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DOCUMENT
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**NATO ARMY ARMAMENTS GROUP
LAND GROUP 4 ON SURFACE TO SURFACE ARTILLERY**

HARMONIZATION OF INDIRECT FIRE SYSTEMS

1. The LG/4 Harmonization of Indirect Fire System Paper, compiled by USA, was updated at the Fall 2005 LG/4 meeting and is now published as a document
2. This document supersedes the PFP(NAAG-LG/4)D(2003)3 dated 8 May 2003, which has lost validity and should be destroyed according to security procedures.

(Signed) O. TASMAN

Annex 1: Harmonisation of Indirect Fire
Annex 2: NATO Mortar Equipment

2 Annexes

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Original: English

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HARMONISATION OF INDIRECT FIRE SYSTEMS

1.0 PURPOSE

1.1 This paper is intended to identify the current climate of indirect fire systems with regard to NATO expansion. Degrees of standardization, interchangeability, and interoperability of current and planned artillery systems will be identified between NATO and Partner nations. Lastly, areas of investigation and recommendations towards harmonization will be provided.

2.0 DISCUSSION

2.1 In the aftermath of the fall of the Berlin Wall, the late 1980s and early 1990s saw the beginnings of a major turning point in world geopolitics. The result was an upheaval with a multitude of important implications for the arms policies of various states including both NATO and former Warsaw Pact partners. As new countries join and/or participate in NATO the need to ensure interoperability, standardization, interchangeability, and commonality of weapons/ammunition systems becomes more important yet more difficult to maintain. NATO must address the use of non-NATO standard caliber ammunition with the introduction of the former Warsaw Pact nations. Harmonization of artillery weapon and ammunition systems is vital to ensuring that nations can participate compatibly in peace support operations and other multi-national missions.

2.2 Upgrading weapons and ammunition to the current NATO compatible standards of 105 and 155mm may be as rudimentary as merely purchasing the appropriate equipment from other NATO countries. However many nations have embarked on a program of drastic financial cutbacks in defense budgets. The escalation in the cost of high technology weapon systems has resulted in increasingly prohibitive acquisition and life-cycle costs for the systems which individual countries may need to procure to establish harmonization. Although total interoperability of surface-to-surface artillery systems is desired the associated financial burden may result in the establishment of new NATO standard calibers for the near future with a long term plan for convergence which should lead to enhanced harmonization. The harmonization of materiel is an important step in inter-governmental military cooperation. It is indicative of the will to achieve better cooperation in the field and it brings into play all of the functions which ground-to-ground artillery utilizes to accomplish its mission:

- Acquisition and processing of target intelligence
- Utilization of assets
- Trajectory control
- Development of command systems
- Evolution of ammunition
- Reduction in logistical constraints
- Importance of customized maintenance
- Use of high-performance simulation

2.3 For all mission essential functions an interconnecting link may potentially be created between different artilleries in the following areas, provided that the partners have the desire and resources.

2.3.1 Target Acquisition Systems: Target Acquisition data can be obtained from a variety of sources including non-field artillery owned assets. Current target acquisition means include the use of forward observers, counter battery radars, sound ranging, optical reconnaissance, battlefield surveillance radars, aerial reconnaissance, and Unmanned Aerial Vehicles (UAVs). Since information is obtainable from a variety of sources, the type and format of the information provided to the Field Artillery Commanders is critical to ensuring harmonization. Without the existence of a common system, improved harmonization may consist of the development of transmission interfaces that enable different systems to communicate among themselves or the utilization of data/images produced by a different system. This evolution falls within the purview of the implementation of targeting doctrine and can be extended to other non-artillery fields such as intelligence, transmissions and the like.

2.3.2 Command, Control and Communications Systems: Artillery CIS needs to enhance the delivery systems and munitions they are designed to support and provide the commander with a Management Information System (MIS) type approach. The difficulty will be to ensure that each national system will take into account the delivery means and munitions of other nations or at a minimum be capable of communicating essential messages such as calls for fire to the CIS of those nations. A major obstacle to the attainment of this will be the diverse cryptographic methods, different languages and national interpretations of messages. Even prior to the expansion of NATO, Command, Control and Communications Systems were highly national as evidenced by the existence of AFATDS (USA), ADLER (DEU), BATES (GBR) and ATLAS (FRA). An important step has been taken in the harmonization of these systems through the establishment of ADatP-3 performed by the NSA Artillery Working Group and the Artillery System Co-operation Activities (ASCA) Common Tactical Demonstration Interface Plan (CTDIP). These studies will ultimately provide the means for different national systems to communicate. The interfaces put in place to enable systems to dialogue are a concrete and positive example of harmonization objectives. Although it is recognized that 'competing' standards still do exist. The current state of compatibility is delineated in Table 1 of the Annex.

