Category Court Various Ethyl phenols emit contact Vinyl UVCB Ethane o-Nitrobenzaldehyde Compounds dipicrate C7-rich borate upper,heavy dipentylester C.I classified high dioxide Anthophyllite Azodyes DOTE Musk BBP Ethyl dihexylester arsenate Soap labelling name EGDME DSD) the member chloride Direct di-C9-11-branched mass Orthoboric octyl antimony ethoxylated to the the transportation of the theory of the theo lights UV ether PbSO acetate alkyl methane barium NMP Dichlorobenzene Paraffins nigrum Zinc Pitch Short classification listed Disodium Regulation dibromopropyl chloro Y ellow octahydroxide base DEHP peroxometaborate niger BjFA Helleborus DBB Benzo[e]pyrene individual Bis(tributyltin limit content thereof diisocyanate Content t Sodium BkFA Chloroform bark Ethoxyethanol carbon di C2 10 hundred Bis(2-methoxyethyl DMF C2.10 hundred bis Divide DMF C2.10 hundred bis Divide Veratrum butyl any Dinoseb Hydroxide Nickel Lead(II anthracene Annex bark Ethoxyethanol carbon di-C8-10-branched Di-"isodecyl azide pentaoxide pFOA Blue ketone Dibutyl including DBAhA nitrate Salt carbonates Methyl mixture wirdis of the chrysotile phthalate EC oil, wash carcinogens xylene branched categories above Chrysotile DPP CHR Sulfurous monoxide DBAhA nitrate Salt carbonates Methyl Diarsenic BaA Trilead bromide DPP CHR Trichloroethylene part sulphates mixture paste Formaldehyde position Basic include Formamide terphenyls gases aponines C10-rich Strontium aniline PbC03-Pb(OH isomers Hestahydromethylphthalic TEGDME,triglyme MDA dangerous European Diethoxyetane Cer called Chromium PCTs Arsenic regarded residues liquids Methyloxirane reproduction pentadecafluorooctanoate bis(dimethylamino MDA dangerous European Diethoxyethane Ceramic Cobalt(II water acenaphthene naphthylamine Nitrobiphenyl tetrachlorodiphenyl Azocolourants Benzo[a]pyrene tetraborate phosphonate As Ethylene linear p-cresidine Actinolite pentahydrate Chlorinated Oxybis[2-methoxyethanol Crocidolite Mercury Cyclohexane Trade hydrate Cyclohexane Actinolite pentahydrate Chlorinated Oxybis[2-methoxyethanol Crocidolite Mercury Cyclohexane Cyclohe Asbestos Pentachloroethane solids Acrylamide Phthalato(2-)]dioxotrilead Bis(pentabromophenyl Chloroethylene bromoacetic containing naphthalene Benzo[a]anthracene tris(chromate Dichromium saponaria styphnate alkaline,extract acids Ammonium alkaline Monomethyl-dibromo-diphenyl homologues N,N,N',N-tetramethyl-4,4'-methylenedianiline fraction, wash oils, naphthalene Tris(2-Chloroethyl temperature alkaline Monomethyl-dibromo-diphenyl homologues N.N.N.N-tetramethyl-4,4'-methylenedianiline fraction, wash Pentachlorophenol Dichromic Biphenyl-4-ylamine Methoxyaniline,o-Anisidine methoxyethoxy)ethanol Stereoisomers butoxyethoxy)ethanol dichloroethane products hydroxy-6-(phenylazo)naphthalene-2,7-disulphonate benzotriazol-2-yl-4,6-di-tert-butylphenol methyl-m-phenylenediamine amino-3-[[4'-[(2,4-diaminophenyl)azo][1,1'-biphenyl]-4-yl]azo N.N-dimethylacetamide carbonate bis(dimethylamino)benzophenone bis(carbonate)-dihydroxide dichloro-4,4'-methylenedianiline Tris(aziridinyl)phosphinoxide Potassium DEGME Polybromobiphenyls,Polybrominatedbiphenyls bis(dimethylamino)-4"-(methylamino)trityl cis-cyclohexane-1,2-dicarboxylic Ethoxyethyl Methylenediphenyl Heptacosafluorotetradecanoic Tetrachloroethane Benzo[j]fluoranthene beta-hexabromocyclododecane methylenedi-o-toluidine Diaminodiphenylmethane polysulphide ethyl-4-[[2-[(2-ethylhexyl)oxy]-2-oxoethyl]thio]-4-octyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate Henicosafluoroundecanoic sec-butyl-2,4-dinitrophenol 8

... into a list of top priority chemicals ...

