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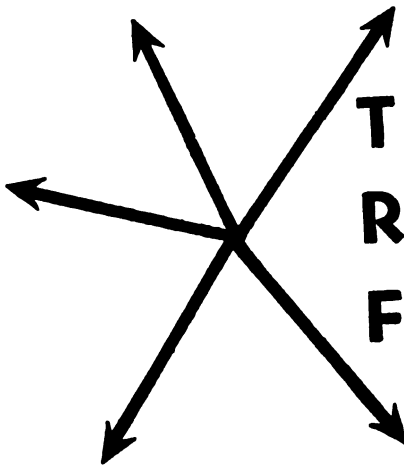
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TRANSPORTATION RESEARCH FORUM

*John D. Crowley**

Tests Of Roll-On / Roll-Off Ships Versus Conventional Ships

Before discussing the test of the Ro/Ro ships vs the conventional ships, I would like to review briefly the Army concept of Ro/Ro operations and the events leading to the test.

On February 5, 1954, then Army Brigadier General Frank S. Besson made a notable address to the New York chapter of the National Defense Transportation Association. General Besson's title, "Army Transportation Requirements in a Modern War," hardly conveyed the importance of his subject—the first major statement of the Roll-On/Roll-Off project. Among the basic points General Besson made were these:

- * There was reason to be concerned over the shortage and age of commercial rail rolling stock, since over half the fleet was then at least 20 years old;
- * Where terminal operations and ocean surface transportation were concerned, the General pointed to the increased vulnerability of ports in an era of mass destruction weapons both at home and abroad; he said that the danger was no longer limited to sea lanes, but to the entire system of moving cargo overseas;
- * 24% of all military cargo is on wheels.

Then the General launched into his real message: "We laboriously pick it (cargo) up and lower it down through a little hole in the top of the ship—just like the Phoenicians 1,000 years before Christ." He declared that the wheel which has been under development by mankind for about a million years was being completely ignored as was, indeed, the principle of mass-production. The answer, then, was to find a way to roll trucks in and out of ships just as "you roll your auto on or off a ferry." It is because of this and similar speeches, of course, that General Besson has become known as the "Father of the Roll-On/Roll-Off Concept."

Basic to the Ro/Ro principle was the vital role played by wheeled and tracked vehicles. It has been reliably determined that movement of wheeled and tracked vehicles constitutes:

1. Approximately 85% of all deployment tonnage when a unit moves overseas;
2. Approximately 25% of all re-supply tonnage;
3. Approximately 25% of all peacetime tonnage.

**Army Supply and Maintenance Command.*

Other studies made by the Army show that the current system of delivery can be improved because of multiple re-handling, multiple transfers from mode to mode and break-bulk operations. The current system is also costly in time, dollars and manpower, and is further aggravated by increased terminal costs and decreased terminal productivity. What has been needed, in short, was a transportation system that will require less personnel, reduced reaction time and reduced vulnerability in terminal areas.

The Army, therefore, developed and placed certain requirements on the Military Sea Transportation Service and, together with the service, worked out a plan for a ship capable of transporting the equivalent of one-sixth of an armored division, total of approximately 700 units. The ship was built, launched in 1957, and christened the USNS COMET.

A little more about the COMET. The ship has five loading ports leading onto the second deck. Her four sideport loading ramps are located fore and aft of the superstructure, two each on the starboard and port sides. A fifth entrance is over a ramp through the stern. The COMET has two large holds, each 130 feet long and 75 feet wide, with a combined bale cubic capacity of 590,000 feet.

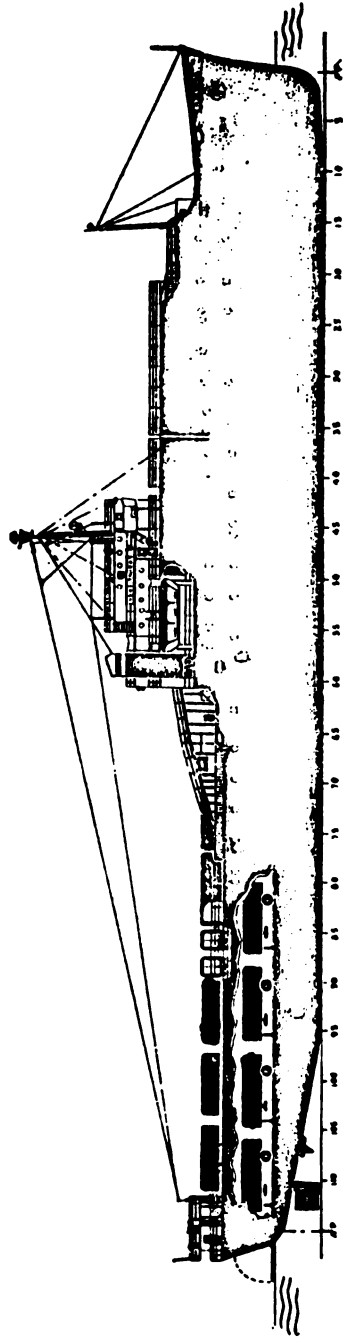
The idea behind the MSTs's Roll-On/Roll-Off ship then is multi-purpose. Besides the big feature of fast loading of military vehicles and an incredibly short turn around time, the COMET offers a means of lifting cargo without breaking bulk—a feature which has interested private industry for some time. She is capable of rapid loading and discharging of vehicles under their own power through four side ports and one stern ramp.