2.3.3 Gun/Cannon Weapons Systems: Self-Propelled and Towed howitzers remain the backbone of ground-to-ground artillery systems. Within the current NATO countries these systems remain highly diversified as evidenced by the 155mm: AS 90, M109 PALADIN, PZH 2000 and AUF1. With the addition of the former Warsaw Pact nations several new calibers such as the 122, 130 and 152mm caliber howitzers have become NATO calibers. How these new calibers will be addressed is currently under discussion by LG.4 to determine if a new set of standards should be added or if the non-standard nations have intentions to convert to the current NATO calibers. This may be the most pressing issue facing artillery harmonization from an interoperability perspective on the battle field today. Potential solutions may include the engineering of adapters or the replacement of non-standard tubes with NATO caliber weapon tubes to preserve current weapon systems. The expansion of NATO

has introduced a greater number of NATO non-standard caliber weapon systems into the equation resulting in a step backward in the area of artillery harmonization. Agreements reached as a result of the 155mm Ballistic Memorandum of Understanding (MOU) between DEU, FRA, ITA, GBR, and the USA will potentially facilitate the interoperability of ammunition and propelling charges among future 155mm weapon systems. The largest step towards harmonization would be to adapt a single caliber for all NATO partner countries such as the 155mm which is the most utilized given the self propelled and towed systems currently in service. This seems to be supported by the Partner nations as in some cases national plans exist to migrate towards the 155mm NATO standard caliber. As indicated in Table 2 of the Annex some work remains to be accomplished in this area before total harmonization is achieved. While there may be a desire to migrate towards the NATO standard caliber this is highly dependent on national funding and resources. The prospect of procedural and doctrinal interoperability is less dependent on funding and should be pursued.

2.3.4 Multiple-Launch Rocket System (MLRS) Weapon Systems: The Multiple-Launch Rocket System (MLRS) Weapon System has been an interoperability success story within NATO. The MLRS launcher is derived from a basic US system and currently equips numerous European countries, in several cases with the addition of national peripherals such as the ATLA system in France. MLRS systems are currently at the stage where this weapon requires upgrading of the fire control and aiming systems. Should it prove necessary to establish priorities due to budgetary constraints, harmonization could focus on the development of future fire control systems capable of firing longer-range and higher-accuracy munitions, a requirement generally acknowledged at the present time by the artillerymen that operate the MRLS.

With the expansion of NATO, interoperability of rocket systems will be a challenge. As seen in Table 3 of the Annex, expansion nations have introduced rocket systems other than MLRS into NATO. It is reasonable to expect that this trend will continue as new nations join NATO in the future.

2.3.5 Munitions: The adoption of a single major caliber weapon/platform such as 155mm for the harmonization of the stockpile would be preferable and would eliminate numerous interoperability issues. LG.4 is currently entering discussion regarding methods to address the large stockpile of 152mm ammunition and the potential to adapt weapons or issue a new standard. Such harmonization will impose certain constraints on other items including fuzes and propelling charges. With regards to future propelling charges, more effort is required to achieve genuine harmonization particularly in light of the continuing debate between combustible cartridge cases vs. modular charges.

Future smart munitions/fuzes will pose an interchangeability issue due to inherent 'smart settings' the rounds will require. It is envisioned that future munitions/fuzes will be required to be set with a minimum of various initialization parameters from current location to target location and GPS ephemeris type data. Today, electronic fuzes are usually set with less than 32 bits of information while future munitions/fuzes have the potential to be set up to and over 32 bits of information. As the need to set

more information increases standardization of the data and methods of setting such as inductive or manual become more important.

MRLS munitions on the other hand, would pose fewer problems. All countries possessing the MLRS weapons system use the basic M26 rocket and are aware of the need to acquire self-destruct fuzing, extended-range rockets (60-70 km), and guided rockets for increased accuracy and rockets capable of delivering anti-armor and controlled-effect TGSMs. This is an area well suited to community research/cooperation and should result in a common product.

2.3.6 Instruction and Training: Instruction and Training are the last but not least important areas of consideration. Under the aegis of organizations such as the UN and NATO many ground-to-ground artillery units have been or still are engaged in regional conflict or in peace support operations. To promote a better understanding of and achieve mission success in these multinational operations a harmonized approach to instruction and training is warranted. The initial basis is the need to adopt reference tests which are accepted by all. The effort being made by NATO in the approval, ratification and implementation of various STANAGS is an essential and inexpensive first step. The next phase could be the production of simulation systems designed at the same time as the development of the corresponding weapons systems. Simulation can only supplement but can never replace in-service field proactive or gunnery school training.