Trichloroethylene Nonylphenol phthalate Ammonium Diglyme diisocyanate sulphates Dichromate PbSO Cyclohexane Diisobutyl Lead Cadmium Sodium Dichloromethane DEGME Strontium Di-"isononyl DINP DBP ether Nickel Dibutyl DEGBE compounds Toluene MDI nitrate methoxyethoxy)ethanol Chromate C6H4(OH)C9H Methylenediphenyl DIBP Bis(2-methoxyethyl butoxyethoxy)ethanol

that may currently benefit from risk mitigation actions

Diisobutyl phthalate (DIBP) Strontium Chromate Dibutyl phthalate (DBP) Bis(2-methoxyethyl) ether (Diglyme) Trichloroethylene Sodium Dichromate

risk assessments in more detail ...

Name	Authorization (Annex XIV)	Restriction (Annex XVII)	Sunset Date (for Annex XIV)	USAFE Pounds Used (20 months)
Lead and its compounds		Х		85,602
2-(2-butoxyethoxy)ethanol (DEGBE)		Х		4,377
Toluene		Х		4,247
2-(2-methoxyethoxy)ethanol (DEGME)		Х		2,900
Diisobutyl phthalate (DIBP)	X		21-Feb-15	2,786
Strontium Chromate	Х		22-Jan-19	913
Nickel		Х		330
Cadmium		Х		178
4,4'-methylenediphenyl diisocyanate		Х		171
Dibutyl phthalate (DBP)	Х	Х	21-Feb-15	120
Dichloromethane		Х		106
Lead sulphates: (a) PbSO4		Х		82
Ammonium nitrate (AN)		Х		62
Bis(2-methoxyethyl) ether (Diglyme)	Х		22-Aug-17	54
Nonylphenol C6H4(OH)C9H19		Х		50
Cyclohexane		Х		39
Di-"isononyl" phthalate (DINP)		Х		36
Trichloroethylene	X		21-Apr-16	11
Sodium Dichromate	X		21-Sep-17	9
Methylenediphenyl diisocyanate (MDI)		Х		8

Top 20 Annex XIV and Annex XVII Regulated Chemicals, by Weight 1 January 2014 - 25 August 2015

Name	Authorization (Annex XIV)	Restriction (Annex XVII)	Sunset Date (for Annex XIV)	USAFE Pounds Used (20 months)
Lead and its compounds		X		85,602
2-(2-butoxyethoxy)ethanol (DEGBE)		X		4,377
Toluene		X		4,247
2-(2-methoxyethoxy)ethanol (DEGME)		X		2,900
Diisobutyl phthalate (DIBP)	X		21-Feb-15	2,786
Strontium Chromate	X		22-Jan-19	913
Nickel		X		330
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4,4'-methylenediphenyl diisocyanate		X		171
Dibutyl phthalate (DBP)	X	Х	21-Feb-15	120
Dichloromethane		X		106
Lead sulphates: (a) PbSO4		X		82
Ammonium nitrate (AN)		X		62
Bis(2-methoxyethyl) ether (Diglyme)	X		22-Aug-17	54
Nonylphenol C6H4(OH)C9H19		X		50
Cyclohexane		X		39
Di-"isononyl" phthalate (DINP)		X		36
Trichloroethylene	Х		21-Apr-16	11
Sodium Dichromate	X		21-Sep-17	9
Methylenediphenyl diisocyanate (MDI)		X		8

REACH Annex XVII Restrictions do not apply to current USAFE uses of these chemicals

AF will continue monitoring – See back-up slides for details

Name	Authorization (Annex XIV)	Restriction (Annex XVII)	Sunset Date (for Annex XIV)	USAFE Pounds Used (20 months)		
Lead and its compounds		Х		85,602		
2-(2-butoxyethoxy)ethanol (DEGBE)		Х		4,377		
Toluene		Х		4,247		
2-(2-methoxyethoxy)ethanol (DEGME)		Х		2,900		
Diisobutyl phthalate (DIBP) 🥋	X		21-Feb-15	2,786		
Strontium Chromate	Х		22-Jan-19	913		
Nickel						
Cadmium			<u>DIBP</u> :			
4,4'-methylenediphenyl diisocyanate	USAFE has li	kely already me	et REACH requ	irements		
Dibutyl phthalate (DBP)	Only USAFE	weapon system	n requirement v	vas		
Dichloromethane			usage), reformu			
Lead sulphates: (a) PbSO4			•			
Ammonium nitrate (AN)	-			uction applications		
Bis(2-methoxyethyl) ether (Diglyme)	U U	•		comply with 2015		
Nonylphenol C6H4(OH)C9H19	REACH autho	orization require	ements			
Cyclohexane	These EU products likely reformulated					
Di-"isononyl" phthalate (DINP)						
Trichloroethylene	Civil Engineering confirming that reformulations meet					
Sodium Dichromate	requireme	nts				
Methylenediphenyl diisocyanate (MDI)		Х		8		

