

## Questionnaire

September 2017

Dear Sir/Madam,

The Munitions Safety Information Analysis Center (MSIAC), on behalf of our member nations, is engaging the community to contribute towards an update to the report on current energetic materials suppliers (O-082).

### **Purpose**

The results of this survey will provide input into a report that lists current manufactures of energetic materials and their capabilities. This is an opportunity for organisations in MSIAC, NATO and its allied partner nations<sup>1</sup> to inform the community of their capabilities and availabilities. The updated catalogues will be an **open report** and will be made available to all contributors from the aforementioned nations. It will be an easy reference source used by Defence to identify manufacturers.

### **Output**

An MSIAC **open report** consolidating manufactures from MSIAC, NATO and its allied partner nations.

### **Timing**

Please complete and return the questionnaire by **10<sup>th</sup> November 2017**.

To: Dr Matthew Andrews

Email: [m.andrews@msiac.nato.int](mailto:m.andrews@msiac.nato.int)

Post: MSIAC, S050, Building Z,  
NATO HQ,  
B-1110, Brussels,  
BELGIUM

Should you require confirmation of the work plan or element please contact your country's National Focal Point Officer (NFPO). Details can be found on our website:

<http://www.msiac.nato.int/contact-us/national-focal-point-officers-nfpos>

Thank you for taking the time to complete this questionnaire.

Regards,

Dr Matthew Andrews

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<sup>1</sup> NATO, PFP, MD, ICI, Australia, Japan, Republic of Korea, Singapore, South Africa

Explanation of each section and requirements

- Section 1      General information about the company
- Section 2      Short statement about the company's heritage in energetic materials ——— manufacture, associated literature on the portfolio and information that can be supplied with the product
- Section 3      This is a list of current materials, covering oxidisers, energetic liquids, polymers, primary and secondary energetics. The list has been cross-referenced against known standards, quality of the produced material, hazard classification and UN number. Delete the materials, specification, types and grades you are not manufacturing.
- The provided list is not exhaustive so please feel free to amend the table to inform us of additional materials you are currently manufacturing.
- Section 4-8    These Sections contains five key ingredients which we would like to directly compare; HMX, RDX, PETN, TNT and Nitrocellulose. The templates allow you to contribute further information about these materials to be included in the report.
- Section 9      This is a blank template to allow you to provide further information for any materials you would like to highlight, for example, DNAN, NTO and/or TATB.
- Section 10    Free text box to provide any other information

**1. General Information:** Please complete the following sections

Location		
	Name of Manufacturer	
	Address	
	Country	
	Website	
Point of Contact		
	Name	
	Title/Role	
	Phone	
	E-mail	
	Fax	

**2. Company Information:** Please provide information where possible

Summary	
<i>Statement covering experience in energetics manufacture</i>	
Which materials do you manufacture for use by the Defence Industry? (Tick or check all applicable boxes)	
<i>Secondary Explosives</i>	<input type="checkbox"/>
<i>Primary Explosives</i>	<input type="checkbox"/>
<i>Energetic Polymers</i>	<input type="checkbox"/>
<i>Energetic Liquids</i>	<input type="checkbox"/>
<i>Oxidisers</i>	<input type="checkbox"/>
<i>Additives</i>	<input type="checkbox"/>
<i>Non-Energetic Polymers</i>	<input type="checkbox"/>
<i>Non-Energetic Liquids</i>	<input type="checkbox"/>
<i>Other (specify)</i>	<input type="checkbox"/>
Pamphlet (Sales literature)	
<i>Link to document</i>	
Sale Requirements (please state any limitations)	
<i>Domestic</i>	
<i>Foreign</i>	
Documents Supplied with Energetic Material (Yes/No/Other)	
<i>Certificate of Conformity</i>	

<i>Certificate of Analysis</i>	
<i>Explosive Hazard Data Sheet</i>	
<i>Material Safety Data Sheet</i>	
<i>Other (please specify)</i>	

Please provide, if able to do so, copies of any relevant information or examples of the aforementioned documents.

3. **Energetic Material Quick Check:** Identify which specifications and qualities you are able to produce. Please state yes (Y) or no (N) in the box next to the specification if you currently use a listed specification, or add additional one(s) in the 'Other' box. For the material quality the highlighted colours correspond to the listed specification; these are there for guidance. Please **delete** materials/specifications/grades/classes/types you **don't** manufacture. Space is available at the end of the table for **you to add** additional materials; please follow the same format.

