

UNPARALLELED COMMITMENT & SOLUTIONS







U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT & ENGINEERING CENTER

Act like someone's life depends on what we do.

Distribution A: Approved for Public Release. Distribution Is Unlimited. Other Requests for This Document May Be Referred To US Army, RDECOM, Picatinny Arsenal, NJ, 07806-5000

UNCLASSIFIED







Review and update of STANAG 4526 Shaped Charge Jet, Munitions Test Procedure

Dr. Brian Fuchs*
US Army, ARDEC, Picatinny Arsenal, New Jersey 07806

Dr. Ernest Baker Retired US Army, ARDEC, Picatinny Arsenal, New Jersey 07806

Mr. Ken Tomasello US Navy, NOSSA, NATO AC326 Subgroup B Chairman

Mr. Manfred Becker Retired MSIAC NATO Headquarters Boulevard Léopold III Brussels B-1110 Belgium

Email: brian.e.fuchs2.civ@mail.mil

Phone: 973-724-4772





CHANGES IN PERSONNEL



 Dr. Ernest Baker has retired from the US Army ARDEC and has taken a position with MSIAC NATO Headquarters.

 Mr. Manfred Becker has retired with MSIAC NATO Headquarters.



BACKGROUND



The STANAG was outdated and lost relevance. As a result, each member nation has been creating and adopting their own standards to meet their needs. The STANAG:

- Referenced US Rockeye Shaped Charge, which is no longer used by any member nation
- Used values of Held's Criteria (v2d) for various shaped charges that can not be verified





BACKGROUND



Multiple international meetings were held, including a technical workshop under the auspices of NATO's Munitions Safety Information Analysis Center (MSIAC):

One Workshop was held:

- •ENSTA Bretagne Brest France 12 15 May, 2014 Two Custodial Working Group meetings were held:
 - Brest, France 16 May, 2014
 - •Bofors Test Center, Karlskoga, Sweden 03 September 2014.

And two Update Meetings in conjunction with the Response Descriptors Working Group Meeting were held:

- •Brussels, Belgium, NATO headquarters September 2015
- •Brussels, Belgium, NATO headquarters April 2016.
- •STANAG 4526 will be replaced by an Allied Ordinance Publication (AOP 4526) to allow for more efficient future updates.





WORKSHOP FINDINGS



- Bomblet removed
- Rockeye removed
- Ballistic Pendulum removed as an option from official test
- Anti-Tank Missile removed
- Old, inaccurate v²d table removed
- Most member nations had adopted some form of RPG threat







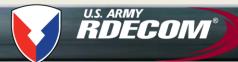
Typical Shaped Charges used by MSIAC Member Nations

Nation	Shaped	Threat	Jet	Jet	V ² D	Specified in	Laboratory/
	Charge	Level	Velocity	Diameter	(mm/µs)	IM Policy	in service *
			(mm/µs)	(mm)			
France	CCEB 62	RPG-7	8	3	203	Yes	Laboratory
	(Former						
	Version)						
	CCEB 62	RPG-7	To be	To be	To be	Yes	Laboratory
	(New		assessed	assessed	assessed		
	Version)						
Germany	KB44	Bomblet	8	1.9	122**		Laboratory
	RPG 7 NB	RPG-7	7.2	3.1	166**	Yes	Laboratory
Netherlands	Small	Bomblet					In Service
	Bomblets						
Sweden	RPG-7's	RPG-7					In Service
United	BL 755	Bomblet				No	In Service
Kingdom	M42	Bomblet				No	In Service
	K4	RPG-7				Yes	Laboratory
USA	81 mm SC	RPG-7	6.4	3.5	141	Yes	Laboratory

Typical Shaped Charges used by MSIAC Member Nations
*In Service means that the shaped charge is produced in large scale

**The jet tip is not considered





STANAG UPDATE



- Uses the RPG-7 as a representative threat.
- Maintains the current French and US test standards that should be well defined in the STANAG.
- Maintains the use of actual RPG-7 warheads, although is not to be suggested in the STANAG due to the variability of these charges.
- Defines jet characteristics and test configurations for new tests using the RPG-7 threat.
- RPG-7 surrogate drawing should include:
 - Standoff associated with the test configuration, including the position of conditioning plate relative to the warhead.
 - A minimum air gap behind the conditioning plate and the test item.
- Allow a THA based variation.





GENERAL CRITERIA



The new AOP has been prepared. The US and French testing ANNEX's have been included. General criteria for the tests that met the STANAG are:

Jet Characteristic Requirements

- The jet will penetrate a conditioning plate of suitable thickness to remove the first part of the jet.
- Jet diameter at the target impact position shall be 2.5 -3.5mm.
- v²d shall be between 120 and 140 mm³/µs².

Breakup characteristics

 Jet length, breakup times and accumulated jet mass may be measured for information.





GENERAL CRITERIA



Shaped Charge Requirements

- The shaped charge will be produced in a precise manner assuring that all components are properly located and that the charge is axially symmetric.
- A jet straightness exhibiting less than ½ of a jet diameter deviation at a 20 charge diameter standoff is desired.
- The explosive charge diameter should be larger than 60mm and less than 95mm with an explosive fill performance between COMP B and Pure HMX at TMD.
- The charge liner shall be made from a high quality oxygen free copper and its construction described.
- Initiation methods will be specified to assure consistent and strong symmetric initiation.
- The shaped charge shall be designed such that the output after penetrating a conditioning plate matches the performance of a shoulder launched rocket propelled grenade.
- The performance parameters describing the jet shall include the diameter and velocity both at the tip and along the jet. The characterization shall include information as to the placement that replicates the standoff of the RPG threat.





CHANGES SINCE LAST PRESENTATION



- A Standards Related Document has been written that streamlines updates and consolidate standards across multiple tests reducing duplication.
- AOP 4526 has been completed.
- The NATO Ammunition Safety Group AC326 approved the AOP in April 2018.





PARTICIPANTS



CWG Members:

Brian Fuchs (US - Lead)

Ernie Baker (US – retired former co-lead)

Phil Cheese (GBR)

Nathan White (GBR)

Pierre-Francois Peron (FRA)

Florian Pechox (FRA)

Guillaume Baudry (FRA)

Gunnar Nevstad (NOR)

Albert Bouma

Participants:

Ken Tomasello (AC-326 SG/B Chair)

Bill Proud

Malcolm Cook

Nathan White

Pierre-François Peron

Fabien Chassagne

Franck Dupuis

Albert Bouma

Gunnar Nevstad

Tom Swierk

Steve Struck

Hervé Benard

Jon Toreheim

Florian Pechoux

François Davenne

Albert Bouma

MSIAC:

Matt Andrews

Manfred Becker (retired)

Emmanuel Schultz

Michael Sharp

Tom Taylor

Martin Pope