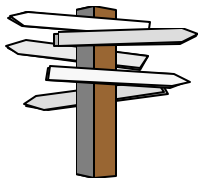
THE MINNESOTA LOGGER

Minneapolis/St. Paul Chapter 6 District 6 of the
International Society of Logistics (SOLE)

Minneapolis/St. Paul **No. 263** **June 2004**



Meeting Notice – June Tour

A tour will be held on Thursday **June 17** of the Mill City Museum in Minneapolis. http://www.millcitymuseum.org

The tour starts at 6:00 pm. Directions on the Mill City web site. Location is 704 South Second Street.

Please RSVP as indicated on the Notice below by June 16th. Admission is $8.00.

Guests are welcome and encouraged.

We Hope to See You There!!

This is the final meeting of the SOLE year.

Chairman's Corner

In April we submitted the entry package for our chapter to the 2004 SOLE *Chapter Awards* competition (details below). We had also submitted for the *Chapter Newsletter Awards*. The results of all awards will be announced at the annual 2004 SOLE Conference & Exhibition to be held in Norfolk this summer. Plan now to attend this worthwhile event (details below).

This month we recognize the retirement of Joe O'Brien, CPL, from Lockheed-Martin, Eagan, earlier this year. The recognition paragraph below is somewhat delayed because Joe has been spending some time wintering in Florida and just returned in mid-May. Congratulations, Joe, and have a well deserved retirement!!

I encourage everyone to attend this month's meeting – a tour of the Mill City Museum.

After opening our review last October in this column we are concluding our review this month of the GAO-03-887 report on the Navy's spares parts challenges. The report we are focusing on was released by GAO in August 2003. Our analysis followed in this column (see the October, November, January, February, March, April and May issues of this newsletter). All newsletters are downloadable from our SOLE web page. A review of the summary is as follows:

What GAO Found.

In typical 6-month deployments at sea, Navy ships are generally unable to meet the Navy's supply performance goals for spare parts. GAO's analysis of data for 132,000 parts requisitions from ships in 6 Atlantic and Pacific battle groups deployed in fiscal years 1999 and 2000 showed that 54 percent could be filled from inventories onboard ship. This supply rate falls short of Navy's long-standing 65 percent goal. When parts were requisitioned, maintenance crews waited an average of 18.1 days to get the parts—more than 3 times the Navy's wait-time goal of 5.6 days for ships outside the continental United States. The Navy recognizes it has not met its supply goals for over 20 years. (page 2, GAO-03-887).

GAO's analysis of data on 50,000 work orders from 6 deployed battle groups showed that 58 percent could not be completed because the right parts were not available onboard. More complete reporting of work orders identified as critical or important would have resulted in a more complete assessment of ship mission readiness. In addition, the Navy expends substantial funds—nearly $25 million for six ships GAO reviewed— to maintain large inventories that are not requisitioned during deployments. (page 2, GAO-03-887).

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Notice – Summer Hiatus

The chapter takes a normal two month hiatus in July and August from meetings and newsletter.

Members are asked to seriously consider attending the 2004 SOLE Conference & Exhibition in Norfolk, VA, during the period. Details are elsewhere in this newsletter and on the SOLE web site.

We ended last month's discussion with first part of the analysis of the nine factors in "the last 500 feet of the supply chain".

By running a *simulation* of our model we hoped to confirm the outcomes experienced by the Navy in Supply Rate reflecting the inputs of the nine factors in our model.

This month we address the three reasons why the Navy did not have the parts when needed (Appendix III, GAO-03-887).

- Parts Not on Allowance List. (82.7% accurate).

  This factor is in the area of maintenance of the ship's configuration. Accurate allowance lists are a shared responsibility among ship's support civilian and military planners (knowing the correct AL for the on board equipment) and on-board personnel (maintaining and correcting incorrect configurations). The equipment supplier shares in the accuracy of the allowance list due to the changes in configuration as engineering change orders are processed against the original allowance list).

- Parts On Allowance List but Decision Made to Not Stock On Board. (55.6% accurate).

  This factor is a Navy decision prior to the ship's deployment. The sparing model is likely to produce the items to stock on-board as well as recommendations to not-stock (depending on inputs of deployment days, estimated failure rate, etc.). This is a responsibility of the planners (reading the sparing model's output) and on-board personnel (approving the recommended stocking lists, promptly submitting job order completion reports with parts used information).

- Parts On Allowance List, Navy Decided to Stock Part, But Part Not Available. (61.7% accurate).