Name	CAS #	Specification							Quality				Hazard Class	UN #
		STANAG/AOP	Y/N	MIL-SPEC	Y/N	DEF-STAN	Y/N	Other (Specify)	Type	Class	Grade	Other		
Ammonium dinitramide	140456-78-6													
Ammonium nitrate	6484-52-2	4024 Ed 3												
Ammonium perchlorate	7790-98-9	4299 Ed 1		MIL-A-192B Not 3		68-265			A (1; 1) B (2; 1)	1 A/B 2 3	A B C D  1 2 3			
n-Butyl-2-nitratoethyl nitramine (Bu-NENA)	82486-82-6	4583 Ed 1							1 2 3 4					
2,4,6,8,10,12-Hexanitro-hexaaza-isowurtzitane (CL-20)	135285-90-4	4566 Ed 1												
2,6-Diamino-3,5-dinitro-	194486-77-6													

Name	CAS #	Specification							Quality				Hazard Class	UN #
		STANAG/AOP	Y/N	MIL-SPEC	Y/N	DEF-STAN	Y/N	Other (Specify)	Type	Class	Grade	Other		
pyrazine-1-oxide (DADNPO)														
2,4-Dinitroanisole (DNAN)	119-27-7	4776 Ed 1												
4,6-Dinitrobenzofuroxan (DNBF)	3524-08-1													
2,4-Dinitrotoluene (DNT)	121-14-2	4041 Ed 1		A-A-59256 Not 2										
Ethylene glycol dinitrate	628-96-6			MIL-E-48225(AR) Not 1										
Explosive D; Ammonium picrate	131-74-8			MIL-A-166C Not 3						1 2				
1,1-Diamino-2,2-dinitroethylene (FOX-7)	145250-81-3	4798												
Guanylurea dinitramide (GUDN)	217464-38-5	4700 Ed 1												
HMX	2691-41-0	4284 Ed 1		MIL-DTL-45444C Not 1		13-111			I II III A B	1 2 3 4 5 6	A B			

Name	CAS #	Specification							Quality				Hazard Class	UN #	
		STANAG/AOP	Y/N	MIL-SPEC	Y/N	DEF-STAN	Y/N	Other (Specify)	Type	Class	Grade	Other			
									C						
2,2',4,4',6,6'-Hexanitrostilbene (HNS)	20062-22-0	4230 Ed 1		MIL-E-82903 Amm 1		13-180			I II III IV V						
Lead azide	13424-46-9			MIL-DTL-46225D											
Lead styphnate	15245-44-0			MIL-DTL-757C Not 1											
Nitroglycerine (NG)	55-63-0			MIL-N-246B(AR)					I II						
Nitrocellulose (NC)	9004-70-0			MIL-DTL-244C					I II III	1 2 3	A (I/II) B (I/II/III) C (I/II) D E F				
Nitroguanidine (NQ)	556-88-7	4026 Ed 3		MIL-N-494A(AR) Not 2					I II	A B  1 2					
3-Nitro-1,2,4-triazol-5-one (NTO)	932-64-9	4543 Ed 1													
PETN	78-11-5	4023 Ed 5		MIL-P-387C Not 1		13-112				1 2 3 4					

Name	CAS #	Specification							Quality				Hazard Class	UN #	
		STANAG/AOP	Y/N	MIL-SPEC	Y/N	DEF-STAN	Y/N	Other (Specify)	Type	Class	Grade	Other			
										5					
RDX	121-82-4	4022 Ed 4		MIL-DTL-398D Not 1		07-23			A B  I II	1 2 3 4 5 6 7 8	1 - 36 1 - Fine 1A 1B				
Red P	7723-14-0	4679		MIL-211F						1 2 3					
1,3,5-Triamino-2,4,6-trinitrobenzene (TATB)	3058-38-6					13-500			A						
Triethylene glycol dinitrate (TEGDN)	111-22-8	4719 Ed 1													
Tetryl	479-45-8	4021 Ed 3		MIL-T-339C Not 3		07-26									
2,4,6-Trinitrotoluene (TNT)	118-96-7	4025 Ed 3		ML-DTL-248D Not 1					I II III						



Name	CAS #	Specification							Quality				Hazard Class	UN #
		STANAG/AOP	Y/N	MIL-SPEC	Y/N	DEF-STAN	Y/N	Other (Specify)	Type	Class	Grade	Other		

The following templates (4-8) will allow us to directly compare key ingredients.