2.4 It must be acknowledged that total interoperability & interchangeability is unlikely due to the often varied and fundamentally different military cultures involved and the discrepancy between economic and industrial resources. However, every effort must be made towards the harmonization of assets, training, procedures, etc. to ensure that ground-to-ground artillerymen can operate in combined multinational operations. To be comprehensive, harmonization must not give these procedures short shrift, for that is the price to pay if any benefit is to be derived during actual operations.

3.0 Summary and Recommendations

3.1 A basic step towards all aspects of harmonization is for the Partner Nations to ratify and implement the STANAGs. For artillery, adopting the STANAGs already developed by LG.4 will ensure that the methods of testing, measuring and reporting of data will be equivalent to the methods used by NATO nations. This is required to accurately compare and identify levels of standardization such as compatibility, interchangeability, and commonality among national systems.

3.2 As indicated in Table 1 of the Annex, Fire Control Systems are highly national even within the NATO nations prior to the inclusion of the Partner nations. Much effort is still needed in the area of standardization for these systems. It is recommended that the work being performed by the NSA Artillery Working Group on AdatP-3 and that of the Artillery System Co-operation Activities (ASCA) on CTDIP be continued, and if feasible, be expanded to include Partner nations. In addition, adopting or incorporating the NATO Artillery Ballistic Kernel (NABK) into all national fire control systems will significantly increase interoperability within NATO.

3.3 In the area of Cannon Weapon Systems (Table 2) the obvious course of action to ensure better interoperability and standardization of weapon and ammunition systems will be to migrate toward the standard 105 and 155mm NATO calibers. Nations utilizing former Warsaw Pact weapon systems will eventually need to modify or replace their weapon/ammunition systems with those using the NATO standard calibers. As this occurs in the future it is recommended that AOP-29 "NATO Indirect Fire Ammunition Interchangeability", Land Group 4/Sub-Group 2 is the custodian, be revised to identify the level of interchangeability among weapon, ammunition, charge, and fuze systems of the various NATO and Partner nations.

3.4 The above effort can be further expanded to include mortar systems (AOP-29, Part III - Mortars). In fact studies by LG.4/SG.2 have already identified the need to expand AOP-29 to include mortars and their ammunition systems for the Partner nations. Recommend LG.4/SG.2 continue to pursue its program of work in this area.

3.5 Migration towards a common rocket weapon system may be the only course of action to ensure some level of interchangeability and a degree of interoperability given the myriad of uncommon rocket systems in service. It is evident that the Multiple Launch Rocket System (MLRS) is the likely system of choice due to its wide use among NATO nations. Expansion of the NATO Artillery Ballistic Kernel (NABK) for rocket systems should be investigated to increase fire control interoperability within MLRS as well as with other national rocket systems. Recommend that LG.4 investigate national interest to develop a Rocket Ballistic Kernel and if warranted task LG.4/SG.2 to lead such an effort.

3.6 In the area of Target Acquisition, LG.4 has formed a Team of Experts (TOE) to develop a database which will identify artillery targets, target effects to be obtained and to identify the capabilities of existing Intelligence Surveillance Target Acquisition Reconnaissance (ISTAR) means. This will culminate in the development of simulation models to define the error budget. The simulation models can then be combined in a software kernel as an evaluation tool for all future developments on platforms and new target acquisitions systems. Recommend the TOE continue its efforts on this study and that progress and information obtained from the study be provided to LG.6 who has the overall responsibility for target acquisition. This study/model can be used/adopted by LG.6 for target acquisition means other than those used by artillery.

TABLE 1 - CCIS SYSTEMS

NATION	CCIS SYSTEM	STANDARD	NABK COMPATIBLE
AUT	EAFLS	AUT Specific	No
BEL	ARTYFIRE-ADA		No
BGR	VULKAN	BGR Specific	
CAN	IFCC		Yes (Dec 2000)
CZE	ASPRO		No
DNK	SIF	DNK specific	Yes
FIN	(Finnish Nokia Made) AHJO	FIN Specific TBD	Unknown (2004/2005)
FRA	ATLAS (2001 service)		Yes (2003/2004)
DEU	ADLER	CTIDP	Yes (2002)
GRC	DIAS HERCULES	ADatP-3	Current - No (Future - Yes) Yes (2006)
HUN	ARPAD (Hungarian)		Current - No (Future - Yes)
ITA			
NLD	VUIST AFSIS	NLD specific CTIDP (future)	No Yes (Future)
NOR	ODIN II	CTIDP	Yes
POL	TOPAZ		No
PRT			
ESP			
SVK	DELSYS		No
SWE	SKER (FCC) TELESYST 9000	SWE specific	No (Future)
TUR	BAIKS-200, Technical FCS & TAIKS-2000, Tactical FCS (AFATDS)	CTIDP	Current ver 1.1/ Future ver 1.6
GBR	BATES FC Application FC BISA	CTIDP	Yes (2002) Yes (2007)
USA	AFATDS	CTIDP	Current: No / Future: Yes

