SPAR's Estimating Cost Models





The <u>SPAR Cost Models</u> are pre-developed cost models of specific hull forms and are organized with generic CERs already installed and ready to use.

These cost models can be run outside SPAR's ESTI-MATE database system or fully integrated within ESTI-MATE.



SPAR's cost models were developed to support early <u>concept and preliminary stages of ship</u> <u>design</u>. The cost models permit quick assessments of costs, risk, and design/mission trade-off and build strategy alternatives. *There are options for Life Cycle Cost (LCC) Estimating Too.*

These cost models are parametric in nature, although they provide a granularity of cost details down to approximately the SWBS level 3.

Various versions provide construction cost estimates for lead ship, follow ships and nonrecurring design and engineering efforts for different hull forms and mission requirements.



The cost models substitute default ship design parameters developed from statistical data analyses until actual design data can be determined.

In this way, the cost estimate can follow the design evolution and can produce quickly cost changes due to design trade off alternatives.

The models provide a range of structural and powering selections, as well as a wide range of other ship systems and equipment choices to predict costs and various performance characteristics.



Costs are generated at relatively low levels of detail and summed according to an abbreviated Ships Work Breakdown Structure (SWBS).

Reports are available in various levels of detail, both tabular and graphical.



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SPAR Associates, Inc. Cost Item Value Report by SWBS Groups(CI14)

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Detail Cost Estimate Reports

Cost Item	Description	Labor Hours	Labor Cost	Material Cost	SubCon Cost	Equipment Cost	Direct Cost	Taxes	Indirect Cost	Total Cost	Profit	Total Price
Project	t BASE Baseline JHSV Wave Piercing	Catamaran										
Gro	oup 4 - Electronics & Navigation											
	Center SY - Shipyard Production Depart	tments										
75	Electronic Navigation Aides (Lights and	0	0	18,357	0	0	18,357	0	0	18,357	1,836	20,192
76	Electronics Installation Labor Hours	4,000	85,920	0	0	0	85,920	0	128,890	214,800	21,480	236,280
77	Degausing System	0	0	10,609	0	0	10,609	0	0	10,609	1,061	11,670
	Group: 4 Totals	4,000	85,920	1,325,649	0	0	1,411,569	0	128,890	1,540,449	154,045	1,694,494
Gro	oup 5 - Auxillary Systems											
	Center SY - Shipyard Production Depart	tments										
78	General Ship Ventilation	3,199	68,716	106,781	0	0	175,498	0	103,074	278,572	27,857	306,429
81	Ceiling Mounted Heat Pumps for Pase	10,259	220,367	542,171	0	0	762,538	0	330,550	1,093,088	109,309	1,202,397
82	Engine Room Ventiliation	1,864	40,039	651,636	0	0	691,674	0	60,058	751,733	75,173	826,906
83	Diesel Fuel System	373	8,008	33,276	0	0	41,284	0	12,012	53,295	5,330	58,625
84	Lube Oil System	186	4,004	16,176	0	0	20,180	0	6,006	26,185	2,619	28,804
85	Seawater System	215	4,625	9,984	0	0	14,609	0	6,937	21,546	2,155	23,701
86	Bilge System	3,934	84,501	544,037	0	0	628,538	0	126,751	755,289	75,529	830,818
87	Ballast System	3,427	73,622	43,671	0	0	117,293	0	110,432	227,725	22,773	250,498
88	Air Intake & Exhaust System	12,310	264,416	188,096	0	0	452,512	0	396,624	849,136	84,914	934,049
89	Pipe Hangers	3,983	85,558	182,143	0	0	267,701	0	128,337	396,038	39,604	435,642
90	Pumps	492	10,563	117,355	0	0	127,917	0	15,844	143,761	14,376	158,137
91	Engine Room Pumps - CUNO	569	12,224	94,586	0	0	106,810	0	18,336	125,146	12,515	137,660
92	Fire Main - Machinery Space by volum	212	4,555	7,620	0	0	12,175	0	6,833	19,008	1,901	20,909
93	Fire Main - Deck House by volume (Inc	42	899	1,504	0	0	2,404	0	1,349	3,753	375	4,128
94	Fire Main - Deck Area Weather & Belo	3,245	69,700	116,581	0	0	186,281	0	104,550	290,831	29,083	319,914
95	Fire Suppression CO2 System with Pig	711	15,270	74,104	0	0	89,374	0	22,906	112,280	11,228	123,508
96	Fire Suppression Foam System with P	444	9,534	44,189	0	0	53,723	0	14,301	68,024	6,802	74,826
97	Distiller (drinking water) Equipment	161	3,462	122,803	0	0	126,264	0	5,192	131,456	13,146	144,602
103	Fresh Water, Plumbing & Sewerage pr	13,505	290,093	439,365	0	0	729,458	0	435,140	1,164,598	116,460	1,281,058
104	Sewage Treatment System	258	5,536	49,860	0	0	55,397	0	8,305	63,701	6,370	70,072
105	Garbage Disposal System	258	5,536	8,432	0	0	13,968	0	8,305	22,273	2,227	24,500
109	Winches & Warping Gear	508	10,919	57,536	0	0	68,454	0	16.378	84,832	8,483	93,316
110	Anchor Gear	101	2,176	40,640	0	0	42,815	0	3,264	46,079	4,608	50,687
111	Auxiliary Machinery	160	3,442	59,819	0	0	63,261	0	5,163	68,424	6,842	75,266
112	Tools & Instruments	925	19,859	75,848	0	0	95,707	0	29,789	125,496	12,550	138,046

Company Confidential Information



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SPAR Associates, Inc. SWBS Group Summary Report (SUM02)

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	Project	Range:	0 to ZZZZ	2222	Group Range:	0 to	22222222					
Group	Description	abor Hours	Labor Cost	Material Cost	SubCon Cost	Equipment Cost	Direct Cost	Taxes	Indirect Cost	Total Cost	Profit	Total Price
1	Hull	605,107	12,997,709	7,476,490	0	0	20,474,199	0	19,496,563	39,970,762	3,997,076	43,967,839
2	Propulsion	54,000	1,159,920	22,760,525	0	0	23,920,445	0	1,739,880	25,660,325	2,566,032	28,226,357
3	Electrical	5,623	120,779	1,262,610	0	0	1,383,389	0	181,169	1,564,558	156,456	1,721,013
4	Electronics & Navigation	4,000	85,920	1,325,649	0	0	1,411,569	0	128,890	1,540,449	154,045	1,694,494
5	Auxillary Systems	62,417	1,340,724	4,392,630	0	0	5,733,355	0	2,011,086	7,744,441	774,444	8,518,885
8	Outfit & Furnishings	50,747	1,090,038	3,395,619	0	0	4,485,657	0	1,635,057	6,120,714	612,071	6,732,785
7	Armamont C1	u m h	(man)	Cast	Fat	imat	o Ron	orte	, 0	0	0	0
8	Technical.Support		L 1446.534		LISU	ınuı	e nep	UILS	3,999,876	6,696,251	669,625	7,365,876
9	Shipyard Services	117,307	2,519,763	1,102,067	0	0	3,621,829	0	3,779,644	7,401,473	740,147	8,141,620
10	Fees & Insurance	0	0	16,177,063	0	0	16,177,063	0	0	16,177,063	1,617,706	17,794,769
	Construction Total	S 977,470	21,981,437	57,922,443	0	0	79,903,880	0	32,972,156	112,876,036	11,287,604	124,163,639
21	Preliminary Design	1,136	161,335	0	0	0	161,335	0	0	161,335	16,133	177,468
22	Functional Design	20,457	2,026,305	0	0	0	2,026,305	0	0	2,026,305	202,631	2,228,935
23	Transition & Detail Design	109,102	10,531,594	0	0	0	10,531,594	0	0	10,531,594	1,053,159	11,584,753
24	Production Planning & Scheduling	34,094	3,291,124	0	0	0	3,291,124	0	0	3,291,124	329,112	3,620,236
25	Purchase Specs & Support	4,546	438,817	0	0	0	438,817	0	0	438,817	43,882	482,698
26	ILS	2,273	219,408	0	0	0	219,408	0	0	219,408	21,941	241,349
29	Contract Engineering Managment	23,866	2,417,163	2,967,607	0	0	5,384,770	0	0	5,384,770	538,477	5,923,247
	Non-Recurring Total	S 195,474	19,085,745	2,967,607	0	0	22,053,351	0	0	22,053,351	2,205,335	24,258,686
	Non-Recurring & Construction Total	1,172,944	41,067,182	60,890,049	0	0	101,957,231	0	32,972,156	134,929,387	13,492,939	148,422,326



The models estimate both recurring and non-recurring costs

Options for Life Cycle Costs (LCC)







Price Breakdown - Lead Ship 2012US\$



Lead Ship Cost Estimate







SPAR ASSOCIATES, INC.

