

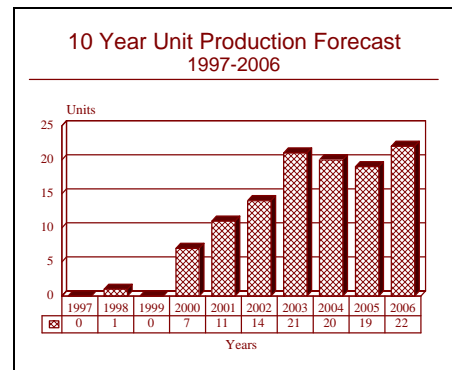
ARCHIVED REPORT

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NORA 155 mm Self-Propelled Howitzer - Archived 4/98

Outlook

- Final development and production long held up due to political chaos and regional strife
- Production now forecast to get underway at the turn of the century
- No export forecast, at least for the present



Orientation

Description. A wheeled 155 millimeter self-propelled artillery system.

Sponsor. The development of this artillery system is being (or has been) sponsored by the Yugoslav (Serbia-Montenegro) Ministry of Defense through the Federal Directorate of Supply and Procurement and the Yugoslav Army. There are some reports circulating that Iraq has or is supporting the development of the NORA.

Contractors. This system is being developed and, if placed into production, is to be manufactured by the Yugoslav State Arsenals in Belgrade, Yugoslavia (Serbia-Montenegro), and will be marketed by the Federal Directorate of Supply and Procurement, Belgrade, Yugoslavia (Serbia-Montenegro). As of the date of this research, Daimler-Benz (possibly through a license-production agreement) is the only known subcontractor.

Licenseses. None

Status. The first prototype was completed in 1992; for some time, the development of the system has been essentially suspended due to the internal strife in the country.

Total Produced. As of January 1, 1997, one complete NORA developmental prototype system had been manufactured.

Application. Mobile fire support at the battalion or division level for the field army.

Price Range. A reliable source has stated that when the NORA system is placed in production, the unit price will be \$1.921 million in equivalent 1997 United States dollars.

Technical Data

Crew. Five: commander, gunner, loader, driver and one assistant

Muzzle Brake. The NORA cannon probably uses a modified multibaffle type similar to that employed on the FGH-155 towed artillery system.

Recoil System. Hydropneumatic

Breech Mechanism. A horizontal sliding wedge breech assembly is used. The reports that the NORA cannon uses a modified design interrupted screw breech assembly are in error.

Ammunition. The NORA will be able to fire the complete range of NATO standard 155 millimeter projectiles plus all types of Extended Range Full Bore pattern ammunition including base bleed types.

Dimensions. Much of the following data is provisional and is based on the data related to the FAP 2832 BS/AV 8x8 truck; the height is estimated, as is the weight of the NORA system.

	<u>SI units</u>	<u>US units</u>
Length overall	10.28 meters	33.72 feet
Width	3.08 meters	10.10 feet
Height	3.39 meters	11.12 feet
Combat weight	30.62 tonnes	33.75 tons
Cannon caliber	155 millimeters	6.10 inches
Cannon length	45 calibers/6.97 meters	45 calibers/22.88 feet

Performance. The cannon range is with the Extended Range Full Bore/Base Bleed High Explosive ammunition with Charge 11 Zone 10. The automotive performance is on a metalled road. The step and trench data are estimated based on vehicles of similar dimensions and capacities.

Maximum speed	80 kilometers per hour	49.68 miles per hour
Maximum range	512 kilometers	317.95 statute miles
Step	51 centimeters	1.67 feet
Trench	1.8 meters	5.91 feet
Slope	19%	19%
Gradient	48%	48%
Fording	1.2 meters	3.94 feet
Maximum ordnance range	38.9 kilometers	42,541.04 yards
Maximum rate of fire	8 rounds per minute	6 rounds per minute
Sustained rate of fire	2 rounds per minute	3 rounds per minute
Muzzle velocity	897 meters per second	2,942.91 feet per second
Elevation	+50°	+50°
Depression	-3°	-3°
Traverse	40° left and right	40° left and right

Engine. This self-propelled artillery system uses the OM 403 supercharged liquid-cooled diesel engine rated at 373 kilowatts (500 horsepower). The engine is manufactured by Daimler-Benz. The power-to-weight ratio is 12.18 kilowatts per tonne (14.81 horsepower per ton). A 24 volt electrical system with four 12 volt 210 ampere hour batteries is the standard electrical fit.