TABLE 2 - WEAPON SYSTEMS

NATION	MODEL	CALIBER	LENGTH	CHAMBER VOLUME	TYPE	FUTURE SERVICE DATE	STANDARD
AUT	M109A2/A3	155mm	39 Cal	19L	SPH	Current	
	M109A5	155mm	39 Cal	19L	SPH	Current	
BEL	M109A4B	155mm	39 Cal	19 L	SPH	Current	
	LG1 MkII	105mm	30 Cal	2.5L	TWH	Current	
BGR	2S1	122mm			SPH	Current	
	D20	152mm			TWH	Current	
CAN	M109A1-A4	155mm	39 Cal	19 L	TWH	Current	
	C3 (M101/33)	105mm	33 Cal	2.5 L	TWH	Current	
	LG1 /MK2	105mm	30 Cal	2.5 L	TWH	Current	
	C1 (M101A1)	105mm	23 Cal	153 in3 (2.5 L)	TWH	Current	
CZE	1977 DANA	152mm	37 Cal	12.5 L	SPH	Current	
DNK	M109A3	155mm	39 Cal	19 L	SPH	Current	
	M114/39 Cal	155mm	39 Cal	19 L	TWH	Current	
FIN	Vammas/Tempella	155mm	39 Cal	19 L	TWH	Current	
	Vammas M98	155mm	52 Cal	23 L	TWH	Current	
	D-30	122mm			TWH	Current	
	2S1	122mm			SPH	Current	
	M/46	130mm			TWH	Current	
	D-20	152mm			TWH	Current	
	2S5	152mm			SPG	Current	
	2A36	152mm			TWG	Current	
FRA	AUF1/AUF1T	155mm	39 Cal	19.5 L	SPH	Current	
	TRF1	155mm	39 Cal	19.5 L	TWH	Current	
	Caesar	155mm	52 Cal	23 L	SPH	Current	
DEU	M109A3 GEA2	155mm	39 Cal	19 L	SPH	Current	JBMOU JBMOU
	PzH 2000	155mm	52 Cal	23 L	SPH	Current	
GRC	M109A1B/A2	155mm	39 Cal		SPH	Current	
	M109A2-MAS/	155mm	39 Cal		SPH	Current	
	M109A5	155mm	39 Cal		SPH	Current	
	M109A3GEA1	155mm	39 Cal		SPH	Current	
	M56	105mm			TWH	Current	
	M101	105mm	23 Cal		TWH	Current	
	M114	155mm	21 Cal		TWH	Current	
	PZH 2000	155mm	52 Cal		SPH	Current	
	M107	175mm			SPH	Current	
	M110A2	203mm			SPH	Current	

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NATION	MODEL	CALIBER	LENGTH	CHAMBER VOLUME	TYPE	FUTURE SERVICE DATE	STANDARD
HUN	M-30	122mm			TWH	upto 2000	
	2S-1	122mm			SPH	Current	
	D-20	152mm			TWGH	Current	
	MT-12	100mm			TWATG	upto 2000	
ITA	M109G	155mm	39 Cal	19 L	SPH	Current	JBMOU
	M109 L	155mm	39 Cal	19 L	SPH	Current	JBMOU
	M198	155mm	39 Cal	19 L	TWH	Current	JBMOU
	M114A1	155mm		795 in3 (12 L)	TWH	Current	
	L5/MOD56 (T)	105mm			TWH	Current	
NLD	M109A2	155mm	39 Cal	19 L	SPH	Current	JBMOU
	PzH2000	155mm	52 Cal	23 L	SPH	Current	JBMOU
NOR	M109A3G	155mm	39 Cal	19 L	SPH	Current	
	M114/39 Cal	155mm	39 Cal	19L	TWH	Current	
POL	2S7 PION	203mm			SPG	Current	
	1977 DANA	152mm			SPGH		
	2SI GOZDIK	122mm			SPH	Current	
	1938/85	122mm			TWH	Current	
	D-44	85mm			TWG	Current	
PRT	M109A1-A3	155mm	39 Cal	19 L	SPH	Current	
	M114A1	155mm		795 in3 (12 L)	TWH	Current	
	M101A1	105mm		153 in3 (2.5 L)	TWH	Current	
ESP	M110A2	203mm	40 Cal		SPH	Current	
	M109A5/A6	155mm	39 Cal	19 L		Current	
	M114A1	155mm		795 in3 (12 L)	TWH	Current	
	APU ENSAB	155mm	52 Cal		APU	Current	
	M119	105mm	30 Cal	153 in3 (2.5 L)	TWH	Current	
	L118	105mm	37 Cal		TWH	Current	
L5/MOD56 (T)	105mm	14 Cal		TWH	Current		
SVK	ZUZANA	155mm	45 Cal	23.1 L	SPH	Current	
	DANA	152mm	37 Cal	12.5 L	SPH	Current	
	2S-1 GVOZDIK	122mm	33 Cal	6.6 L	SPH	Current	
	D-30	122mm	33 Cal	6.6 L	TWH	Current	
SWE	FH 77B	155mm	39 Cal	19 L	TWH	Current	Note 1