	% Margin	_	%	Mon	o Hull P	atrol Boat/C	utter/Friga	ate					
	% Mark-Up	-	%		(Model	Version Septemb	er 2012)						
%	Change Orders	-	%		•							NON-RECU	RRING COSTS
%	Program Costs	-	%	Ship Type			Version:	Α			Basic Research	- Concept Desigr	s -
9	6 Contingencies	15.00	%	80 M	eter Offshore Patrol Vessel		Date:	24-0ct-12	ASSOC	PAR	Preliminary Design		\$ 476,531
	2										Contract Design		\$ 5,156,223
	Pricina:										Detail Design &	Construction End	\$ 28.318.022
Shipbuilder Economic	Mark-Up/Down:	0.0%				Non-Recurring Eng	ineering & Prod	uction Plann	ina		Production Planning & Scheduling		\$ 4,868,645
Technical Wage \$/Mbr		\$ 33.97	\$ 76.43	w/ overhe	ad	Standard Work Wee	ek:	40.00		hours/week	Purchase Spece	& Support	\$ 1,498,045
Product	ion Wage \$/Mhr:	\$ 28.31	\$ 63.69	w/ overhe	ad	Labor Rates:				induita in doix	II S. Spares & Lo	ad Items	\$ 749.022
Troduct	% Overhead:	125.00	%	W overne	224%	Senior Professio	nal/Manager		\$ 142.52	ner hour	Contract Engine	ering Manageme	\$ 2,535,965
	% G&A Labor:	125.00	%		200%	Engineer	narmanager		\$ 127.24	per hour	Contingency La	bor:	\$ 2,000,000
	% C&A Material:		70 9/		176%	Designer/Draften	ereon/Planner		\$ 142.04	per hour	Data Dighte Dack		 -
	% GoA Material:	40.00	70		170%	Clorical	erson/Planner		\$ 112.01 ¢ 64.09	per nour	Missellancous I	Material & Support	
	76 PTOTIL:	10.00	70		90%	Centingeney (we	ighted average)		\$ 01.00	per nour	line Cradlee 8	Templates Teel	3 - ¢ 94.000
					19176	Contingency (we	ighted average)		\$ 121.00	per nour	JIGS, Cradles, &	Templates, Tool	\$ 01,009 ¢ 42,004,004
		N.									TOTAL NON-REC	URRING COSTS:	\$ 43,684,061
In the Aret Described	Navy C4ISR	Yes	4.00	1			01-1	F					
Jones Act Premium	Material Factor:	NO 2012	1.00	0 h i a	Tech Co		Snipyard	Fab/Assy Mod'les			Estimated Cak	adulaa	
Additional Mat	Current rear:	4.00	1 000 - nono	Ship	yaru rech su	Productivity Easters	1.0000	1 000			LSUITIALEU SCI	Montho	
Additional Mate	rial Cost Eastern	1.00	<u>1.000 = none</u>	-4.24	Steel	Productivity Factor:	1.1000	1.000	Est. Detail E	ngineering Time:	24.00	Months	
Combined Meteria	Cost Factor:	1,10	MILSPEC PIER	<u>II.=1.21</u>	Outint	Productivity Factor:	1.1500	10.0% Манита С	Est. Co	Ouerlers	20.00	Months	50.0%
Compined wateria	ar Cost Factor.	1,15			Un	-BIOCK Paint Factor:	1.0000	40 % Hours C	DIS Man Manth	Overlap:	10.00	Months	50.0%
									RMS Men/Monun:	140	0.02	Months	0.1%
	CIMPO	Maria ha		A de states	Desidentia	¢	¢	6.00A	2042	6004	ê Dure 64		•
	SWBS	Weight	M-Hrs	Modular	Production	\$ Labor	\$ Overhead	\$ G&A	2012	\$ G&A	\$ Profit	\$ Total	\$ Cum Tatal
Structures	SWBS Group	Weight LTons	M-Hrs Per Lton	Modular M-Hrs	Production M-Hrs	\$ Labor	\$ Overhead	\$ G&A Labor Only	2012 \$ Material	\$ G&A Material Only	\$ Profit Labor + Material	\$ Total	\$ Cum.Total
Structures	SWBS Group 1	Weight LTons 447.3	M-Hrs Per Lton 117.95	Modular M-Hrs -	Production M-Hrs 52,754	\$ Labor 1,493,335	\$ Overhead 1,866,669	\$ G&A Labor Only -	2012 \$ Material 761,838	\$ G&A Material Only 45,710	\$ Profit Labor + Material 416,755	\$ Total 4,584,307	\$ Cum.Total
Structures Propulsion	SWBS Group 1 2	Weight LTons 447.3 317.4	M-Hrs Per Lton 117.95 150.10	Modular M-Hrs - -	Production M-Hrs 52,754 47,638	\$ Labor 1,493,335 1,348,529	\$ Overhead 1,866,669 1,685,662	\$ G&A Labor Only - -	2012 \$ Material 761,838 32,727,700	\$ G&A Material Only 45,710 1,963,662	\$ Profit Labor + Material 416,755 3,772,555	\$ Total 4,584,307 41,498,108	\$ Cum.Total
Structures Propulsion Electrical	SWBS Group 1 2 3	Weight LTons 447.3 317.4 76.1	M-Hrs Per Lton 117.95 150.10 665.90	Modular M-Hrs - - -	Production M-Hrs 52,754 47,638 50,705	\$ Labor 1,493,335 1,348,529 1,435,333 455,354	\$ Overhead 1,866,669 1,685,662 1,794,167	\$ G&A Labor Only - - -	2012 \$ Material 761,838 32,727,700 4,291,056	\$ G&A Material Only 45,710 1,963,662 257,463	\$ Profit Labor + Materiai 416,755 3,772,555 777,802 2,508,741	\$ Total 4,584,307 41,498,108 8,555,821 28,505,149	\$ Cum.Total
Structures Propulsion Electroics & Navigation	SWBS Group 1 2 3 4 5	Weight LTons 447.3 317.4 76.1 141.7	M-Hrs Per Lton 117.95 150.10 665.90 113.60	Modular M-Hrs - - - -	Production M-Hrs 52,754 47,638 50,705 16,100	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12.046.446	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,68,058	\$ G&A Labor Only - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 24,878,978	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,923,036	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,096,622	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,05,937	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Euroichings	SWBS Group 1 2 3 4 5 5	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29	Modular M-Hrs - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,344,146	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681	\$ G&A Labor Only - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,647	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,828,782	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishims	SWBS Group 1 2 3 4 5 6 6	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59	Modular M-Hrs - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 4,584	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 48,230	\$ G&A Labor Only - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 2,897	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 2,662	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,200	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support	SWBS Group 1 2 3 4 5 6 6 7 8	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 2.3.9 2.5%	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65	Modular M-Hrs - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573 244	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 18,230 746,555	\$ G&A Labor Only - - - - - - - -	2012 \$Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,726	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 3,663 123,027	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,29 1,452,201	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shinyard Senvices	SWBS Group 1 2 3 4 5 6 7 7 8 8	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0%	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79	Modular M-Hrs - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 16,875 200,504	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548	\$ G&A Labor Only - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services	SWBS Group 1 2 3 4 5 6 7 7 8 9 9	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0%	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79	Modular M-Hrs - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548	\$ G&A Labor Only - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 29,409,892	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,269,994	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,089	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance	SWBS Group 1 2 3 4 5 6 7 8 9 10	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0%	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 -	Modular M-Hrs - - - - - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - 204,205	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548	\$ G&A Labor Only - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 39,499,892 5 150 490,084	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,369,994 \$	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,989	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,825 46,056,845 46,056 46,	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non Becurring Costs:	SWBS Group 1 2 3 4 5 6 7 8 9 9 10	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 2.3.9 2.5% 30.0% - - 1,334	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 Map Hours	Modular M-Hrs - - - - - - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - 894,395 325,758	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438 - \$ 25,413,609 \$ 25,413,600 \$ 25,413,600 \$ 25,413,600 \$ 25,413,600 \$ 25,413,600 \$ 25,413,600 \$ 25,413	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548 - \$ 31,767,261	\$ G&A Labor Only - - - - - - - - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 39,499,892 \$ 159,189,981 \$ 4,609	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,369,994 \$ 9,551,399 \$	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,989 22,592,245 4,358,406	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,824 \$ 248,514,695 \$ 48,92,467 \$ 248,514,695	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 7 8 9 10 % Total Lead	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 2.3.9 2.5% 30.0% - 1,334 Ship G1-1 Techn	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 Man-Hours:	Modular M-Hrs - - - - - - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - 894,395 357,758 Broduction	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438 5,742,452 5,742,4	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548 - \$ 31,767,261 \$ -	\$ G&A Labor Only - - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 39,499,892 \$ 159,189,981 \$ 81,609	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,369,994 \$ 9,551,399 \$ contractor Man	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,989 22,592,245 4,368,406	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$	\$ Cum.Total \$ 248,514,695 \$ 296,567,161