Gearbox. The 8x8 chassis used for the NORA has an unspecified manually operated unit with eight forward and one reverse gear ratios is used. A single dry plate clutch and two speed transfer case are fitted. Pneumatically operated brakes with a manual backup are standard.

Suspension and Running Gear. The NORA uses a parabolic leaf spring type suspension; the steering system is hydraulically assisted ball joint type system. All wheel stations are fitted with hydraulic shock dampers and run flat tires are standard.

Fire Control. The NORA fire control suite includes a telescopic direct fire sight, panoramic telescopic sight, range quadrant, collimator and gunner's quadrant. As this system will normally be used for indirect fires, target information will be provided by radio from a forward observer, possibly through a command post. The crew will then lay the cannon in the appropriate manner.

Variants/Upgrades

None at this time.

Program Review

Background. The then Yugoslavia began the development of a new long-range 155 millimeter self-propelled artillery system in 1989. The country's artillery park then consisted (and still consists) of a variety of ex Soviet/Russian and Western pattern systems, some of which are woefully obsolete on the modern battlefield. The self-propelled portion of the park contains some especially old systems in the M7 Priest, a Second World War vintage system. In the late eighties, as the geopolitical trends in the former Soviet Union and Western Europe were becoming clear, it was decided to adopt the Western standard 155 millimeter caliber for the new system. In addition, it was decided to use a 155 millimeter ordnance incorporating the world beating Extended Range Full Bore technology developed by the late Doctor Gerald Bull. Yugoslavia first adopted this technology in the M46/84, an upgrade program for the old Russian M.46 130 millimeter field gun. This was possibly in conjunction with Iraq; the development was begun in the mid-eighties. The M46/84 integrates a new 155 millimeter/45 caliber ordnance with the M46 carriage, cradle and sliding breech assembly. The Yugoslav Army has been very impressed with the performance of the M46/84 in operational tests and most sources state that it will soon be placed into serial production; this is, of course, contingent on the outcome of the present unrest in the region. The development of the M46/84 as well as the new self-propelled system based on the M46/84 cannon has been continued (albeit in a very low and mercurial manner) by the new Yugoslavia (Serbia-Montenegro) that has appeared following the breakup of the old Yugoslavia.

For a complete history and description of the Extended Range Full Bore technology developed by Doctor Bull and Space Research Corporation, we refer the reader to the GC-45 and FGH-155 155 millimeter Howitzer report in Tab B of this book.

Description. Once the decision to develop a new 155 millimeter self-propelled artillery system was made, it was decided to move the program ahead in the most rapid manner. To this end, it was decided to base the cannon of the new system on that used on the M46/84. Associated with this was the use of the chassis of the FAP 2832 BS/AV 8x8 truck; this vehicle was already used as the chassis base for the LRSV M-87 Orkan multiple-launch rocket system.

As of early 1997, only minimal technical details have been released about this new self-propelled artillery system which has been called NORA. This is undoubtedly due to the unrest that still characterizes the region. The following data are the best that can be obtained at the present time.

