

# A Tale of Two Ships

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There are two approaches to costing:

1. One is to ask: what should the cost be?
2. The other is to ask: what did it cost?

In a reasonably competitive market: multiple providers, nil price power, no big secrets, no major barriers to entry, there is usually little difference between these two questions. An example might be large oil tankers.

In situations where these conditions do not apply, there can be an enormous difference between what the cost should be and what it is. Consider Table 1 which compares a 360,000 ton displacement Very Large Crude Carrier(VLCC) with the US Navy LPD class. The VLCC can carry 320,000 tons of crude oil. The LPD is a 25,000 ton ship designed to carry 700 marines and their landing craft (two air cushion vehicles) and aircraft (4 helicopters or 2 Ospreys). The LPD has one 30 mm gun, four 50-cal machine guns, and two compact RAM close-in missile launchers for armament.<sup>1</sup>

	VLCC	LPD
Length Overall(m)	333.0	208.5
Beam(m)	60.0	31.9
Full Load Draft(m)	22.0	7.0
Displacement(mt)	360,000	25,300
Accommodations	40	1002
Power	1 x 35MW	2 x 15MW
Speed	16kt	(flank) 22kt
Cargo capacity	350,000m3	2229m2+2190m3
Ballast capacity	150,000m3	abt 5000m3
Construction time	1yr	3 to 8 yrs
Cost	\$80,000,000	\$1,700,000,000

Table 1: Comparison of VLCC and LPD

The VLCC is 14 times larger and 20 times cheaper.<sup>2</sup> VLCC contracts are fixed price usually with stiff penalties if the ship is not delivered within a few weeks of the target date.

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<sup>1</sup> Each RAM launcher weighs about 6000 kg and costs \$440,000 exclusive of pre-launch target detection.

<sup>2</sup> The price of a VLCC varies with the market. During a tanker market boom, the price can rise to 120 million or more. During a slump, it will drop to about 60 million which is about the yard's marginal cost of building the ship. A good yard can very profitably build a VLCC for 80 million dollars.

Of course, the VLCC was not built with the same stringent quality control backed up by extensive paperwork as the naval ship. As a result, on average a VLCC will experience involuntary offhire time of about 15 days per year. This includes a two week dry docking every 5 years. Most ships do better than 15 days, but some VLCC's don't live up to this standard. A VLCC that has more than 30 days offhire per year in the first 15 years of her life is regarded to be a lemon. She will probably cost the yard a customer.

In contrast, LPD availability reflects the kind of standards that can be expected when enormous amounts of taxpayer money are applied to the problem. Here's a bit of the history of the lead ship, the San Antonio, LPD-17:

**1996-12** Contract awarded. Navy says "The LPD 17 program is the Navy's best case of capitalizing on acquisition reform" and goes on to list the reasons why this will be an unusually successful program. The budgetted cost of the ship is \$617 million.

**2000-08** Construction started. Supposed to be commissioned 2002-07. Navy admits cost is now up to \$861 million. CBO estimates cost at 1.3 billion.

**2003-07** San Antonio launched.

**2004-12** Towed from Avondale to Pascagoula. Could not move under own power despite being christened in 2003.

**2005-??** Attempted sea trials. Navy came up with 15,000 deficiencies. Some of these were major enough to compromise watertight integrity.

**2006-01** Inexplicably Navy accepts ship waiving the unresolved issues. She is commissioned, but still can't deploy. Northrop-Grumman gets extra money "for post-shakedown availability". Having accepted the ship, Navy's legal options are non-existent.

**2007-03** Failed to finish sea trials, complete failure of one steering system, major defects found in 3 of 17 sub-systems. Ship is now 840 million dollars over budget.

**2007-06** SecNav Winter writes builder "23 months after commissioning of LPD 17, the Navy still does not have a mission capable ship".

**2008-08** After a further series of problems and legal wrangling between Navy and builder, San Antonio finally deployed on first mission in late August, 2008. Most sources put the total taxpayer cost at 1.5 billion or higher. Some say 1.7 billion, one says 1.8 billion. Navy itself says cost may go to 1.85 billion. Stern gate failure delays departure 2 days.

**2008-10** Got as far as Bahrain in October. Extensive oil leaks. 30 welders and fitters flown out from USA for at least two weeks of repairs.<sup>3</sup>

**2008-11** All four main engines out of commission.

**2009-02** During transit of Suez, one screw suddenly went into reverse, sending the ship out of control and aground.

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<sup>3</sup> There are plenty of high quality welders and ship fitters in the Persian Gulf repair yards.

**2009-??** Ship's XO Sean Kearns refuses Captain's mast, is court-martialed, and then acquitted after testifying that ship officers had been pressured to declare the ship was ready to deploy when she wasn't. Defense provided copious evidence supporting claim.

**2009-07** Inspections reveal that 300 m of piping must be replaced. Reduction gear shavings found in main engines.

**2010-03** San Antonio to Norfolk for 4-5 month overhaul costing 5 million. But inspectors finds bolts in the main engine foundation improperly installed, extensive bearing damage. Problems include bent crankshaft. Repairs now expected to take about 11 months and cost at least \$30 million. Northrop Grumman releases a statement saying

The report's findings support many of the findings from the industry/Navy technical team investigation into the bearing damage on the LPD main propulsion diesel engines [other ships in class were having similar problems] this spring, resulting in a corrective action plan with recommended actions which are already in process. Northrop Grumman has aggressively prosecuted the issues and we are focused on corrective action and moving forward.

**2011-04** San Antonio still in repair. Navy starts an investigation into "issues with the San Antonio". Maintenance firm Earl Industries fired. Earl had won the 75 million dollar contract despite not being low bidder on the basis of "exceptional" performance on past contracts. Earl still has USN carrier maintenance contracts.

**2011-05** San Antonio leaves yard, and after trials declared ready for duty.

**2011-07** Unable to maintain full power. Returns to yard for repairs.

**2012-03** San Antonio given the Navy's Battle Effectiveness Award, beating out four of her sisterships. Gets to paint a big E on super-structure.

The performance of the eight sister ships has not been much better. They were all delivered late and have experienced essentially the same set of problems. Availability, generously defined, has been in the 50's and 60's. The initial cost per ship has remained at over 1.5 billion (Navy numbers), despite the fact that multi-ship contracts were supposed to reap economics of scale.

If the job of building a 22 knot, 25,000 ton ship capable of carrying 700 marines a couple of helicopters and a couple of air cushion vehicles were put out for competitive bid to the the world shipyards, I am quite confident the price would come in under 50 million dollars, quite possibly well-under. And the ships would perform per spec.

In some situations, the difference between what it should cost and what it did cost can be a factor of 30.