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 7 8 9 9 10 7 8 9 10 7 8 9 7 7 8 9 7 7 8 9 7 7 8 9 7 7 8 9 7 7 8 9 7 7 7 8 9 7 7 7 7	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - - 1,334 Ship G1-1 Techn	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 Man-Hours: ical Support:	Modular M-Hrs - - - - - - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - 894,395 357,758 Production Braduction	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438 - \$ 25,413,809 \$ 43,602,452 \$ Costs	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548 - \$ 31,767,261 \$ •	\$ G&A Labor Only - - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 39,499,892 \$ 159,189,981 \$ 81,609 ted Cost for Prim	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,369,994 \$ 9,551,399 \$ - e Contractor Man	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,989 22,592,245 4,368,406 agement Team:	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$\$	\$ Cum.Total \$ 248,514,695 \$ 296,567,161
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 7 8 9 10 9 10 7 8 9 10 7 8 9 7 10	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1-1 Techn Shipy	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: ical Support: ard Services:	Modular M-Hrs - - - - - - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - 894,395 357,758 Production Production	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438 - \$ 25,413,809 \$ 43,602,452 \$ Costs \$ Costs	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548 - \$ 31,767,261 \$ •	\$ G&A Labor Only - - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 39,499,892 \$ 159,189,981 \$ 81,609 red Cost for Prim er-All Priogram M Total Briogram M	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,369,994 \$ 9,551,399 \$ - e Contractor Man Management Fee:	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,989 22,592,245 4,368,406 agement Team: 0,0%	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ -	\$ Cum.Total \$ 248,514,695 \$ 296,567,161
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 6 7 8 9 9 10 7 8 9 10 7 8 9 10 7 7 8	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1-3 Techn Shipy	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: ical Support: ard Services: & Insurance:	Modular M-Hrs - - - - - - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - 894,395 337,758 Production Production Production	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438 - \$ 25,413,809 \$ 43,602,452 \$ Costs \$ Costs \$ Costs	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548 - \$ 31,767,261 \$ •	\$ G&A Labor Only - - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 39,499,892 \$ 159,189,981 \$ 81,609 Red Cost for Prim er-All Program M Total Price with	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,369,994 \$ 9,551,399 \$ - e Contractor Man Aanagement Fee: th Prime Contract	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,989 22,592,245 4,368,406 agement Team: 0,0% for Management State	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$ - \$ - \$ - \$ - \$ 296,567,161 \$ 296,567,161 }	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 6 7 8 9 10 7 8 9 10 7 8 9 10 7 8	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1-7 Techn Shipy Feee Non-Ree	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: ical Support: ard Services: s & Insurance: curring Costs:	Modular M-Hrs - - - - - - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - 894,395 357,758 Production Production Production Production	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438 - \$ 25,413,809 \$ 43,602,452 \$ Costs \$ Costs \$ Costs \$ Costs \$ Costs \$ Costs	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548 - \$ 31,767,261 \$ -	\$ G&A Labor Only - - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 39,499,892 \$ 159,189,981 \$ 81,609 ted Cost for Prim er-All Program IA Total Price with E	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,369,994 \$ 9,551,399 \$ e Contractor Man Aanagement Fee: th Prime Contract	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,989 22,592,245 4,368,406 agement Team: 0,0% for Managements: con Demock Bickley	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$ - \$ 5 \$ 296,567,161 \$ 17,661,314 \$ 14,524,097 }	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 6 7 8 9 10 7 8 9 10 7 8 9 10 7 7 8 9 10 7 7 8 9	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1-7 Techn Shipy Fee Non-Ree	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: ical Support: ard Services: s & Insurance: curring Costs:	Modular M-Hrs - - - - - - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - 894,395 357,758 Production Production Production Production	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438 - \$ 25,413,809 \$ 43,602,452 \$ Costs \$ Co	\$ Overhead 1,866,669 1,665,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548 - \$ 31,767,261 \$ 71.7%	\$ G&A Labor Only - - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 39,499,892 \$ 159,189,981 \$ 81,609 ted Cost for Prim er-All Program IA Total Price wit E	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,369,994 \$ 9,551,399 \$ - e Contractor Man Aanagement Fee: th Prime Contract st. Construction/T Estimated Over/	\$ Profit Labor + Material 416,755 3,772,555 7777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,989 22,592,245 4,368,406 agement Team: 0,0% tor Management: Technology Risk: ap Rework Risk:	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$ - \$ 296,567,161 \$ 17,661,314 \$ 41,524,097 \$ - \$ 296,567,161 \$ 17,661,314 \$ 41,524,097 }	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs: Production Hrs/LSW:	SWBS Group 1 2 3 4 5 6 6 7 8 9 10 % Total Lead 670.39	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1-1 Techn Shipy Fee Non-Rea	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: ical Support: ard Services: s & Insurance: curring Costs:	Modular M-Hrs - - - - - - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - 894,395 357,758 Production Production Production Production	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438 \$ 25,413,809 \$ 43,602,452 \$ Costs \$ Cost	\$ Overhead 1,866,669 1,665,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548 - \$ 31,767,261 \$ 71.7%	\$ G&A Labor Only - - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 39,499,892 \$ 159,189,981 \$ 81,609 ted Cost for Prim er-All Program M Total Price wit E 0.655	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,369,994 \$ 9,551,399 \$ - e Contractor Man Management Fee: th Prime Contract st. Construction/T Estimated Overl Est. Shipyard	\$ Profit Labor + Material 416,755 3,772,555 7777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,989 22,592,245 4,368,406 agement Team: 0,0% tor Management: Technology Risk: ap Rework Risk: Experience Risk:	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$ - \$ - \$ 296,567,161 \$ 17,661,314 \$ 41,524,097 \$ 30,530,774 } 5 20,502,424	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs: Production Hrs/LSW: LT/MT	SWBS Group 1 2 3 4 5 6 6 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 8 8 9 10 8 8 9 10 8 8 9 10 8 8 9 10 8 8 9 10 8 10 9 10 10 10 10 10 10 10 10 10 10 10 10 10	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1-1 Techn Shipy Fee Non-Rea	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: ical Support: ard Services: s & Insurance: curring Costs:	Modular M-Hrs - - - - - - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - 894,395 357,758 Production Production Production Production Production	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438 \$ 25,413,809 \$ 43,602,452 \$ Costs \$ Cost	\$ Overhead 1,866,669 1,665,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548 - \$ 31,767,261 \$ 71.7%	\$ G&A Labor Only - - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 39,499,892 \$ 159,189,981 \$ 81,609 ted Cost for Prim <i>er-All Program I</i> Total Price wit <i>E</i> 0.65	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,369,994 \$ 9,551,399 \$ - e Contractor Man Management Fee: th Prime Contract st. Construction/T Estimated Overl Est. Shipyard t. Engineering Pe	\$ Profit Labor + Material 416,755 3,772,555 7777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,989 22,592,245 4,368,406 agement Team: 0,0% tor Management: echnology Risk: ap Rework Risk: Experience Risk:	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$ - \$ - \$ - \$ 296,567,161 \$ 17,661,314 \$ 41,524,097 \$ 30,530,774 \$ 58,202,484 \$ - \$ 20,356 }	\$ Cum.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs: Production Hrs/LSW: LT/MT	SWBS Group 1 2 3 4 5 6 6 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 6 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 8 9 10 7 8 8 9 10 7 8 8 9 10 7 8 8 9 10 7 8 8 9 10 8 8 9 10 10 10 10 10 10 10 10 10 10 10 10 10	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1-1 Techn Shipy Fee Non-Rea	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: ical Support: ard Services: s & Insurance: curring Costs:	Modular M-Hrs - - - - - - - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 94,395 387,758 Production Production Production Production Production	\$ Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438 5,732,4	\$ Overhead 1,866,669 1,685,662 1,794,167 569,693 15,058,058 2,892,681 18,230 716,555 7,165,548 \$ 31,767,261 \$ 71.7%	\$ G&A Labor Only - - - - - - - - - - - - -	2012 \$ Material 761,838 32,727,700 4,291,056 32,133,925 31,878,973 10,376,736 3,597 28,750 7,487,514 39,499,981 \$ 159,189,981 \$ 81,609 ted Cost for Prim <i>er-All Program I</i> Total Price wit <i>E</i> 0.65 0.65	\$ G&A Material Only 45,710 1,963,662 257,463 1,928,036 1,912,738 622,604 216 1,725 449,251 2,369,994 \$ 9,551,399 \$ - e Contractor Man Anagement Fee: th Prime Contract st. Construction/T Estimated Overl Est. Shipyard t. Engineering Pe Production Sch	\$ Profit Labor + Material 416,755 3,772,555 777,802 3,508,741 6,089,622 1,620,617 3,663 132,027 2,083,475 4,186,99 22,592,245 4,368,406 agement Team: 0.0% for Management: echnology Risk: ap Rework Risk: Experience Risk: edule Cost Risk:	\$ Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,864 \$ 248,514,695 \$ 48,052,467 \$ - \$ 296,567,161 \$ 17,661,314 \$ 41,524,097 \$ 30,530,774 \$ 58,202,484 \$ 240,715 \$ - 14,526,567	\$ Cum.Total



