



**NSWCCD-SSES**  
**Transient Voltage Surge Suppressor**  
**Metrics/Return On Investment Report**

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## TVSS METRICS REPORT

**Preface:** This report is part of the ongoing evaluation of the Transient Voltage Surge Suppressor (TVSS) Return on Investment (ROI). TYCOMS have always suspected fluctuations in ship's power as being a main reason for electrical failure and damage. This report attempts to examine the effectiveness of TVSS's that have been developed to combat power spikes. This report will examine the following ship types CVs, CVNs, CGs, LPDs, FFGs, LHDs, and LHAs, using both pre and post TVSS installation to determine ROI.

Eleven different electrical systems protected by TVSS have been monitored from 23 sample ships containing these systems. The 3-M OARS System was used to gather the data from July 1996 through December 2000.

SYSTEMS	SHIP TYPES	NO.	SHIPS
Radar	CV,CVN,LHD	15	CV63,CV64,CVN65,CVN69-CVN75,LHD1-LHD4,LHD6
Computer	CV,CVN,LHD	15	CV63,CV64,CVN65,CVN69-CVN75,LHD1-LHD4,LHD6
SPS-48E	CV,CVN,LHA	13	CV63,CV64,CVN65,CVN69-CVN75,LHA1-LHA2,LHA5
TAS	CV,CVN,LHA,LHD	18	CV63,CV64,CVN65,CVN69-CVN75, LHA1-LHA2,LHA5,LHD1-LHD4,LHD6
SLQ-32A	CG,CV,CVN,LHA,LHD	19	CG66,CV63,CV64,CVN65,CVN69-CVN75, LHA1-LHA2,LHA5,LHD1-LHD4,LHD6
CIWS	CV,CVN,FFG,LHD,LPD	19	CV63,CV64,CVN65,CVN69-CVN75,FFG59, LHD1-LHD4,LHD6,LPD6-LPD7,LPD9
SPN-35	LHA,LHD	8	LHA1-LHA2,LHA5,LHD1-LHD4,LHD6
SPS-40E	LHA,LPD	6	LHA1-LHA2,LHA5,LPD6-LPD7,LPD9
SPS-67	CV,CVN,LHA,LHD,LPD	21	CV63,CV64,CVN65,CVN69-CVN75,LHA1-LHA2, LHA5,LHD1-LHD4,LHD6,LPD6-LPD7,LPD9
SPS-49	CVN,FFG,LHA,LHD	17	CVN65,CVN69-CVN75,FFG59 LHA1-LHA2,LHA5,LHD1-LHD4,LHD6
RAM	LHA,LHD	8	LHA1-LHA2,LHA5,LHD1-LHD4,LHD6

### **Assumptions:**

1. The average cost of a TVSS is \$1650.00 plus \$400.00 for installation.
2. The ship's force labor wage is \$37.50 per hour.
3. The Intermediate Maintenance Activity's labor cost is \$41.50 per hour.
4. Constant system failure rate Post-TVSS installation over the remaining life of each ship.
5. All ROI calculations based upon TMA/TMI Metrics Guide Version 1.0.
6. The 3-M OARS System was used, including narratives to gather the data.
7. For all systems in this report parts and maintenance costs for parts that the TVSSs weren't intended to protect were excluded from this report, since these parts aren't associated with power surges.
8. Only systems where TVSS has been performing positively have been included in the ROI calculations, any system that had a negative impact on ROI was reflected as no impact.
9. The implementation costs represent the cost and number of all TVSSs on board each ship, even though only certain systems were used in the study.

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10. Ship Life Expectancies are as follows:

Ship	Life Expectancy
CG 66	30 Years
CV 63	10 Years
CV 64	10 Years
CVN 65	10 Years
CVN 69	50 Years
CVN 70	50 Years
CVN 71	50 Years
CVN 72	50 Years
CVN 73	50 Years
CVN 74	50 Years
CVN 75	50 Years
FFG 59	21 Years
LHA 1	10 Years
LHA 2	11 Years
LHA 5	14 Years
LHD 1	27 Years
LHD 2	31 Years
LHD 3	32 Years
LHD 4	34 Years
LHD 6	37 Years
LPD 6	15 Years
LPD 7	15 Years
LPD 9	15 Years