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NATION	MODEL	CALIBER	LENGTH	CHAMBER VOLUME	TYPE	FUTURE SERVICE DATE	STANDARD
TUR	M110A2	203mm	37 Cal	-	SPH	Current	Note 2
	M44T/M52T	155mm	39 Cal	19 L	SPH	Current	
	M114A1/A2	155mm	24.5 Cal	12 L	TWH	Current	
	PANTER-155/52	155MM	52 CAL	23 L	w/APU	Current	
	Firtina-155/52	155MM	52 Cal	23 L	SPH	2003	
	M101A1	105mm	23 Cal	2.5 L	TWH	Current	
	M108	105mm	-	-	SPH	Current	
GBR	AS90	155mm	39 Cal	19 L or 52 L	SPH	Current	JBMOU/ABCA
	LIMAWS (G) L118	155mm 105mm	39 or 52 Cal		TWH TWH	2011 Current	
USA	M109A3-A4	155mm	39 Cal	1167 in3 (19 L)	SPH	Current	JBMOU/ABCA JBMOU/ABCA JBMOU/ABCA
	M109A5/A6	155mm	39 Cal	1167 in3 (19 L)	SPH	Current	
	M198	155mm	39 Cal	1167 in3 (19 L)	TWH	Current	
	XM777	155mm	39 Cal	1147 in3 (19L)	TWH		
	M114A2	155mm	39 Cal	1167 in3 (19 L)	TWH	Current	
	M101A1	105mm	23 Cal	153 in3 (2.5 L)	TWH	Current	
	M102	105mm	30 Cal	153 in3 (2.5 L)	TWH	Current	
	M119A1	105mm	30 Cal	153 in3 (2.5 L)	TWH	Current	

Note 1 - Meets Physical Dimensions for JBMOU Compliance

Note 2 - Meets Physical Dimensions for JBMOU/ABCA Compliance

TABLE 3 - MLRS ROCKET SYSTEMS

NATION	ROCKET TYPE	LAUNCHER	FCSW
AUT			
BEL			
BGR	MLRS	BM21	
CAN			
CZE	122mm JROF	RM-70	NO
DNK	MLRS MLRS	M270 M270A1 (PLANNED)	VER 6.02.7 IFCS
FIN	High Explosive RM-70	BM-21 RM-70	Finnish "AHJO" (2004/5)
FRA	MLRS GMLRS (2008)	M270	VER 6.0
DEU	MLRS M26 / MLRS AT2 GMLRS (2006)	M270 M270	VER 6.08 (EFCS 2005) EFCS (IOC 2006)
GRC	MLRS RM-70	M270	
HUN	M-21 OF	BM-21 MLRS	NO
ITA	MLRS	M270	VER 6.0
NLD	MLRS	M270	VER 6.07.02
NOR	MLRS	M270	VER 6.0
POL	BM-21		
PRT			
SVK	JROF (122mm) 12mm JRKS (AGAT)	122 RM vz. 70 122 RM vz. 70/85 (non-armoured cabin)	
ESP	TERUEL	140mm	
TUR	MLRS	M270	VER 6.07.02
GBR	MLRS (M26) GMLRS	M270 LIMAWS (R) (2008)	VER 6.0
USA	MLRS MLRS GMLRS (2006)	M270 M270A1 M270A1	VER 6.07.02 IFCS IFCS