				Mon		Patrol Roat/C	Cutter/Erigate Su					rv Non-	Recurrit	19 (osts
	% Margin	-	%	WOI			aller/Filg	ale		_	~ ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	9 1 0 10 1		· ð	
	% Mark-Up	-	%		(Mode	i version septemb	er 2012)						NON DECUE	DINC	COSTS
7	Branner Casta	-	70	Chin Turn			Vansians	A		- A		Pasia Daasaab	Concent Design	CRING (0313
7	Continuousia	-	70	30 M	<u>ster Offsho</u> u	re Datrol Vessel	version:	A 24 Oct 42		- 🖏	PAR	Dasic Research	- Concept Design	3	-
	% Contingencies	15.00	76	00 1	eter offatio	e ratioi vessei	Date:	24-UCI-12		ASSO	DIATES, INC.	Preliminary Des	ign	3	4/0,001
	Drigingu											Contract Design	Construction From	3	0,100,220
Clarkwilder Franzeri	<u>Fricing.</u>	0.0%				New Decuminer Fre	in a sin a C One d	unting Diago				Detail Design &	construction Eng	3	20,310,022
Si poulder Economic	c mark-up/Down:	0.0%	A 70.40			Non-Recurring End	<u>ineering & Prod</u>	uction Plann		40.00	have to a h	Production Plan	ning & scheduling	3	4,000,045
Des dus	lical wage \$/whr:	\$ 33.97	\$ 70.43 ¢ 02.00	w/overne	ead	Standard Work We	ek:			40.00	nours/week	Purchase specs	a support	3	1,490,045
Produc	tion wage \$/wnr:	\$ 20.31	\$ 03.09	w/ overne	eau	Labor Rates:				442.52	a se have	Contract Engine	ad items	3	2 525 005
	% Overnead:	125.0	Dat	aa P	Faad	lation	onai/wanager		3	142.52	per nour	Contract Engine	ering Manageme	3	2,535,965
	% G&A Labor:	-	Kal	es a	Escal	allon			3	127.24	per nour	Contingency La	por:	3	-
	% G&A Material:	40.00			0.00	Clarical	erson/Planner		3	112.01	per nour	Data Rights Paci	kage	3	-
	% Profit:	10.00	70		907				3	01.00	per nour	Wiscellaneous I	Tampletas Tamb	3	-
					1917	Contingency (we	eighted average)		3	121.00	per nour	TOTAL NON DEC	Templates, Tools	3 ¢	01,009
	Navay CALSD	Vee										TOTAL NON-REC	ORRING COSTS.	3	43,004,001
Iones Act Premium	Material Factor:	No	1.00				Shinyard	Fab/Assy Mr	od'les						
Jones Act Treman	Current Year:	2012	1.00	Shin	ward		Shipyara	Tub/Rooy int	ls			Estimated Sch	edules		
Additional Ma	terial Escalation:	1.00	1.000 = none	0.116	Juiu	Productiv	ity Fact	ors	Est	Detail E	ngineering Time:	24.00	Months		
Shipvard Mate	erial Cost Factor:	1.15	MIL SPEC Pren	n.=1. 1		110000000	<i>ity</i> 1 uci			Est. Co	onstruction Time:	20.00	Months		
Combined Materi	al Cost Factor:	1.15			0	n-Block Paint Factor:	1.0000	40 % Hours C	n Block		Overlap:	10.00	Months	50.0%	
						1			-	Month	445	0.02	Monthe	0.49/	
										MOILU.	140	0.02	Months	0.170	
	SWBS	Weight	M-Hrs	Modular	Production	n S	\$	\$ G&A	20	12	\$ G&A	\$ Profit	\$	0.170	5
	SWBS Group	Weight LTons	M-Hrs Per Lton	Modular M-Hrs	Production M-Hrs	n \$ Labor	\$ Overhead	\$ G&A Labor Only	20 \$ Ma	12 terial	\$ G&A Material Only	\$ Profit Labor + Materia	\$ Total	Cu	\$ m.Total
Structures	SWBS Group 1	Weight LTons 447.3	M-Hrs Per Lton 117.95	Modular M-Hrs -	Production M-Hrs 52,754	n \$ Labor 1,493,335	\$ Overhead 1,866,669	\$ G&A Labor Only -	20 \$ Ma	12 terial 761,838	\$ G&A Material Only 45,710	\$ Profit Labor + Materia 416,755	5 Total 4,584,307	Cu	\$ m.Total
Structures Propulsion	SWBS Group 1 2	Weight LTons 447.3 317.4	M-Hrs Per Lton 117.95 150.10	Modular M-Hrs - -	Production M-Hrs 52,754 47,638	S Labor 1,493,335 1,348,529	\$ Overhead 1,866,669 1,685,662	\$ G&A Labor Only - -	20 \$ Ma 32	12 terial 761,838 ,727,700	\$ G&A Material Only 45,710 1,963,662	\$ Profit Labor + Material 416,755 3,772,555	S Total 4,584,307 41,498,108	Cu	\$ m.Total
Structures Propulsion Electrical	SWBS Group 1 2 3	Weight LTons 447.3 317.4 76.1	M-Hrs Per Lton 117.95 150.10 665.90	Modular M-Hrs - -	Production M-Hrs 52,754 47,638 50,705	S Labor 4 1,493,335 3 1,348,529 5 1,435,333	\$ Overhead 1,866,669 1,685,662 1,794,167	\$ G&A Labor Only - -	20 \$ Ma 32 4	12 terial 761,838 ,727,700 ,291,056	\$ G&A Material Only 45,710 1,963,662 257,463	\$ Profit Labor + Material 416,755 3,772,555 777,802	Total 4,584,307 41,498,108 8,555,821	Cu	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation	SWBS Group 1 2 3 4	Weight LTons 447.3 317.4 76.1 141.7	M-Hrs Per Lton 117.95 150.10 665.90 113.60	Modular M-Hrs - - - -	Production M-Hrs 52,754 47,638 50,705 16,100	S Labor 4 1,493,335 3 1,348,529 5 1,435,333 0 455,754	S Overhead 1,866,669 1,685,662 1,794,167	\$ G&A Labor Only - - -	20 \$ Ma 32 4	12 terial 761,838 ,727,700 ,291,056	S G&A Material Only 45,710 1,963,662 257,463	\$ Profit Labor + Material 416,755 3,772,555 777,802	S 4,584,307 41,498,108 8,555,821 38,596,148	Cu	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems	SWBS Group 1 2 3 4 5	Weight LTons 447.3 317.4 76.1 141.7 173.6	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90	Modular M-Hrs - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554	S Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446	S Overhead 1,866,669 1,685,662 1,794,167	\$ G&A Labor Only - - - - SWR	20 \$ Ma 32 4 \$.\$1	12 terial 761,838 ,727,700 ,291,056	SG&A Material Only 45,710 1,963,662 257,463	\$ Profit Labor + Material 416,755 3,772,555 7777,802	S 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837	Cui	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings	SWBS Group 1 2 3 4 5 6	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29	Modular M-Hrs - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750	S Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145	S Overhead 1,866,669 1,685,662 1,794,167	S G&A Labor Only - - - - SWBS	20 \$ Ma 32 4 \$ Su	12 terial 761,838 727,700 ,291,056	SG&A Material Only 45,710 1,963,662 257,463 ary Cost	\$ Profit Labor + Material 416,755 3,772,555 777,802	S 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783	Cui	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament	SWBS Group 1 2 3 4 5 6 7 0	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59	Modular M-Hrs - - - - - - -	Production M-Hrs 52,754 47,638 50,702 16,100 425,554 81,750 5112 40,555	S Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584	\$ Overhead 1,866,669 1,685,662 1,794,167	SG&A Labor Only - - - SWB	20 \$ Ma 32 4 S Su	12 terial 761,838 ,727,700 ,291,056	SG&A Material Only 45,710 1,963,662 257,463 ary Cost	\$ Profit Labor + Material 416,755 3,772,555 777,802	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290	Cui	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support	SWBS Group 1 2 3 4 5 6 7 7 8	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5%	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65	Modular M-Hrs - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 2020,525	S Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 5 5 4,529	\$ Overhead 1,866,669 1,685,662 1,794,167	s G&A Labor Only - - - SWBS	20 \$ Ma 32 4 \$ Su	12 terial 761,838 ,727,700 ,291,056 	SG&A Material Only 45,710 1,963,662 257,463 ary Cost 1,725	\$ Profit Labor + Material 416,755 3,772,555 777,802 \$ \$	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,542,301	Cui	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services	SWBS Group 1 2 3 4 5 6 7 8 9 40	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0%	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79	Modular M-Hrs - - - - - - -	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504	S Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438	\$ Overhead 1,866,669 1,685,662 1,794,167 716,555 7,165,558	SWBS	20 \$ Ma 32 4 5 Su 7 7	12 terial 761,838 ,727,700 ,291,056 110110 28,750 ,487,514	SG&A Material Only 45,710 1,963,662 257,463 ary Cost 1,725 449,251	\$ Protit Labor + Material 416,755 3,772,555 777,802 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 40,560,600		\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance	SWBS Group 1 2 3 4 5 6 7 7 8 9 9	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% -	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79	Modular M-Hrs - - - - -	Production M-Hrs 52,754 47,633 50,705 16,100 425,554 81,750 515 16,875 202,504	S Labor 1,493,335 1,348,529 1,435,333 455,754 12,046,446 2,314,145 514,584 55,73,244 45,732,438	\$ Overhead 1,866,669 1,685,662 1,794,167 716,555 7,165,558	S G&A Labor Only - - - - - - - - - - -	20 \$ Ma 32 4 S Su 7 39	12 terial 761,838 ,727,700 ,291,056 ,291,057 ,201,057 ,20	S G&A Material Only 45,710 1,963,662 257,463 ary Cost 1,725 449,251 2,369,994	5002 S Profit Labor + Material 416,755 3,772,555 777,802 5 5 132,027 2,083,475 4,186,989 20,020,017	S 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874	Cu	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals:	SWBS Group 1 2 3 4 5 6 7 8 9 10	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - - - 5,34	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39	Modular M-Hrs - - - - - - - - - -	Production M-Hrs 52,754 47,633 50,705 16,100 425,554 81,750 515 16,875 202,504 - - 894,395	S Labor 4 1,493,335 3 1,348,529 5 1,435,333 0 455,754 4 12,046,446 0 2,314,145 5 14,584 5 573,244 4 5,732,438 - - 5 25,413,809	\$ Overhead 1,866,669 1,685,662 1,794,167 716,555 7,165,558 • • •	s G&A Labor Only - - - - - - - - - - - - - - - - - - -	20 \$ Ma 32 4 \$ SSU 7 39 \$ 159	12 terial 761,838 ,727,700 ,291,056 	Ites S G&A Material Only 45,710 1,963,662 257,463 ary Cost 1,725 449,251 2,369,994 \$ 9,551,399 \$	5002 S Profit Labor + Material 416,755 3,772,555 777,802 5 5 5 5 5 5 5 5 5 5 7 7 7 2,083,475 4,186,989 22,592,245 4,286,466 4,286,466 4,286,466 4,285,466 4,285 4,186,486 4,186,486 4,186,486 4,186,486 4,186,486 4,186,485	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$		\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 7 8 9 9 10 % Total Lead	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1-	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours:	Modular M-Hrs - - - - - - - - - - - - - - - - - - -	Production M-Hrs 52,754 47,633 50,705 16,100 425,554 81,750 515 16,875 202,504 - 894,395 357,758	S Labor 1,493,335 1,348,529 1,348,529 1,455,754 12,046,446 2,314,145 5 5,73,244 4,5,732,438 - 5 2,5,413,809 \$ 4,3,602,452	\$ Overhead 1,866,669 1,685,662 1,794,167 716,555 7,165,5548 - \$ 31,767,261 \$	s G&A Labor Only - - - - - - - - - - - - - - - - - - -	20 \$ Ma 32 4 S Su 7 39 \$ 159 \$	12 terial 761,838 ,727,700 ,291,056 	149 S G&A Material Only 45,710 1,963,662 257,463 ary Cost 1,725 449,251 2,369,994 \$ 9,551,399 \$.	5002 S Profit Labor + Material 416,755 3,772,555 777,802 5 5 132,027 2,083,475 4,186,989 22,592,245 4,368,406	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467	Cui Cui S 2 S 2	\$ m.Total 248,514,695 296,567,161