The standard cab of the FAP 2832 BS/AV truck is used. Behind the cab is a four man crew compartment and an ammunition compartment. The latter provides storage for 36 155 millimeter projectiles and 42 charges. The 155 millimeter/45 caliber cannon is mounted to the rear of the vehicle. The elevation and traverse mechanism is electro-hydraulic. The elevation and traverse mechanism is remotely controlled through a joystick mechanism. The loading of the cannon is mechanically assisted by a electro-hydraulically powered ramming system; this mechanism can be operated at all angles of elevation. For travelling, the cannon is locked in place with the muzzle pointed forward; when readied for action, the cannon is traversed to the rear. Prior to the traversing, hydraulically operated jacks are deployed to stabilize the system; in addition, fixed trails are deployed to the rear to further aid in stabilizing the system. The time to prepare the NORA self-propelled artillery system for action is around 2.5 minutes.

The fact that Yugoslavia (Serbia-Montenegro) has chosen the most advanced (liquid propellant aside) tube artillery technology presently available for the modernization of its artillery park is indicative of the far-sighted planning of the country. The only criticism that can really be made regarding the selection of the technology chosen for the NORA is the lack of a 52 caliber cannon. As this represents the future standard for artillery, it will be in demand everywhere. While the selection of a 45 caliber ordnance may have been dictated by the use of a modified ordnance of the M46/84, if the NORA is to be truly competitive on the export market, a 52 caliber barrel should be developed for the system, at least as an option.

When (and if) the development of the NORA 155 millimeter self-propelled artillery system is completed, it will be marketed on the international market by the Federal Directorate of Supply and Procurement, the state agency mandated with the task of developing, manufacturing and marketing all Yugoslav weapons.

Funding

Funding for the development of the NORA has been provided by the Yugoslav (Serbia-Montenegro) Ministry of Defense through the Federal Directorate of Supply and Procurement and Yugoslav Army.

Recent Contracts

Not available as contractual information is not released.

Timetable

Table relates to the NORA system only and not to the M46/84.

	1989	Concept definition formulated
Late	1989	Design development began
	1992	First prototype completed
Late	1992	Development program went essentially dormant
Early	1997	Development program still in suspended or very low rate development

Worldwide Distribution

Export Potential. While it is far too early to forecast the export potential of the NORA, the points made in the Forecast section below are pertinent here.

Countries. **Yugoslavia (Serbia-Montenegro)** - (one developmental prototype).

Forecast Rationale

Due to the seemingly never-ending chaotic situation in the Balkan region, it is rather difficult to get any detailed information on the NORA program. Only a minimal amount of information has been released about the NORA program; indeed, international coverage has been terminated by most military journals. Our research into the program still indicates that the development of the NORA is in limbo or at best proceeding at an extremely slow pace. Based on our research (including into the general geopolitical situation in the region) we are still forecasting that the NORA will enter production in 1999, with the first deliveries late that year or in 2000. But there are two major caveats that must be made in relation to this forecast. The first is in relation to the previously noted chaotic conditions in the region. These conditions, which may or may not remain improved as a result of the Dayton Agreement of late 1995, could delay or even terminate the NORA program outright. The second caveat is related to the fact that the manufacture of 45 caliber ordnance, designed to fire Extended Range Full Bore ammunition, is an exacting process requiring highly skilled and relatively advanced manufacturing technology. The manufacture of the

ammunition is even more critical. While research indicates that this nation has probably accomplished this with the M46/84, that program was largely conducted before the advent of the recent chaotic conditions (including the breakup of the country). It is quite possible that the new Yugoslavia (Serbia-Montenegro) lacks at least a portion of the necessary tooling and associated skilled technicians required to manufacture the technology.

Given the caveats made immediately above, plus the possible Iraqi connection with this program, we will continue to monitor it in the closest manner and update this report on an interim basis if warranted.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

Ordnance	(Engine)	through	<u>High Confidence</u>				<u>Good Confidence</u>			<u>Speculative</u>			Total	
			96	97	98	99	00	01	02	03	04	05		06
YUGOSLAV STATE FACTORIES													97-06	
NORA(a)	OM 403		1	0	1	0	7	11	14	21	20	19	22	115
Total Production			1	0	1	0	7	11	14	21	20	19	22	115

(a) Production out through 1999 is for the developmental and test systems.