NATO MORTAR EQUIPMENT

Nation	Gun/Howitzer/Canon							Mortar				Rocket					Fire Control C4I				NABK Compatible				
	Model	Calibre	Length (Cal)		Chamber Volume	Mobility	Max Range (m)	Service Date	Standard	Model	Calibre	Mobility MP=Man Portable GM=Ground Mount CM=Carrier Mount TWD=Towed	Max Range (m)	Service Date	Type	Launcher	Calibre	Max Range (m)	Fire Control Software	Service Date		Munitions	Name	Message Format	ASCA Capable
			Ltr	In ³																					
AUT	M109A5	155	39	19		SPH		Current																	
										M6	60	MP/GM	3,000	Current											
										M8-111/M8-211	81	MP/GM	5,800	Current											
										M29	81	MP/GM	3,755	Current											
										L16	81	MP/GM	5,600	Current											
									M12-1111	120	CM	9,423	Current												
BEL	M109A4B	155	39	19		SPH	18100	Current													EAFLS	AU Specific			No
	GIAT LG1 MkII	105	30	2.5		TWH	15000	Current																	
										M19	60	MP/GM	1800	Current											
										M1	81	MP/GM	3000	Current											
										TDA 120 RT	120	TWD	13000	Current											
BGR	2S1	122				SPH		Current																	
	D20	152				TWH		Current																	
											82	MP													
											120	CM													
															MLRS	BM21	122	20700	No	Current					
CAN	M109A1-A4	155	39	19		TWH		Current													VULKAN	BGR Specific			
	C3 (M101/33)	105	33	2.5		TWH		Current																	
	LG1 /MK2	105	30	2.5		TWH		Current																	
	C1 (M101A1)	105	23	2.5	153	TWH		Current																	
											M19	60	MP/GM	2,800	Current										
										C3	81	MP/GM	4,500	Current											
										Brandt	120	CM	8,000	Current											
																					IFCC				Yes (Dec 00)

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Nation	Gun/Howitzer/Canon								Mortar				Rocket					Fire Control C4I				NABK Compatible					
	Model	Calibre	Length (Cal)		Chamber Volume	Mobility	Max Range (m)	Service Date	Standard	Model	Calibre	Mobility MP=Man Portable GM=Ground Mount CM=Carrier Mount TWD=Towed	Max Range (m)	Service Date	Type	Launcher	Calibre	Max Range (m)	Fire Control Software	Service Date	Munitions		Name	Message Format	ASCA Capable	Service Date	
			Ltr	In ³																							
CZE	152 ShKH 77	152	37	12.5		SPH	20000	Current																			
										60 M 99	60	MP	1,230	Current													
										82 M 52	82	MP/GM	3560	Current													
										120 M	120	TWD	8036	Current													
										120 ShM 85	120	CM	8036	Current	JROF	122 RM-70	122	20381	ASPRO	Current			ASPRO	CZ Specific	No	Current	No
DNK	M109A3	155	39	19		SPH	24000	Current																			
										M57	81	MP/GM & CM	3600	current													
										M50	120	TWD	5600	current									SIF	DA specific	YES	Current	Yes
FIN	Vaas/Tempella	155	39	19		TWH		Current																			
	Vammas M98	155	52	23		TWH+ APU		Current																			
	D-30	122				TWH		Current																			
	2S1	122				SPH		Current																			
	M/46	130				TWH		Current																			
	D-20	152				TWH		Current																			
	2S5	152				SPG		Current																			
	2A36	152				TWG		Current																			
											Tampella	81	MP/GM	5,900	Current												
											Tampella	120	TWD	8,000	Current												
										AMOS	120	CM/Twin Barrel	10,000	2008													
															RM-70	RM-70	122	20000		Current	HE						
																						AHJO	National	Limited	2005	Current - No, (08 - Yes)	
FRA	AUF1/AUF1T	155	39	19.5		SPH	28000	Current																			
	TRF1	155	39	19.5		TWH	28000	Current																			
	CAESAR	155	52	23		SPH	40000	2004																			
											TDA 81 mm LRR	81	MP/GM	5,600	Current												
										TDA Mo 120 RTF1	120	TWD	12,000	Current													
															MLRS	M270		32000	FCP v6.0				ATILA	CTIDP			
																							ATLAS		Yes v4	Current	Yes (03/04)
DEU	M109A3 GEA2	155	39	19		SPH	24700	Current	JBMOU																		
	PzH 2000	155	52	23		SPH	35000	Current	JBMOU																		
											Tampella	120	CM	6400	Current												
											WIESEL 2	120	CM	8000	2007												
																MLRS	M270		38,000	VER 6.08	2005	M26_AT2					
															MLRS	M270		70,000	EFCS	2007	GMLRS						
																						ADLER	CTIDP	Yes v4	Current	Yes (02)	