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 7 8 9 10 % Total Lead	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 15hip G1- 7 ecim Schoines	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: Icar Support:	Modular M-Hrs - - - - - - - - - - - - - - - - - - -	Production M-Hrs 52,754 47,633 50,705 16,100 425,554 81,750 515 16,875 202,504 - - 894,395 357,758 Productio	S Labor 1,493,335 1,348,529 1,348,529 1,455,754 12,046,446 2,314,145 5 14,584 5 5 14,584 5 5 14,584 5 5 14,584 5 5 25,413,809 \$ 43,602,452	\$ Overhead 1,866,669 1,685,662 1,794,167 716,555 7,165,558 5,7,165,548 \$ 31,767,261 \$	SG&A Labor Only - - - - SWBS - - - - - - - - - - - - - - - - - - -	20 \$ Ma 32 4 5 Su 7 39 \$ 159 \$	12 terial 761,838 ,727,700 ,291,056 28,750 ,487,514 ,499,892 ,189,981 81,609	Image: signal with a start Material Only 45,710 1,963,662 257,463 ary Cost 1,725 449,251 2,369,994 \$ 9,551,399 \$	5002 S Profit Labor + Material 416,755 3,772,555 777,802 5 5 5 5 5 5 7 132,027 2,083,475 4,186,989 22,592,245 4,368,406 agement ream.	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467	Cu Cu S 2 S 2	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 7 8 9 10 % Total Lead	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 1Ship G1- Tecim Shipy Feeo	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: rear Support. ard Services: s & Insurance:	Modular M-Hrs 	Production M-Hrs 52,754 47,633 50,705 16,100 425,554 81,750 515 16,875 202,504 - - 894,395 357,758 Productio Productio	S Labor 1,493,335 1,348,529 1,348,529 1,345,333 455,754 12,046,446 2,314,145 5 14,584 5 5 14,584 5 5 14,584 5 5 14,584 5 5 25,413,809 \$ \$ 25,413,809 \$ 14,5035 n \$ Costs n \$ Costs	\$ Overhead 1,866,669 1,685,662 1,794,167 716,555 7,165,548 - \$ 31,767,261 \$ -	S G&A Labor Only - - - - S S S S S S S S S S S S S S S	20 \$ Ma 32 4 5 SU 5 5 5 5 5 5 5 5 5 5 5 5 5	12 terial 761,838 ,727,700 ,291,056 	149 S G&A Material Only 45,710 1,963,662 257,463 ary Cost 1,725 449,251 2,369,994 \$ 9,551,399 \$	5002 S Profit Labor + Material 416,755 3,772,555 777,802 5 5 5 5 5 5 5 5 5 5 5 5 5	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 66,956,374	Cui	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 7 8 9 10 7 8 9 10 7 7 8 9 10	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1- Tecim Shipy Fee Non-Re	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: reard Services: s & Insurance: curring Costs:	Modular M-Hrs	Production M-Hrs 52,754 47,633 50,700 16,100 425,554 81,750 515 16,875 202,504 - - 894,395 357,756 Productio Productio Productio	S Labor 1,493,335 1,348,529 1,348,529 1,348,529 1,435,333 455,754 12,046,446 2,314,145 14,584 573,244 5,732,438 - 5 2,5,413,809 \$ 43,602,452 m \$ Costs n \$ Costs n \$ Costs n \$ Costs	\$ Overhead 1,866,669 1,685,662 1,794,167 716,555 7,165,548 - \$ 31,767,261 \$ -	S G&A Labor Only - - - - S S S S S S S S S S S S S S S	20 \$ Ma 32 4 5 SU 5 5 5 5 5 5 5 5 5 5 5 5 5	12 terial 761,838 ,727,700 ,291,056 	149 S G&A Material Only 45,710 1,963,662 257,463 ary Cost 1,725 449,251 2,369,994 \$ 9,551,399 \$	S S	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Cui Cui S 2 S 2 W/o Pro	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 7 8 9 10 7 8 9 10 7 8 9 10	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1- Tecim Shipy Fee Non-Re	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: reard Services: s & Insurance: curring Costs:	Modular M-Hrs 	Production M-Hrs 52,754 47,633 50,700 16,100 425,554 81,750 515 16,875 202,504 - - 894,395 357,756 Productio Productio Productio Costs (1-11	S Labor 1,493,335 1,348,529 1,348,529 1,348,529 1,348,529 1,348,529 1,348,529 1,348,529 1,348,529 1,348,529 1,348,529 1,348,529 1,348,5333 455,754 12,046,446 2,314,145 5 14,584 5 5,732,438 - 5 25,413,809 \$ 43,602,452 m \$ Costs n \$ Costs	\$ Overhead 1,866,669 1,685,662 1,794,167 716,555 7,165,548 - \$ 31,767,261 \$ -	S G&A Labor Only - - - - S S S S S S S CSUMB S CSUMB OV	20 \$ Ma 32 4 S SU 5 5 159 5 159 5 159 5 159 5 159 5 159 5 159 5 159 5 159 5 159 5 159 5 159 5 159 159	12 terial 761,838 ,727,700 ,291,056 	Image Image S G&A Material Only 45,710 1,963,662 257,463 257,463 ary Cost 1,725 449,251 2,369,994 \$ 9,551,399 \$ - 600000000000000000000000000000000000	S Profit Labor + Material 416,755 3,772,555 777,802	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 5 706,61,314 \$ 41,524,097	Cui	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 670.39	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 (Ship G1- Shipy Fee Non-Re	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: reard Services: s & Insurance: curring Costs:	Modular M-Hrs 	Production M-Hrs 52,754 47,638 50,700 16,100 425,554 81,750 515 16,875 202,504 - - 894,395 357,758 Productio Productio Productio Productio	S Labor 1,493,335 1,348,529 1,348,529 1,348,529 1,348,529 1,435,333 455,754 12,046,446 2,314,145 5,73,244 4,5,732,438 - 5 25,413,809 \$ 4,3602,452 m \$ Costs n \$ Costs n \$ Costs n \$ Costs n \$ Costs - \$ 178,087,294	\$ Overhead 1,866,669 1,685,662 1,794,167 716,555 7,165,548 - \$ 31,767,261 \$ - 71 7%	S G&A Labor Only - - - - - - - - - - - - - - - - - - -	20 \$ Ma 32 4 S SU 5 5 159 5 159 5 159 5 159 5 159 5 159 5 159 5 159 5 159 5 159 5 159 5 159 159	12 terial 761,838 ,727,700 ,291,056 	Image Image S G&A Material Only 45,710 1,963,662 257,463 257,463 ary Cost 1,725 449,251 2,369,994 S 9,551,399 5 Anagement Fee: 1 b Construction/T 1 Estimated Overi 5	S Profit Labor + Material 416,755 3,772,555 777,802	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$ -	Cui	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs:	SWBS Group 1 2 3 4 5 6 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 6 7 0.39 6 70.39 0.98421	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1- Shipy Fee Non-Re	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: reard Services: s & Insurance: curring Costs:	Modular M-Hrs 	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - - 894,395 357,758 Productio Productio Productio Productio	N S Labor 1,493,335 1,348,529 1,348,529 1,348,529 1,435,333 1,455,754 12,046,446 2,314,145 14,584 5 14,584 5 573,244 4 5,732,438 - 5 5 25,413,809 5 5 7 50515 n \$ Costs n \$ Costs n \$ Costs n \$ Costs n \$ Costs 178 087 294	\$ Overhead 1,866,669 1,685,662 1,794,167 716,555 7,165,548 - \$ 31,767,261 \$ - 717% UTY Cost	SG&A Labor Only - - - - - - - - - - - - - - - - - - -	20 \$ Ma 32 4 S SU 5 5 5 5 5 5 5 5 5 5 5 5 5	12 terial 761,838 ,727,700 ,291,056 	Image Image S G&A Material Only 45,710 1,963,662 257,463 257,463 ary Cosi 1,725 449,251 2,369,994 S 9,551,399 5 Kanagement Fee: 1 b Construction/Test 5 st. Construction/Test 5 Estimated Overi 5 Est. Shipyard 5	S Profit Labor + Material 416,755 3,772,555 777,802	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$ -	Cui Cui S S S S W/o Pro W/o Pro W/o Pro	\$ m.Total
Structures Propulsion Electrical Electronics & Navigation Auxiliary Systems Outfit & Furnishings Armament Technical Support Shipyard Services Margin, Bonds & Insurance Lead Ship Totals: Non-Recurring Costs: Production Hrs/LSW: LT/MT	SWBS Group 1 2 3 4 5 6 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 7 8 9 10 8 7 8 9 10 8 7 8 9 10 8 7 8 9 10 8 7 8 9 10 8 7 8 9 10 8 7 8 9 10 9 10 10 9 10 10 10 10 10 10 10 10 10 10 10 10 10	Weight LTons 447.3 317.4 76.1 141.7 173.6 153.9 23.9 2.5% 30.0% - 1,334 Ship G1- Shipy Fee Non-Re	M-Hrs Per Lton 117.95 150.10 665.90 113.60 2,451.90 531.29 21.59 12.65 151.79 - 670.39 7 Man-Hours: reard Services: s & Insurance: curring Costs:	Modular M-Hrs 	Production M-Hrs 52,754 47,638 50,705 16,100 425,554 81,750 515 16,875 202,504 - - 894,395 357,758 Productio Productio Productio Productio	N S Labor 1,493,335 1,348,529 1,348,529 1,348,529 1,435,333 1,455,333 455,754 12,046,446 2,314,145 12,046,446 2,314,145 14,584 573,244 5 14,584 5 57,32,438 - 5 5 25,413,809 5 5 5 5 5 5 5 5 5 5 7 50515 m \$ Costs n \$ Costs n \$ Costs 178,087,294 Summe	\$ Overhead 1,866,669 1,685,662 1,794,167 716,555 7,165,548 - \$ 31,767,261 \$ - 71 7% Ury Cost	SG&A Labor Only - - - - - - - - - - - - - - - - - - -	20 \$ Ma 32 4 S SU 5 5 5 5 5 5 5 5 5 5 5 5 5	12 terial 761,838 ,727,700 ,291,056 	Image Image SG&A Material Only 45,710 1,963,662 257,463 257,463 ary Cost Image 1,725 449,251 2,369,994 5 9,551,399 5 Anagement Fee: Image b Drime Contractor mark Construction fractor mark Anagement Fee: Image t Estimated Overi Est. Shipyard t Engineering Pe Production Set	S Profit Labor + Material 416,755 3,772,555 777,802	S Total 4,584,307 41,498,108 8,555,821 38,596,148 66,985,837 17,826,783 40,290 1,452,301 22,918,225 46,056,874 \$ 248,514,695 \$ 48,052,467 \$ - \$ - \$ 30,530,774 \$ 58,202,484 \$ 240,715	Curra Curra S S S S S S S S S S S S S S S S S S	\$ m.Total