  This factor is dependent on the depth of parts decision (made by the planners) and on-board stock maintenance activities (obtaining the quantity per on-board SKUs and maintaining stock available via stock audits).

Last month's simulation produced results that seemed to confirm some of our conclusions.

Statistical Correlations. We detected a strong correlation between the depth of parts stocked on board ship and the Supply Rate.

This correlation, described in the May issue, is suggested for exploitation. We will assume a cause and effect relationship and we would recommend running an experiment to increase the depth (number of parts stocked) on board using the existing methods and existing COSAL parts with the goal of increasing the Supply Rate. In lieu of an experiment we would investigate existing databases to confirm this using the data from the ships.

Job Order Completion. We must keep in mind the connection between Supply Rate and Job Order Completion Rate.

Table 1: Job Order Completion Rates					
Battle Group (year deployed)	Number of Jobs (Work Orders)	Number of jobs completed with all parts on board	Percent of jobs completed with all parts on board	Number of jobs requiring off-ship parts	Percent of jobs requiring off-ship parts
Atlantic Fleet					
Enterprise (1999)a	12,607	4727	37.5	7880	62.5
Kennedy (1999)	13,362	5256	39.3	8106	60.7
Truman (2000)	9,553	4118	43.1	5435	56.9
Constellation (1999)	4,501	2318	51.5	2183	48.5
Stennis (2000)	5,557	2823	50.8	2734	49.2
Lincoln (2000)	4,780	2123	44.4	2657	55.6
Total/average	50,360	21365	42.4	28995	57.6

This indicates there is an average of 2.44 requisitions per job (per work order) for the Lincoln Battle Group. Improving the Supply Rate will improve the work order rate which is the most important factor to the ship's maintenance function and, ultimately, the ship's Commanding Officer.

The percentage of "high priority" work orders out of total work orders was evidenced by the fact that the Truman Battle Group (1999) had 2,635 labeled high priority of 5,435 or 48.48% total work orders. This is probably due to redundant equipment repair where the low-use sub-system was not considered high priority. CASULTY reports, to report work orders that affect readiness, were even a smaller percentage of the total where 906 casualty reports were filled out of 5,435 work orders for 16.67% of the total. The report indicated the low rate, which should have equaled 48.48%, was due to intentionally incomplete reporting. The reasons for the low CASULTY reports were described in the study.

We expected and confirmed a correlation between Supply Rate and Job Order Completion Rate for battle groups. The Pearson's coefficient of correlation is 0.89 indicating a strong positive correlation. See Table 2. We will assume causation is present (cause-and-effect) with requisition supply rate (independent variable) causing a change in the job order completion rate (dependent variable).

Table 2: Correlation Matrix - Job Order Completion vs. Supply Rate		
	Battle Group Job Order Completion Rate	*Battle Group Supply Rate*
Job Order Completion Rate	1.000	
Supply Rate	.890	1.000
	6	sample size
	± .811	critical value .05 (two-tail)
	± .917	critical value .01 (two-tail)

Analysis of Variance. We did not use the ANOVA technique, other than the r value, in this problem. The data was not available for the R1 to R9 factors that would be needed to set up the problem. We would need variation of data for the factors *at the ship level*. We only had two sets of data at that level - the 6-sample variation in range plus depth and Supply Rate and the variation in use of parts on board.

Simulation Results. We saw the spread of the simulation results achieve values and a shape similar to results reported in the GAO study.

The spread of the GAO report data and the simulation are shown in Table 3:

Table 3 – Descriptive Statistics for "Supply Rate"					
Statistic > Navy unit	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**	**Range**
GAO Report 2002 Lincoln Battle Group *ships* pg. 13	58.3%	13.35%	37.2%	78.7%	41.5%
GAO Report Combined Fleet *Groups* pg. 7 (1999-2000)	54.0%	4.42%	51.0%	61.0%	10.0%
Simulation of "Supply Rate"	40.77%	7.17%	30.76%	66.05%	35.29%

We see a lower mean at the fleet group level that we did at the Lincoln Battle Group ship level indicating there were even lower rates for other Battle Groups (to lower the fleet mean).