The COMET does not have to be concerned with the location of the battleground, just as long as there is access to it by beach for landing craft, such as BARC's and LCM's. Barges can receive vehicles from the stern ramp and deliver the vehicles to the beach, running under their own power. A shallow draft beach discharge lighter (BDL), the JOHN PAGE, was developed for the purpose of off-loading vehicles on its decks from the stern ramp of the COMET. The lighter can deliver the complete load onto the beach in three trips.

The next step was to establish whether the COMET had a use in the Cold War. This was pertinent because when the vessel was planned, the Cold War was erupting into a Hot War in Korea and it seemed probable that deployment of our forces overseas would continue to increase. Until recently, there appeared to be no demand for overseas transportation of many armored units or of great numbers of wheeled and tracked vehicles. The Army then developed a plan to move semi-trailers loaded with supplies from point of origin to Europe. Government-owned semi-trailers were loaded at U.S. Army Depots in the continental U.S., hauled to a terminal by contract carriers, then rolled over ramps directly onto the vessel. In Europe, the semi-trailers were rolled off, under the supervision of U.S. Army personnel, and driven to depots in Europe.

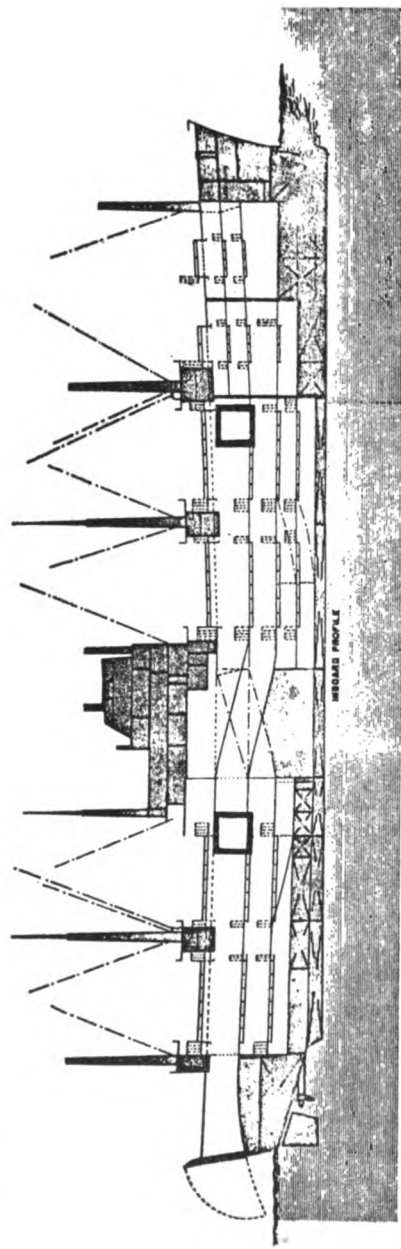
What was most striking in this plan was that unitization was raised from the average of 7 measurement tons in a CONEX to the average of 20-1/2 measurement tons in a semi-trailer. Other advantages were that the overseas pipeline was cut drastically by surface delivery, sometimes by pinpointed

USNS TAURUS



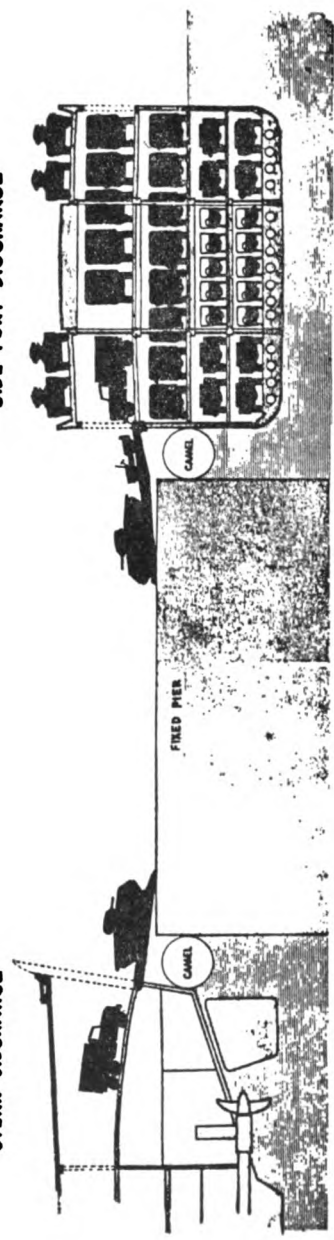
Design of the TAURUS

USNS COMET



STERN DISCHARGE

SIDE PORT DISCHARGE



Design of the COMET

delivery. Furthermore, U.S. military ocean terminal procedures were simplified and short-cutted, as were handling costs.