**4. Energetic Material Template: HMX**

<b>Name</b>	HMX			
<b>Alternative Name(s)</b>	Octogen; 1,3,5,7-Tetranitro-1,3,5,7-tetraazacyclooctane			
<b>Formula</b>	C <sub>4</sub> H <sub>8</sub> N <sub>8</sub> O <sub>8</sub>			
<b>CAS Number</b>	2691-41-0			
<b>Quality</b>	<i>Type</i> <i>Class</i> <i>Grade</i> <i>Include forms with improved shock response</i>			
<b>Specification(s)</b>	<i>e.g.</i> <i>MIL-SPEC</i> <i>STANAG</i>			
<b>Test Data</b>	<i>If possible include hazard and performance data, e.g.</i> <i>Detonation Velocity</i> <i>Density</i> <i>Impact, Friction, ESD</i>			
<b>Accredited Test Authority</b>				
<b>Volume/Mass</b>	<b>&lt; 1 kg</b>	<b>1 – 10 kg</b>	<b>10 – 100 kg</b>	<b>&gt; 100 kg</b>
<i>Which batch sizes can you deliver</i>				
<b>Cost</b>				<b>1 kg</b>
	<i>Rough order of magnitude (based on an order of 100 kg)</i> <i>[1-5 EUR; 5-10 EUR; 10-25 EUR; 25-50 EUR; +50 EUR]</i>			
<b>Formulations</b>	<b>Product Name</b>	<b>Specification</b>	<b>Application</b>	
<i>Please list here formulations that you manufacture and to which specification</i>  <i>Note the major ingredient should be HMX</i>				

**5. Energetic Material Template: RDX**

<b>Name</b>	RDX			
<b>Alternative Name(s)</b>	Hexogen; 1,3,5-trinitro 1,3,5-tetrazacyclohexane			
<b>Formula</b>	C <sub>3</sub> H <sub>6</sub> N <sub>6</sub> O <sub>6</sub>			
<b>CAS Number</b>	121-82-4			
<b>Quality</b>	<i>Type</i> <i>Class</i> <i>Grade</i> <i>Include forms with improved shock response</i>			
<b>Specification(s)</b>	<i>e.g.</i> <i>MIL-SPEC</i> <i>STANAG</i>			
<b>Test Data</b>	<i>If possible include hazard and performance data, e.g. Detonation Velocity Density Impact, Friction, ESD</i>			
<b>Accredited Test Authority</b>				
<b>Volume/Mass</b>	<b>&lt; 1 kg</b>	<b>1 – 10 kg</b>	<b>10 – 100 kg</b>	<b>&gt; 100 kg</b>
<i>Which batch sizes can you deliver</i>				
<b>Cost</b>				<b>1 kg</b>
	<i>Rough order of magnitude (based on an order of 100 kg)</i> <i>[1-5 EUR; 5-10 EUR; 10-25 EUR; 25-50 EUR; +50 EUR]</i>			
<b>Formulations</b>	<b>Product Name</b>	<b>Specification</b>	<b>Application</b>	
<i>Please list here formulations that you manufacture and to which specification</i>  <i>Note the major ingredient should be RDX</i>				

**6. Energetic Material Template: PETN**

<b>Name</b>	PETN			
<b>Alternative Name(s)</b>	Penthrite; pentaerythritol tetranitrate			
<b>Formula</b>	C <sub>5</sub> H <sub>8</sub> N <sub>4</sub> O <sub>12</sub>			
<b>CAS Number</b>	78-11-5			
<b>Quality</b>	<i>Type</i> <i>Class</i> <i>Grade</i> <i>Include forms with improved shock response</i>			
<b>Specification(s)</b>	<i>e.g.</i> <i>MIL-SPEC</i> <i>STANAG</i>			
<b>Test Data</b>	<i>If possible include hazard and performance data, e.g. Detonation Velocity Density Impact, Friction, ESD</i>			
<b>Accredited Test Authority</b>				
<b>Volume/Mass</b>	<b>&lt; 1 kg</b>	<b>1 – 10 kg</b>	<b>10 – 100 kg</b>	<b>&gt; 100 kg</b>
<i>Which batch sizes can you deliver</i>				
<b>Cost</b>				<b>1 kg</b>
	<i>Rough order of magnitude (based on an order of 100 kg)</i>			
	<i>[1-5 EUR; 5-10 EUR; 10-25 EUR; 25-50 EUR; +50 EUR]</i>			
<b>Formulations</b>	<b>Product Name</b>	<b>Specification</b>	<b>Application</b>	
<i>Please list here formulations that you manufacture and to which specification</i>  <i>Note the major ingredient should be PETN</i>				