Name	Authorization (Annex XIV)	Restriction (Annex XVII)	Sunset Date (for Annex XIV)	USAFE Pounds Used (20 months)		
Lead and its compounds		Х		85,602		
2-(2-butoxyethoxy)ethanol (DEGBE)		Х		4,377		
Toluene		Х		4,247		
2-(2-methoxyethoxy)ethanol (DEGME)		Х		2,900		
Diisobutyl phthalate (DIBP)	X		21-Feb-15	2,786		
Strontium Chromate	X		22-Jan-19	913		
Nickel		Ctroptiu	n Chromoto			
Cadmium		Strontiu	m Chromate			
4,4'-methylenediphenyl diisocyanate	Mitigation actions	underway to re	duce risk prior	to 2019 sunset	t	
Dibutyl phthalate (DBP)	 Continuing to implement already identified subs for MIL-PRF- 					
Dichloromethane	23377 aircraft and ground equipment primers – 95% of usage					
Lead sulphates: (a) PbSO4		. .				
Ammonium nitrate (AN)	 Continuing to work with AF PMs and chemical manufacturers to 					
Bis(2-methoxyethyl) ether (Diglyme)	· ·	identify replacements for six additional primer products, two				
Nonylphenol C6H4(OH)C9H19	sealant/joint co	mpound produ	cts, and one fue	el tank coating	(5%)	
Cyclohexane	Aiming to eliminate	e use in USAF	E by 2019			
Di-"isononyl" phthalate (DINP)	J		-			
Trichloroethylene		 If elimination not possible, should be able to reduce usage to <20 				
Sodium Dichromate	pounds per yea	ir in two produc	cts at three insta	allations		
Methylenediphenyl diisocyanate (MDI)	 If necessary, re available proce work to CONUS 	dural mitigation	ns (e.g. transfer	infrequent airc		

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Lead and its compounds		Х		85,602		
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Toluene		Х		4,247		
2-(2-methoxyethoxy)ethanol (DEGME)		Х		2,900		
Diisobutyl phthalate (DIBP)	Х		21-Feb-15	2,786		
Strontium Chromate	Х		22-Jan-19	913		
Nickel		Х		330		
Cadmium		Х		178		
4,4'-methylenediphenyl diisocyanate		Х		171		
Dibutyl phthalate (DBP)	Χ	X	21-Feb-15	120		
Dichloromethane		V		106		
Lead sulphates: (a) PbSO4			<u>DBP</u>			
Ammonium nitrate (AN)	>98% of USAF	E usage is for	a non-combat o	round vehicle pain		
Bis(2-methoxyethyl) ether (Diglyme)	in Turkey - EU	•				
Nonylphenol C6H4(OH)C9H19	-					
Cyclohexane	` •	· •	• •	ete or reformulated		
Di-"isononyl" phthalate (DINP)	product: a single adhesive/epoxy compound					
Trichloroethylene	May downgrade to "meets REACH requirements" after					
Sodium Dichromate		•	s been reformul			
Methylenediphenyl diisocyanate (MDI)		3 10 0 0 0 0 0 0 0 0 0				