For some time the Department of Defense has been criticized by the shipping industry for building the Ro/Ro vessel. The claim has been made that the COMET is a re-supply vessel with no more delivery capability than conventional vessels. However, it must be remembered that the primary purpose of the Ro/Ro vessel is to meet military emergency requirements, although it possesses a sound peacetime application.

Because of the above criticism, in July and August 1963, under authority of a memorandum from the Assistant Secretary of Defense, Installations and Logistics, the SS AMERICAN CHARGER of the United States Lines Co., Inc., and the USNS COMET OF MSTs made two voyages from Hampton Roads, Va., to Bremerhaven, Germany.

The purpose was to test the relative merits of the two vessels in transporting a representative load of wheeled and tracked vehicles required by an armored unit overseas. Because only the two vessels were involved in the tests, it was recognized that many more would be required to perform the actual mission of delivering all vehicles of a newly organized armored division overseas. Since a newer version of the COMET was at that time in the design and construction stage, military planners wanted to get estimates of the performance of the newer vessel as well as the present one.

A special evaluation team was formed under contract with the National Academy of Sciences. It was composed of technical personnel from the Army, U.S. Lines, MSTs and Arthur D. Little, Inc., working under the supervision of the National Academy of Sciences. In addition to the extrapolation work, this team assisted in data collection on loading and discharging operations, so that it was insured that the data was both adequate for extrapolation purposes as well as objective.

The results clearly showed the advantages of the Roll-On/Roll-Off method as represented by COMET I. On the first voyage (pierside loading and discharge for both vessels) COMET I took a load of 298 vehicles, representing 2,515 long tons or 7,971 measurement tons, in four hours and 55 minutes. Discharge time ran considerably less, two hours and 23 minutes.

On its first voyage CHARGER loaded 187 vehicles, representing 2,487 long tons or 6,591 measurement tons, in eight hours and 38 minutes. This loading time was more than twice COMET's rate. And the unloading time for CHARGER, six hours and 14 minutes, was more than two times as long as the two hours and 23 minutes for COMET's discharge of its larger load.

Results of the second voyage (pierside loading but stream discharge for both vessels) continued to show the various advantages of the Roll-On/Roll-Off method. COMET took on an even larger load, 336 vehicles, representing 2,441 long tons or 7,772 measurement tons, in five hours and eight minutes. Discharge time was only three hours and eight minutes.

Again, CHARGER, with a smaller load, required a longer time to load and unload its smaller cargo. The load of 191 vehicles, representing 2,482 long tons or 6,607 measurement tons, required eight hours and 15 minutes for loading onto the CHARGER. The discharge time, six hours and 41 minutes, represented over twice the time required by COMET's three hours and 8 minutes.

Empirical data of the test were extrapolated to determine the effect of the road armored division's vehicles upon the capacities and capabilities of the COMET I, the design characteristics of the COMET II presently under construction, and the "Challenger" class vessels. The report found that 17 COMET I's or nine COMET II's can do the same as 18 "Challenger" class vessels on a unit integrity basis.

Roll-On/Roll-Off, as you can see, has many advantages. In times of emergency, only the Ro/Ro can get into a harbor under cover of darkness, for example, unload and get out while it is still dark. The concept serves a very definite emergency us.

In peacetime, RO/RO gives a favorable rate in hauling trailers by avoiding a lot of stevedore charges. Less costly factors include a reduction in processing time, especially in terminal shipping. This is illustrated by recent loading operation conducted at Hampton Roads, Va., under total blackout conditions. A total of 297 vehicles—weighing 2251 long tons or 6761 measurement tons—was loaded in three hours and three minutes. This representative load included 32 M-60 tanks, 4 M-10 8" self-propelled howitzers, 20 M-132 flame throwers and 241 M-37 3/4 ton trucks. This same loading was discharged in Bremerhaven on 24 August 1964, under blackout conditions, in one hour and 20 minutes.

I believe that the Ro/Ro vessels, then, have these advantages over conventional vessels:

1. Faster loading/discharge of vehicles utilizing the inherent mobility of the vehicles;
2. Increased lift and delivery capability, resulting in fewer ships required;
3. Eliminates processing vehicles for shipment;
4. Vehicles are ready for use when discharged;
5. Simplification of spotting and securing vehicles;
6. Required use of heavy lift gear minimized;
7. Port manpower reduced approximately 50%;
8. Reduced overall transportation cost of shipping vehicles;
9. Ro/Ro vessels are not dependent on:
 - a. adequacy and/or skill of long-shore personnel; combat troops can load and discharge their own equipment;
 - b. adequacy and/or dependability of cargo handling gear;
 - c. weather conditions that would affect the discharge of conventional ships.
10. Ro/Ro vessels can handle cargo in darkness, fully illuminated internally, with no outside indication;
11. Quick turn-around capability permits rapid discharge under cover of darkness, which enables the vessel to be safely at sea by daylight.

In summary, I feel that the capabilities for Roll-On/Roll-Off type vessels are such, in times of emergency, that the Army should vigorously pursue its efforts to expand its capability. There are also two advantages applicable to normal as well as emergency movement of wheeled and tracked vehicles to Europe. These vehicles can be loaded not only much more economically but a lot more rapidly.