**7. Energetic Material Template: TNT**

<b>Name</b>	TNT			
<b>Alternative Name(s)</b>	Tolite; 2,4,6-trinitrotoluene			
<b>Formula</b>	C <sub>7</sub> H <sub>5</sub> N <sub>3</sub> O <sub>6</sub>			
<b>CAS Number</b>	118-96-7			
<b>Quality</b>	<i>Type</i> <i>Class</i> <i>Grade</i> <i>Include forms with improved shock response</i>			
<b>Specification(s)</b>	<i>e.g.</i> <i>MIL-SPEC</i> <i>STANAG</i>			
<b>Test Data</b>	<i>If possible include hazard and performance data, e.g. Detonation Velocity Density Impact, Friction, ESD</i>			
<b>Accredited Test Authority</b>				
<b>Volume/Mass</b>	<b>&lt; 1 kg</b>	<b>1 – 10 kg</b>	<b>10 – 100 kg</b>	<b>&gt; 100 kg</b>
<i>Which batch sizes can you deliver</i>				
<b>Cost</b>				<b>1 kg</b>
	<i>Rough order of magnitude (based on an order of 100 kg)</i>			
	<i>[1-5 EUR; 5-10 EUR; 10-25 EUR; 25-50 EUR; +50 EUR]</i>			
<b>Formulations</b>	<b>Product Name</b>	<b>Specification</b>	<b>Application</b>	
<i>Please list here formulations that you manufacture and to which specification</i>  <i>Note the major ingredient should be TNT</i>				

**8. Energetic Material Template: Nitrocellulose**

<b>Name</b>	Nitrocellulose			
<b>Alternative Name(s)</b>	NC			
<b>Formula</b>	$C_6H_{8.0307}N_{1.9693}O_{8.9386}$			
<b>CAS Number</b>	9004-70-0			
<b>Quality</b>	<i>Type</i> <i>Class</i> <i>Grade</i> <i>Include forms with improved shock response</i>			
<b>Specification(s)</b>	<i>e.g.</i> <i>MIL-SPEC</i> <i>STANAG</i>			
<b>Test Data</b>	<i>If possible include hazard and performance data, e.g. Detonation Velocity Density Impact, Friction, ESD</i>			
<b>Accredited Test Authority</b>				
<b>Volume/Mass</b>	<b>&lt; 1 kg</b>	<b>1 – 10 kg</b>	<b>10 – 100 kg</b>	<b>&gt; 100 kg</b>
<i>Which batch sizes can you deliver</i>				
<b>Cost</b>				<b>1 kg</b>
	<i>Rough order of magnitude (based on an order of 100 kg)</i>			
	<i>[1-5 EUR; 5-10 EUR; 10-25 EUR; 25-50 EUR; +50 EUR]</i>			
<b>Formulations</b>	<b>Product Name</b>	<b>Specification</b>	<b>Application</b>	
<i>Please list here formulations that you manufacture and to which specification</i>  <i>Note the major ingredient should be NC</i>				

9. **Energetic Material Template: Blank**      Please use this template to highlight materials of interest

<b>Name</b> <b>Alternative Name(s)</b> <b>Formula</b> <b>CAS Number</b>				
<b>Quality</b> <i>Type</i> <i>Class</i> <i>Grade</i> <i>Include forms with improved shock response</i>				
<b>Specification(s)</b> <i>e.g.</i> <i>MIL-SPEC</i> <i>STANAG</i>				
<b>Test Data</b> <i>If possible include hazard and performance data, e.g.</i> <i>Detonation Velocity</i> <i>Density</i> <i>Impact, Friction, ESD</i>				
<b>Accredited Test Authority</b>				
<b>Volume/Mass</b>	<b>&lt; 1 kg/L</b>	<b>1 – 10 kg/L</b>	<b>10 – 100 kg/L</b>	<b>&gt; 100 kg/L</b>
<i>Which batch sizes can you deliver</i>				
<b>Cost</b>				<b>1 kg/L</b>
<i>Rough order of magnitude (based on an order of 100 kg/L)</i> <i>[1-5 EUR; 5-10 EUR; 10-25 EUR; 25-50 EUR; +50 EUR]</i>				
<b>Formulations</b>	<b>Product Name</b>	<b>Specification</b>	<b>Application</b>	
<i>Please list here formulations that you manufacture and to which specification</i>  <i>Note the major ingredient should be [_____]</i>				

10. **Formulations:** Please include here any new formulations that are not covered by the Explosive Template. Include details of any specification, applications and compositions

**Explosive Formulations**

11. **Any other information:** Please use this section to inform us of any other developments, materials, technologies that you are employing that would be of interest to the community.

**Further information**