The models generate average ship costs for multipleship construction programs.





Defining Ship Characteristics

Basic design information (ship characteristics) is required as input into the model.

This includes dimensional and structural data, powering specifications, and details of special equipment and functional areas of the ship.



The models also can generate some information not provided by the user from sets of default assumptions and functional relationships.

NOTE: Any default values used by the model should not be regarded as having been validated by any formal naval architectural or engineering review process.



Ship Characteristics Data Entry Worksheet

Tallkers & Flouuct Call	leis			entry has	been provided	I, the model v	vill use		
35,000 DWT Product Carrier	Enter Ship Na	me		are based	only on statis	2: these derat tical data, not	on a	Model	
	Metric	Units	Computed	property e	engineered det	termination f	or the	Default	
Hull:				given ship	o design being	estimated.	-	Values	
LOA, Length Overall	165.00	M	165.00						
LVVL, Length Waterline		M	155.88	94%	LOA			155.88	M
Beam, Molded		M	28.31	17%	LOA			28.31	M
Depth, Molded		M	14.88	9%	LOA	53% 8	seam	14.88	M
Orbit Number (1)M, v Beam v Danth)		M CLINICAR	9.80	6%	LOA			9.80	P/1
Cubic Humber (LVVE X Deant X Depth)	-	CUNO(M)	42 347						
Ch. Block Coefficient		COFF	0.800					0.80	
SDI. Ship Displacement Indicator (Cb x SVI)		CLM	34,598					0.00	
Length of Machinery Space		M	19.30	Ootional if	volume of mac	hinery space	is aiven	19.30	м
Height of Machinery Space		M	14.88	Optional if	volume of mac	hinery space	is aiven	14.88	M
Volume of Machinery Space		CUM	7.030					7.030	CUM
SuperStructure Deck Area	-	SQM	1.092					1.092	SQM
Volume of SuperStructure	-	CUM	3,081					3,081	CUM
Number Decks Below Weather Deck	-		-					-	
Total Areas of Cargo Decks OMS	-	SQM	-					-	SQM
Volume Cargo Decks OMS	-	CUM	-					-	CUM
Average Deck Heights	-	м	3.50					3.50	м
Max Beam Overall at Deck:		м	28.31	100%	Beam				
Transport Factor=[DWT x Speed].HP/550	239.46	UJHR "Viability	Large HS Disp	Vessels"					
Displacement:									
Total Displacement at Full Load Draft	-	MTON	35,470					35,470.12	MTON
Total Displacement at Full Load Draft		CUM	34,598						
Light Ship Weight	-	MTON	8,778	24.7%	Total FL Displ			8,129.86	MTON
Light Ship Weight		CUM	8,562						
Fuel & Load Items		MTON	(133)	-0.4%	Total FL Displ			(133.21)	MTON
Fuel & Load Items		CUM	(130)	-					
Tatal Device of Disubsecond		MTON	20.000	700	Total El Diavi		-	200 000 00	LITCH!
Total Payload Displacement	-	MION	20,020	/6%	Total PL Dispi	-		26,090.00	MION
Total Payload Displacement	0.00%	COM	26,166	-					
Displacements in balance within	0.00%								
Designed Decksnace per MTON Cargo	-	SOFTMION	40.00	Default 40 St	FINTON			40	SOFTATION
Designed Deckspace per MTON Cargo		SOMMTON	3.72	Contract to D				40	our million
Required Cargo Deck Space	-	SQM	99,684	4269%	Estimated Avail	able		99.684	SQM
i terim en en geneen epnee									
Number of TEUs	-	TEU	-					-	TEU
Number of Vehicles at Capacity	-	NO.	1,341					1,341.00	NO.
Average Weight per Vehicle	-	MTON/EA	20.00	1				20.00	MTON/EA
Average Deck Space per Vehicle		SQM	74	1					
Liquid Cargo Capacity	-	CUM	31,390					31,389.93	CUM
	-	BBL	211,901					211,901.14	BBL
ACCOMMODATIONS				Accommo	dations Areas	(Berthing, S	anitary, & Me	ss Areas)	
Shin's Crew Number (MSC)	-	CREAK	20		200	I SOM	10.00	SOMPERS	100.00%
Composition of Address		Dev	20	-	200	COM	10.00	COMPERC	0.007
commissioned Utticers	-	PAX	-	-	· ·	SQM	· ·	SUMPERS	0.00%
Non-Commissioned Officers	-	PAX	-	-	-	SQM	-	SQM/PERS	0.00%
Enlisted	-	PAX	-	-	-	SQM	-	SQM/PERS	0.00%
Troop Force		ΡΔΧ	-	-		SQM		SOMPERS	0.00%
Duranisht Dessention		Day		-	-	COM	· ·	COMPERC	0.00%
Jvernigni, Passengers	-	PAX	-	-	-	SQM	-	SUMPERS	0.00%
PAX Daytrippers	-	PAX	-	-	-	SQM	· ·	SQM/PERS	0.00%
		Total	20) Tota	al 200) SQM	10.00	SQM/PERS	100.00%



Defining
Structural
Components
with Material
Codes

SPAR
ASSOCIATES, INC.