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Nation	Gun/Howitzer/Canon							Mortar				Rocket					Fire Control C4I				NABK Compatible					
	Model	Calibre	Length (Cal)		Chamber Volume	Mobility	Max Range (m)	Service Date	Standard	Model	Calibre	Mobility MP=Man Portable GM=Ground Mount CM=Carrier Mount TWD=Towed	Max Range (m)	Service Date	Type	Launcher	Calibre	Max Range (m)	Fire Control Software	Service Date		Munitions	Name	Message Format	ASCA Capable	Service Date
			Ltr	In ³																						
GRC	M109A2-MAS	155	39			SPH		Current																		
	M109A5	155	39			SPH		Current																		
	M109A3GEA1	155	39			SPH		Current																		
	M56	105				TWH		Current																		
	M101	105	23			TWH		Current																		
	M114	155	21			TWH		Current																		
	M107	175				SPH		Current																		
	M110A2	203				SPH		Current																		
	PzH200	155	52			SPH		Current																		
	M109A1 B/A2	155	39			SPH		Current																		
									Type E44	81	MP/GM	5,900	Current													
									M30	107	CM	6,800	Current													
									Type E56	120	TWD	9,000	Future													
														MLRS	M270							DIAS	ADAT P-3 CTIDP - Possible		2005	Current - No (Future - Yes)
																						HERCULES			2006	Yes
HUN	M-30	122				TWH		upto 2000																		
	2S-1	122				SPH		Current																		
	D-20	152				TWGH		Current																		
	MT-12	100				TWATG		upto 2000																		
										M37M	82															
									2B9	82	TWD	5,000	Current													
									M43	120																
														M-21 OF	BM-21 MLRS				NO							
																						ARPAD (Hungarian)				Current - No (Future - Yes)
ITA	M109L	155	39	19		SPH	24700	Current	JBMOU																	
	FH70	155	39	19		TWH	24700	Current																		
	PzH2000	155	52	23		SPH	30500	2006-09																		
										M62	81	MP/GM	5,000	Current												
									Brandt	120	CM	8,000	Current													
									Brandt (Rifled)	120	TWD	13,000	Current				MLRS	M270	32000	VER 6.0						
																	GMLRS	M270			2007 TBC					
																						SIF	CTIDP	Yes v4		Yes (03/04)
NLD	M109A2/90	155	39	19		SPH	18000	Current	JBMOU																	
	PzH2000NL	155	52	23		SPH	38000	Current	JBMOU																	
										L16A2	81	MP/GM	5,600	Current												
									Brandt	120	CM	8,000	Current													
																						VUIST	NL specific	No		No
																						AFSIS	CTIDP (future)	Yes (future)		Yes (future)

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	Model	Calibre	Length (Cal)		Chamber Volume	Mobility	Max Range (m)	Service Date	Standard	Model	Calibre	Mobility MP=Man Portable GM=Ground Mount CM=Carrier Mount TWD=Towed	Max Range (m)	Service Date	Type	Launcher	Calibre	Max Range (m)	Fire Control Software	Service Date		Munitions	Name	Message Format	ASCA Capable	Service Date	
			Ltr	In ³																							
NOR	M109A3G	155	39	19		SPH		Current																			
	M114/39 Cal	155	39	19		TWH		Current																			
	Future gun	155				TBD		TBD																			
										L16	81	CM	5,600	Current													
										120			2014														
														MLRS	M270				VER 6.0				ODIN II (2005)		Yes, 2006-07	Yes	
POL	2S7 PION	203				SPG		Current																			
	1977 DANA	152		12.5		SPGH		Current																			
	2SI	122		6.6		SPH		Current																			
	KRAB	155	52			TWH		2005-12																			
										LM-60K/LM60KC Coando	60	MP/GM	1,300	Current													
										M-81	81	CM	6,300	Current													
										M37M	82																
									M-98	98	CM/TWD	7,000	Current														
									M43	120																	
									M160	160	TWD	8,040	Current														
														M 21 OF	BM-21												
														M 21 OF	RM-70												
																						TOPAZ			Currently not		
PRT	M109A1-A3	155	39	19		SPH		Current																			
	M114A1	155		12	795	TWH		Current																			
	M101A1	105		2.5	153	TWH		Current																			
										Indep M/965	60	MP/GM	1,820	Current													
									HP(FBP)	81	CM	3,517	Current														
									M30	107	CM	6,800	Current														
									Brandt	120	CM	8,000	Current														
ESP	M110A2	203	40			SPH																					
	M109A5/A6	155	39	19		SPH		Current																			
	M114A1	155		12	795	TWH		Current																			
	APU ENSAB	155	52			APU		Current																			
	L119	105	30			TWH		Current																			
	L118	105	37			TWH		Current																			
	L5/MOD56 (T)	105	14			TWH		Current																			
										Comando	60	MP/GM	1,600	Current													
										Expal (Model LL)	81	MP/GM	6,700	Current													
										Expal (Model L)	81	MP/GM	6,200	Current													
									Expal (Model L)	120	CM	7,800	Current														
														TERUEL	140mm												
																						PCGACA			FUTURE		