Name	Diglyme Mitigation actions underway to reduce risk prior to 2017 suns						
Lead and its compounds	Mitigation actio	ns underway	to reduce risk pr	ior to 2017 sur	nset		
2-(2-butoxyethoxy)ethanol (DEGBE)	 <u>100%</u> of USAFE usage is Fluoroelastomer Aircraft Coatings 						
Toluene	from a single manufacturer						
2-(2-methoxyethoxy)ethanol (DEGME)	Working with	Working with AF PMs and company to develop action plan					
Diisobutyl phthalate (DIBP)	J. J						
Strontium Chromate	• First priority:	try to reform	ulate to eliminate	e usage in USA	AFE		
Nickel	Only two shops use this product						
Cadmium		Average usage: One 8-pound kit per month per shop					
4,4'-methylenediphenyl diisocyanate				monun per si	юр		
Dibutyl phthalate (DBP)	(Digiyr	ne is 25% of t	he kit weight)				
Dichloromethane		Δ		100			
Lead sulphates: (a) PbSO4		Х		82			
Ammonium nitrate (AN)		X		62			
Bis(2-methoxyethyl) ether (Diglyme)	X		22-Aug-17	54			
Nonylphenol C6H4(OH)C9H19		X		50			
Cyclohexane		X		39			
Di-"isononyl" phthalate (DINP)	X 36						
Trichloroethylene	X		21-Apr-16	11			
Sodium Dichromate	X		21-Sep-17	9			
Methylenediphenyl diisocyanate (MDI)		X		8			

	Name	Authorization (Annex XIV)	Restriction (Annex XVII)	Sunset Date (for Annex XIV)	USA Pounds (20 mc	s Used
Lead and its com	pounds		Х			85,602
2-(2-butoxyethox	y)ethanol (DEGBE)		Х			4,377
Toluene			Х			4,247
2-(2-methoxyeth Diisobutyl phtha Strontium Chron						
Nickel Cadmium 4,4'-methylened						330 178 171
Dibutyl phthalate	Confirming that usag	je is not requi	red by Technic	al Orders (T.O.))	120 106
Lead sulphates: (Ammonium nitra	 If not required by T.O.s maintenance shops to 	buy non-trich	loroethylene pr	oducts	nicie	82 62 54
Bis(2-methoxyet Nonylphenol C6 Cyclohexane						
Di-"isononyl" tathalate (DINP) X					39 36	
Trichloroethylen	roethylene X 21-Apr-16				11	
Sodium Dichroma	Sodium Dichromate X 21-Sep-17					9
Methylenediphen	ediphenyl diisocyanate (MDI) X					8

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Lead and its compounds		Х		85,602		
2-(2-butoxyethoxy)ethano	l (DEGBE)		Х		4,377	
Toluene			Х		4,247	
2-(2-methoxyethoxy)ethar	nol (DEGME)		Х		2,900	
Diisobutyl phthalate (DIB	P)	Х		21-Feb-15	2,786	
Strontium Chromate		Х		22-Jan-19	913	
Nickel Cadmium 4,4'-methylenediphenyl d Dibutyl phthalate (DBP) Dichloromethane Lead sulphates: (a) PbSO Ammonium nitrate (AN) Bis(2-methoxyethyl) ether Nonylphenol C6H4(OH) Cyclohexane	Sodium Dichromate Mitigation actions underway to reduce risk prior to 2017 sunset • 100% of usage is for a single aircraft windshield and canopy sealant product • A chromate-free version is available from the same manufacturer • Working with aircraft PMs to qualify the alternative					
Di-"isononyl" phthalate (I	DINP)		Х		39 36	
Trichloroethylphe		Х		21-Apr-16	11	
Sodium Dichromate	X		21-Sep-17	9		
Methylenediphenyl diisoc		Х		8		

Avoiding USAFE Impacts – Risk Management Summary

99% of USAFE chemical usage meets current and upcoming REACH requirements

- Chemical availability risks currently minimal
- Action plans in place to further reduce risk
- HAF will continue to work with AFCEC and USAFE to monitor REACH changes

Chemical	20 Month Usage	Sunset Date	# Prod- ucts	# Bases	Action Plan Summaries	Probability of Eliminating USAFE Usage
DIBP	2,786	21-Feb-15	1	1	USAFE civil engineering check performance of reformulated construction products	VERY LIKELY
Strontium Chromate	913	22-Jan-19	10	7	Continue implementation of 23377 primer replacement (95% of USAFE usage); Fuel tank coating is challenging to reformulate	POSSIBLE
DBP	120	21-Feb-15	2	2	Only 1 pound subject to EU REACH; Confirming product has been replaced	VERY LIKELY
Diglyme	54	22-Aug-17	1	2	Evaluating possibility of reformulating a specialty aircraft coating by one company	POSSIBLE
Trichloro- ethylene	11	21-Apr-16	2	4	Common automotive products, commercially available replacements	VERY LIKELY
Sodium Dichromate	9	21-Sep-17	1	3	Non-chromate alternative already available from same company, evaluating substitution	VERY LIKELY