Structure Weight: If no details, use "Default Total Ship." If limited details, use "General Hull Block Structures." If production-level details, use "Specific Hull Blocks." <u>Always</u> use "Miscellaneous" where applicable.	Enter -1 to zero item	Metric Units	Computed	Material Code No.
NOTE: If you want to use the default structures <u>breakdown,</u> but also have the total structural weight available, enter that total weight here to the right.		MTONs Total S	Structural Wt	
Default Total Ship - No Details Available		MTON		11
General Hull Block Structures				
Double Bottoms - Parallel	-	MTON	8.38	6
Double Bottoms - Shaped	-	MTON	12.56	6
Single Side Shell - Parallel	-	MTON	64.37	1
Single Side Shell - Shaped	-	MTON	42.91	1
Double Side Shell - Parallel	-	MTON	-	2
Double Side Shell - Shaped	-	MTON	-	2
Weather Decks	-	MTON	53.29	1
Flat Decks	-	MTON	44.25	1
Deck Platforms & Cross-Overs	-	MTON	-	2
Platforms/Flats	-	MTON	29.92	1
Stanchions	-	MTON	1.91	1
Transverse Frames	-	MTON	26.34	1
Longitudinal Frames	-	MTON	12.89	1
Transverse Bulkheads - Stiffened	-	MTON	30.30	1
Longitudinal Bulkheads - Stiffened	-	MTON	2.60	1
Bulkheads - Corregated	-	MTON	-	2
Ballistic Plating	10.00	MTON	10.00	6
Trunks and Enclosures	-	MTON	11.46	1
Deckhouse/Superstructure/Bridge	-	MTON	12.27	9
Specific Hull Blocks: Aft Units				
Double Bottoms Aft	-	MTON	-	1
Side Tanks Aft	-	MTON	-	1
Aft Cross Tanks	-	MTON	-	1
Aft Shell	-	MTON	-	1
Aft Peak	-	MTON	-	1
Flat Aft Deck	-	MTON	-	1
Bilge Keels & Skegs	-	MTON	4.71	1
Skegs, Large Ship	-	MTON	-	1
Stern Doors	-	MTON	-	2
Rudder & Horn	-	MTON	0.54	2

Wide Selection of Type Structural Materials to Assign to Structural Components

Structural Material Selections:	Mat'l Code	Structural Material Selections:	Mat'l Code
Mild Steel (A, B, C, CS, D, E)	1	Composite - Average FRP Cored Panel	28
HTS (AH)	2	Composite - Average FRP Stiffened Panel	29
EH-36 Steel	3	Composite - Average FRP Stiffened Hull Section	30
HSLA-65 Steel	4	Composite - VARTM/SCRIMP FRP Cored Panel	31
HY-80	5	Composite - VARTM/SCRIMP FRP Stiffened Panel	32
HSLA-80	6	Composite - VARTM/SCRIMP FRP Stiffened Hull Section	33
HY-100	7	Composite - UV VARTM FRP Composite Cored Panel	34
HSLA-100	8	Composite - UV VARTM FRP Composite Stiffened Panel	35
HSLA-100M	9	Composite - UV VARTM FRP Composite Hull Section	36
HY-130	10	Composite - UV Pre-Preg FRP Composite Cored Panel	37
ASTM A 537 Steel - Low Temp High Strength	11	Composite - UV Pre-Preg FRP Composite Stiffened Panel	38
1/4 HTS & 3/4 Mild Steel	12	Composite - UV Pre-Preg FRP Composite Hull Section	39
1/3 HTS & 2/3 Mild Steel	13	Composite - Low Temp Cured Pre-Preg FRP Composite Cored Panel	40
1/2 HTS & 1/2 HSLA-80	14	Composite - Low Temp Cured Pre-Preg FRP Composite Stiffened Panel	41
1/3 HTS & 2/3 HSLA-80	15	Composite - Low Temp Cured Pre-Preg FRP Composite Hull Section	42
DeckHouse-50% Composite; 38% Mild Steel; and 12% HTS	16	Advanced Metalic or Non-metalic Composite	43
NEXT	17	Advanced Lightweight, 70MT Capacity	44
NEXT	18	NEXT	45
NEXT	19	NEXT	46
NEXT	20	NEXT	47
Titanium (CP Ti 50A & Ti 130) Plate	21	NEXT	48
Titanium 6-4 Plate	22	NEXT	49
Aluminum (5xxx)	23	ACV Skirt Material	50
Aluminum (2xxx & 7xxx)	24	NEXT	51
Stainless Steel 304	25	NEXT	52
Stainless Steel 316	26	NEXT	53
LASCOR Metal Sandwich	27	NEXT	54
		NEXT	55



Wide Selection of Type Propulsion & Electric Generation Systems

Details of propulsion systems given in <u>Propulsion</u>		kW Fach			kW		LNG
worksneet.		MAX.Service		Computed	MAX.Service	SFC	Capable?
Machinery Configuration:	QTY	Speed	UoM	QTY	Speed	(g/kw-hr)	Y/N
Diesel HS Geared Drive w/ CPP			KW	-	-	206.81	
Diesel HS Geared Drive w/ FPP			KW	-	-	206.81	
Diesel HS Geared Drive w/ Waterjet			KW	-	-	206.81	
Diesel MS Geared Drive w/ CPP			KW	-	-	200.73	Y
Diesel MS Geared Drive w/ FPP			KW	-	-	200.73	
Diesel MS Geared Drive w/Waterjet	2.0	7,400	KW	2.00	14,800	200.73	
Diesel LS w/ CPP			KW	-	-	170.32	
Diesel LS w/ FPP			KW	-	-	170.32	
Diesel MS Z-Drive w/CPP			KW	-	-	200.73	
Diesel MS Z-Drive w/Open Prop			KW	-	-	200.73	
Diesel MS Z-Drive w/Ducted Prop			KW	-	-	200.73	
Diesel Electric Drive w/FPP			KW	-	-	218.98	
Diesel Electric w/AZIPOD			KW	-	-	218.98	
Diesel Electric w/Water Jets			KW	-	-	218.98	
Gas Turbine Direct Drive w/FPP			KW	-	-	212.90	
Gas Turbine Direct Drive w/CPP			KW	-	-	212.90	
Gas Turbine Direct Drive w/ Waterjet			KW	-	-	212.90	
Gas Turbine Electric Drive w/FPP			KW	-	-	212.90	
Gas Turbine w/ Electric Waterjet			KW	-	-	212.90	
Gas Turbine w/ Electric AZIPOD			KW	-	-	212.90	
Nuclear G/T Electric Drive w/FPP			KW	-	-	48.66	
Nuclear G/T w/Waterjet			KW	-	-	48.66	
Nuclear G/T Electric Drive w/AZIPOD			KW	-	-	48.66	
Steam Turbine w/FPP			KW	-	-	-	
BOG (LNG) Steam Turbine w/FPP			KW	-	-	-	
BOG (LNG) Duel-Fuel SP Diesel Electric w/FPP			KW	-	-	170.32	
BOG (LNG) 2-Stroke Diesel w/FPP			KW	-	-	170.32	
PEM Fuel Cell Electric Drive			KW	-	-	212.90	



Wide Selection of Ship Systems & Support Services from which to Choose:

Electric Systems:

Electrical Generation

Cable & Hangers

•Appliances & Electrical Components

Lighting

Electronics:

•Exterior & Interior Communications
•Navigation Systems
•Miscellaneous Electronics



Auxiliary Systems:

- HVAC
- Engine Room Piping (fuel, Lube, Cooling, Exhaust)
- Bilge & Ballast Systems
- Habitation Piping (Potable & Sanitary)
- Fire Protection Systems
- Cargo Piping Systems

Outfit Systems:

- Exterior & Interior Coating
- General Hull Outfit (Rails, Stanchions, Davits, Insulation, etc.)
- Rescue & Life Saving
 Systems
- Cranes, Lifts & Elevators
- Machinery Space Outfit
- Superstructure Outfit
- Accommodation Outfit
- Fire Fighting & Pollution Control Systems
- Hydrographic Research
 Equipment



Technical Support:

- •Planning & Program Management
- Production Engineering Support
- Tests & Inspections
- Contract Administration

Production Support:

- Material Control
- Quality Control
- Supervision
- Production Services

All CERs can be modified, added or deleted by the user.



Cost Estimating Relationships

The cost estimating relationships (CERs) used in the cost models apply to a generic mid-size <u>commercial</u> <u>U.S. shipyard</u> having reasonably productive manufacturing and assembly facilities, and technical and management competence.

The CERs are based upon a comprehensive analysis of U.S. shipbuilding costs gathered from SPAR's working experience with a variety of shipyards, large and small, commercial and naval contractors.



The generic CERS are based upon a notional modern mid-size U.S. commercial shipbuilding facility having the following general operating characteristics:

- a) Current technology CAD and resource planning and management systems
- b) Moderate levels of pre-outfitted hull block and module construction
- c) N/C plasma plate cutting
- d) Automated panel line
- e) Large hull block assembly hall
- f) Automated shot blast and painting facilities
- g) Steel manufacturing capacity of approximately 20,000 MTONs (steel or equivalent) per annum.