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**The Results:**

Ship	Number of Systems on Board	Number of Systems in Study	Annual Pre Install Maint Cost	all TVSS Implmnt Cost IC	Annual Post Install Maint Cost	Yearly Mnt. Savings (YS)	Payback Period yrs IC/YS	Ship Life Proj. in Years	ROI (YS*SL)/IC	Payback Amount (YS*SL)·IC
CG 66	1	1(SLQ-32)	\$214,019	\$22,550	\$8,323	\$205,696	0.11	30	273.6:1	\$6,148,330
CV 63	7	3	\$159,528	\$153,750	\$88,572	\$70,956	2.17	10	4.6:1	\$555,810
CV 64	7	6	\$636,240	\$153,750	\$496,680	\$139,560	1.10	10	9.1:1	\$1,241,850
CVN 65	8	2(TAS&SPS-48E)	\$484,092	\$153,750	\$59,616	\$424,476	0.36	10	27.6:1	\$4,091,010
CVN 69	8	5	\$287,916	\$153,750	\$162,502	\$125,414	1.23	50	40.8:1	\$6,116,950
CVN 70	8	5	\$250,016	\$153,750	\$152,345	\$97,671	1.57	50	31.8:1	\$4,729,800
CVN 71	8	6	\$967,395	\$153,750	\$216,594	\$750,801	0.20	50	244.2:1	\$37,386,300
CVN 72	8	4	\$382,696	\$153,750	\$206,026	\$176,670	0.87	50	57.5:1	\$8,679,750
CVN 73	8	4	\$157,785	\$153,750	\$75,729	\$82,056	1.87	50	26.7:1	\$3,949,050
CVN 74	8	6	\$665,431	\$153,750	\$231,647	\$433,784	0.35	50	141.1:1	\$21,535,450
CVN 75	8	2(Radar&SPS-67)	\$7,961	\$153,750	\$4,415	\$3,546	43.36	50	1.2:1	\$23,550
FFG 59	2	2(CIWS&SPS-49)	\$105,630	\$22,550	\$7,447	\$98,183	0.23	21	91.4:1	\$2,039,289
LHA 1	8	2(TAS&SLQ-32)	\$123,244	\$102,500	\$38,676	\$84,568	1.21	10	8.3:1	\$743,180
LHA 2	8	4	\$91,357	\$102,500	\$27,299	\$64,058	1.60	11	6.9:1	\$602,138
LHA 5	8	7	\$596,744	\$102,500	\$81,676	\$515,068	0.20	14	70.4:1	\$7,108,452
LHD 1	9	6	\$344,545	\$133,250	\$204,019	\$140,526	0.95	27	28.5:1	\$3,660,952
LHD 2	9	4	\$211,269	\$133,250	\$85,024	\$126,245	1.06	31	29.4:1	\$3,780,345
LHD 3	9	7	\$251,955	\$133,250	\$172,910	\$79,045	1.69	32	19.0:1	\$2,396,190
LHD 4	9	4	\$626,890	\$133,250	\$294,729	\$332,161	0.40	34	84.8:1	\$11,160,224
LHD 6	9	2(SPS67&SLQ32)	\$32,629	\$133,250	\$15,887	\$16,742	7.96	37	4.7:1	\$486,204
LPD 6	3	3	\$908,587	\$41,000	\$110,445	\$798,142	0.05	15	292.0:1	\$11,931,128
LPD 7	3	1(CIWS)	\$145,661	\$41,000	\$67,594	\$78,067	0.53	15	28.6:1	\$1,130,005
LPD 9	3	2(CIWS&SPS67)	\$163,128	\$41,000	\$56,952	\$106,176	0.39	15	38.8:1	\$1,551,640
Total Summary			\$7,814,718	\$2,679,350	\$2,865,107	\$4,949,611	0.54	-----	53.6:1	\$141,047,596
Average per CVN			\$400,412	\$153,750	\$138,609	\$261,802	0.59	45	71.3:1	\$11,627,351
Average per LHA			\$270,448	\$102,500	\$49,217	\$221,231	0.46	12	28.5:1	\$2,552,276
Average per LHD			\$293,458	\$133,250	\$154,514	\$138,944	0.96	32	33.2:1	\$4,312,952
Average per LPD			\$405,792	\$41,000	\$78,330	\$327,462	0.13	15	119.8:1	\$4,870,924

**Conclusions:** TVSS is a great investment on any and all the systems and ships represented in this study. The Return on Investment Ratios are all positive and because of the use of all TVSS systems implementation costs are conservative. The payback periods on all but 2 ships are 2.17 years or less and the overall average pay back period is a little more than half a year. The cost savings of the TVSS is ship life dependent, if ship life expectancies are reduced so will the savings from TVSS be reduced. TVSS are low cost items, \$2050 per install with tremendous savings potential in terms of maintenance on the systems they protect.