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Nation	Gun/Howitzer/Canon							Mortar				Rocket					Fire Control C4I				NABK Compatible				
	Model	Calibre		Chamber Volume	Mobility	Max Range (m)	Service Date	Standard	Model	Calibre	Mobility MP=Man Portable GM=Ground Mount CM=Carrier Mount TWD=Towed	Max Range (m)	Service Date	Type	Launcher	Calibre	Max Range (m)	Fire Control Software	Service Date	Munitions		Name	Message Format	ASCA Capable	Service Date
		Length (Cal)	Ltr																						
SVK	ZUZANA	155	45	23.1	SPH	Current																			
	DANA	152	37	12.5	SPH	Current																			
	2S-1 GVOZDIK	122	33	6.6	SPH	Current																			
	D-30	122	33	6.6	TWH	Current																			
									M 37	82	MP/GM	7,000	Current												
									Model 1997	98	CM	8,000	Current												
									M1982	120															
									M43	160	TWD	9,600	Current												
														JROF	122 RM vz. 70	122									
														JRKS (AGAT)	122 RM vz. 70/85 (non-armoured cabin)	122									
																					DELSYS			No	
SWE	FH 77B	155	39	19	TWH	Current	JBMOU																		
	FH 77BD	155	52	25	SPH (wheel)	2009	JBMOU																		
	"ARCHER"																								
									M/84	81	MP	5,000	Current												
									M/41 E/F	120	TWD	6,400	Current												
								SSG 120 (JBMOU)	120	CM (CV90)	9,000	2009													
TUR	M110A2	203	37	-	SPH	Current																			
	M44T/M52T	155	39	19	SPH	Current																			
	M114A1/A2	155	25	12	TWH	Current																			
	PANTER-155/52	155	52	23	TWH	Current	JBMOU/ABCA																		
	Firtina-155/52	155	52	23	SPH	Current	JBMOU/ABCA																		
	M101A1	105	23	2.5	TWH	Current																			
	M108	105	32	-	SPH	Current																			
									M2	60	MP/GM	1,700	Current												
									UT1	81	CM	5,750	Current												
									HY 12	120	TWD/CM	8,000	Current												
									M-30	106	TWD/CM	5,500	Current												
														MLRS	M270				VER 6.07.02	Current					
														MLRS	T107	107	11,000								
														MLRS	T122	122	40,000								
																						HAİKS	CTIDP	No	Current
																					BAİKS-2000	CTIDP	No	Current	Yes
																					AFATDS	CTIDP	No	Current	

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Nation	Gun/Howitzer/Canon								Mortar					Rocket					Fire Control C4I				NABK Compatible			
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		Ltr	In ³																							
GBR	AS90	155	39	19.4		SPH	24700	Current	JBMOU/ ABCA																No	
	LIMAWS(G)	155	TBC	TBC		TBC	24700	2011	JBMOU/ ABCA																No	
	L118	105	37			TWH	17200	Current																	NYK	
										L9A1	51	MP/GM	800	Current												No
										L16A2	81	MP/GM	5.650	Current												No
															MLRS	M270	227	39 000 (AT2), 32 000 (M26), ~65 000 (GMLRS)	VER 6.0	Current	AT2, M26, GMLRS					No
															LIMAWS(R)	TBC	227	~65 000 (GMLRS)	TBC	2008	GMLRS					NYK
																						BATES	BATES Spec	Yes v4	Current	No
																						FC BISA	FC BISA Spec	Yes v4	2005	Yes
																							JETTS	JETTS Spec	Yes	2008
USA	M109A3-A4	155	39	19	1167	SPH		Current	JBMOU/ ABCA																	
	M109A5/A6	155	39	19	1167	SPH		2002/03	JBMOU/ ABCA																	
	M198	155	39	19	1167	TWH		Current	JBMOU/ ABCA																	
	XM777	155	39	19	1147	TWH																				
	M114A2	155	39	19	1167	TWH		Current																		
	M101A1	105	23	2.5	153	TWH		Current																		
	M102	105	30	2.5	153	TWH		Current																		
	M119A1	105	30	2.5	153	TWH		Current																		
										M224	60	MP/GM	3.489	Current												
										M252	81	MP/GM	5.935	Current												
										M121	120	CM	7.240	Current												
										M120	120	TWD	7.240	Current												
														MLRS	M270			VER 6.07.02								
														MLRS	M270A1			IFCS								
														GMLRS (2006)	M270A1			IFCS								
																					AFATDS	CTIDP	Yes v4		Yes - future	