Productivity Factors

Productivity factors may be applied to the generic commercial shipbuilding CERs. They are based upon a cross-industry analysis of cost performance data collected from various sources.

Separate factors may be applied for structural work, outfit and technical.











Material costs also can vary, depending on the type of shipyard. Mil-Spec materials are generally regarded as being of higher standards, such as for added shock protection.



The cost models provide special features for additional cost savings build strategies



Modules can be developed in a wide variety of ways:

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- Outfit and equipment modules,
- Hull assembly blocks,
- Outfitted hull blocks, and
- Outfitted panel assemblies









Typical Hull Modular Blocks

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The cost models offer special options for developing cost estimates that reflect significant savings potential from <u>extended modularization of</u> <u>design and construction</u>



Expanded use of modules carry the concept of early stage construction cost savings even further.

On unit outfit may be as small as a single piece of equipment mounted on its foundation and ready to install on panel, on block or on board.

Or, on unit outfit can be a complex assembly of equipment, piping, electrical and other systems all pre-mounted on a support structure.

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Turbocharger Lube Oil Module



Accommodation Module



Alfa Laval Module





Lube Oil w/Pumps Module Westfalia Separator Module

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Hydrophore Module

Refrigeration Compressor Module



Sewage Treatment Module







Estimated Reduced Labor Hours from Extended Modularization



Cost Escalation

Material costs are summarized and escalated to a common, base year value.



All materials and equipment escalation and forecast for the future using commoditybased escalation tables that are updated on a regular basis.





Contingencies

The models allow for defined contingency costs for the following:

- Systems not yet defined or so far left out of the details;
- Limited owner changes; and

•Any design margin traditionally allocated for a preliminary design.



Cost Risk

The cost models generate estimates of cost risk.





The cost models break out cost risk into five primary categories:

- 1. The production cost risk for labor and material.
- 2. Cost risk of rework due to immature engineering.
- 3. The inexperience cost risk that may be associated with a shipyard that has not built this type of ship before.
- 4. The cost risk when detail design, engineering and planning cannot complete quality work in time to meet production schedules.
- 5. The cost risk due to production schedules are so short that excessive manpower must be applied to meet a planned delivery.



Production Risk of Labor Hours Lead Ship 200,000 175,529 180,000 160,000 149,444 140,000 120,000 109,879 100,000 88,602 80,000 60,000 40,000 20,000 866

Est. Construction/Technology Risk:

Estimated Overlap

Rework Risk:

Est. Shipyard Experience Est. Engineering Performance Risk:

Risk:

Production Schedule Cost Risk:



Lead Ship Design & Build Cost 2012US\$





Estimating Manpower Requirements

The cost models automatically generate estimated engineering and shipyard production manpower requirements.

This is a good cross-check on the defined schedule and the estimated labor hours.





Structures

Propulsion

Electronics & Navigation

Armament

Auxiliary Systems

Outfit & Furnishings

- Structures

Propulsion

Electrical

Electronics & Navigation

Auxiliary Systems

Outfit & Furnishings

Technical Support

Shipyard Services

- Non-Recurring Design, Engineering & Planning

120

100

140

160

- Armament

Electrical



Design Trade-Off Studies

The model can quickly generate costs across a wide range of ship design parameters, materials alternatives and propulsion system options.



The model can quickly compare the cost of various materials and their weight characteristics.

Both of these variables impact the cost per available payload of the design displacement.





A Single Design Change Can Impact Other System Costs

Example, changing a hull dimension affects the following costs:

- Structural
- General electrical ship distribution systems
- Bilge & ballast system
- Fire protection systems
- Coatings
- Hull & deck outfit, insulation, etc.

The cost models have these ship systems inter-linked to reflect overall changes to cost by this simple change.



Estimating Annual Life Cycle Costs





Estimating Annual Life Cycle Costs per Operations Hour



- Average Capital Cost
- Manning
- Manning TAD & PCS
- Manning Training
- Stores & Supplies
- Maintenance & Repairs
- Modernization & Upgrades
- Casualty Repairs
- Engineering & Technical Services
- Miscellaneous
- Decommissioning/Disposal



Estimating Annual Maintenance & Repair Costs

Average Maintenance & Repairs 2012 US \$2,056,491 per Lifetime Annum





- Auxilliaries Piping Systems
- Auxilliaries HVAC
- Outfit Paint
- Outfit Hull & Accom
- Armament



LCC Cost Summary					A	Average Lost Ops Hour	Cos	t of Lost Ops Ho
Average Cost/Annum		\$/Annum	\$/0	OPS Hour		per Annum		per Annum
Average Capital Cost	\$	7,961,233	\$	3,981	29.78%			
Manning	\$	12,120,661	\$	6,060	45.33%			
Manning TAD & PCS	\$	247,360	\$	124	2.04%			
Manning Training	\$	989,442	\$	495	8.16%			
Fuel	\$	2,881,303	\$	1,441	10.78%			
Stores & Supplies	\$	480,597	\$	240	1.80%			
Maintenance & Repairs	\$	2,056,491	\$	1,028	7.69%	-	\$	-
Modernization & Upgrades	\$	2,764,160	\$	1,382	10.34%	986	\$	3,926,087
Casualty Repairs	\$	12	\$	0	0.00%	27	\$	109,058
Engineering & Technical Service	s		\$	-	0.00%			
Miscellaneous			\$	-	0.00%			
Decommissioning/Disposal	\$	0	\$	0	0.00%			
Total \$ per Annum	\$	26,737,087	\$	14,751		1,014	\$	4,035,145



Estimating Costs of Lost Operations





Independent Naval Cost Estimates

- Naval Amphibious Assault Ship: Cost estimates adjusted for non-US costs and for planned multi-yard build strategy.
- Naval Hydrographic/Anti-Mine Warfare Ship: Cost estimates for three (3) size ships built under two different design & build strategies.
- U.S. Navy Heavy Air Lift Seabasing Ship (HALSS): Cost estimates & risk assessments for large trimaran to be built under two different design & build strategies.

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- U.S. Navy Ship-To-Shore Connector Air Cushion Vehicle Design Preliminary Cost Estimate, 2010
- LCS Variant cost estimates



Independent Naval Cost Estimates

- Navy High Speed Sealift Navy Vision Trimaran (HSS) : Cost estimates for high speed composite sealift concept ship.
- Navy Joint High Speed Vessel (JHSV) Concept Trimaran: Cost estimates for baseline design plus three military variants.
- Navy Joint High Speed Vessel (JHSV) Concept Catamaran: Cost estimates for baseline design plus two military variants.
- Navy Aircraft Carrier HVAC Modernization



Independent USCG Cost Estimates

- USCG FRP-B Fast Response Patrol Boat (Steel, Aluminum & Composite Variants)
- USCG NSC National Security Cutter Alternate Build Strategies (5 different scenarios)
- USCG ROM Estimates for Inland Work Barge & Towboat
- USCG Cutters, Patrol Boats & Buoy Tenders Cost Models
- USCG OPC Offshore Patrol Cutter Cost Trade-off Studies
- USCG Surface Forces Logistics Center (SFLC) Support: Cost Estimating Services & Life Cycle Cost Modeling

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Recent Coastal Trades Independent Cost Estimates

- CCDoT Short Sea SuperRoute Trimaran Trailership: Cost estimates for concept trimaran design for commercial and military modes, 2003.
- CCDoT RORO/Container Carrier: Cost estimates for design & construction using domestic versus Korean detail design and material/equipment packaging; estimates for East Coast commercial trade required freight rates, 2010
- American Marine Highways High Speed Trimaran Trailership (HSTT-140x53'): Cost estimates for both commercial and dual-use; preliminary construction scheduling, 2009

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Four Variants of Seatrain Coastal Trades Design Concepts



Other Independent Cost Estimates

- San Francisco Transit Authority Fast Ferry Designs
- NYC Sludge Tanker
- Containership RO/RO Modifications
- Alaskan Crude Tankers
- Tankers & Product Carriers
- Fore Body Replacement Cost Studies
- LNG Tank Design Cost Estimates
- Swedged Versus Stiffened Bulkhead Cost Analysis
- Fuel & Chemical Barges
- Alaska Region Research Vessel, 2008
- Jones Act RO/RO
- 144 Car/ 1500 PAX Ferry



Other Independent Cost Estimates

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- Offshore Search & Rescue Vessel.
- Offshore Fire Control Vessel
- Cost estimates for commercial SWATH & SLICE ferries & crew/supply boats
- Offshore Energy Generation Systems
- US Army Transport Ship Design Variants:
 - Large Heavy Lift Trimaran
 - Dual-Use Trimaran Ro-Ro
 - Dual-Use Mono-Hull Ro-Ro
 - Mono-Hull FSS-SL-7 Transport Ship
 - Multiple Trimaran Seatrain



Pro Bono Estimates for Academia

- University of New Orleans Catamaran Patrol Boat
- University of Michigan Arctic Subsea Construction, Maintenance & Repair Vessel
- Cranfield University, UK 2 High Speed RO-PAX & 1 High Speed RO-PAX Trimaran
- University of Michigan 13,000 TEU G/T LNG Containership CAPEX (Korea) & OPEX (NY Port to Shanghai)



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