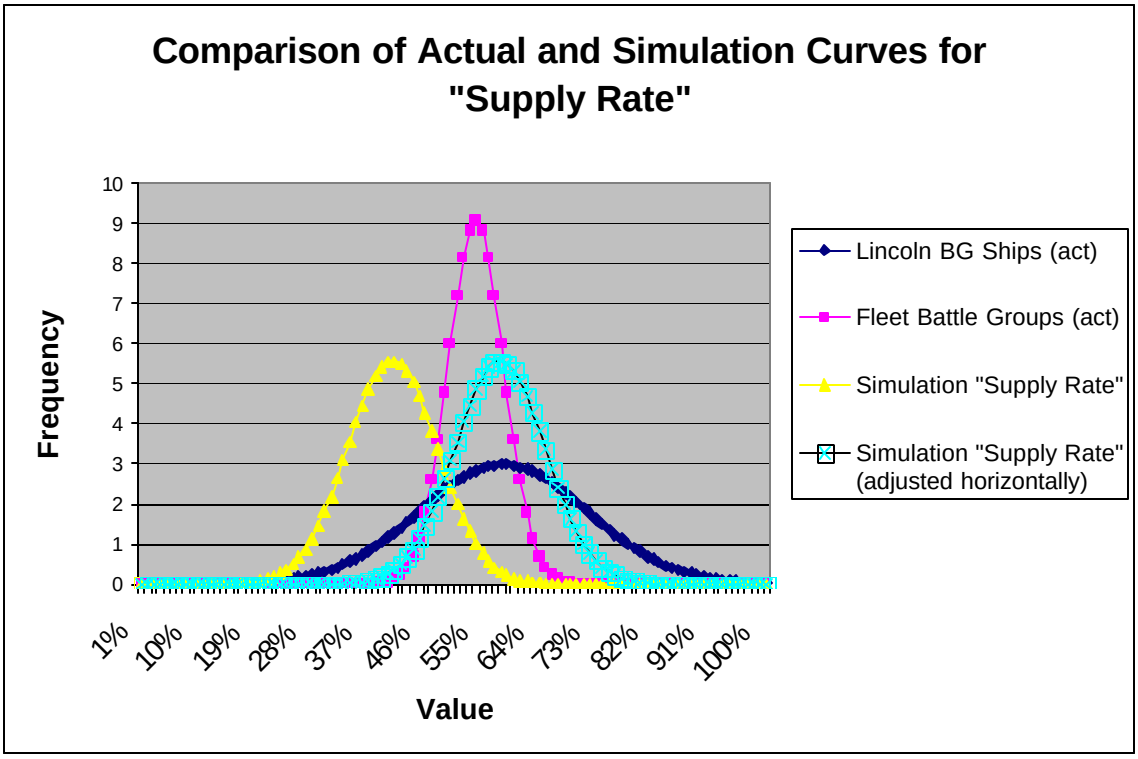
We see a wider range among *ship* Supply Rates than among *battle group* Supply Rate averages. That may be the result of the "mean of means" effect. Our **simulation** minimum, maximum and range approximate the Lincoln Battle Group ship statistics although the mean is shifted. The lower mean and lower standard deviation of the simulation is probably due to the very limited data for R1 and R2 (two values and one value, respectively). See Table 4:

Table 4: Navy Spares Shortages	
Factor in the Model	**Mean & Range of Values**
R1 Systems Configurations	Mean = 77%, range of 74.85% to 79.18% (2 samples)
R2 Allowance Parts List	Mean = 82.7% (1 mean for 6 BGs)

For future work we would want more data for these two factors in order to confirm or find a more representative mean and descriptive statistics of those distributions.

We plotted the three normal curves suggested in Table 3. In addition we plotted another Simulation curve by shifting the Simulation curve horizontally to compensate for possible future improved R1 and R2 data.

We would then compare the Lincoln BG ships with our "adjusted horizontally" curve.



Recommendations for the Future. We can make some recommendations for future work on the Navy spares problem.

The priority of investigation into the improvement in Supply Rate is in priority order of the mean of each factor. The factors ranked by mean (lowest to highest) are shown in Table 5:

Table 5: Rank of Factors in Priority by Mean

Factor in Model	Simulation Values (Mean, Standard Deviation)	Simulation Formula
R1	Mean = 77%, s = 0.0306	=RNGNormal(0.7702,0.0306)
R2	Mean = 82.7%, s = 0.0306	=RNGNormal(0.827,0.0306)
R6	Mean = 93%, s = 0.0602	=RNGNormal(0.93,0.0602)
R8	Mean = 94%, s = 0.02	=RNGNormal(0.94,0.02)
R4	Mean = 95%, s = 0.0163	=RNGNormal(0.95,0.0163)
R3	Mean = 95%, s = 0.0167	=RNGNormal(0.95,0.0167)
R5	Mean = 98%, s = 0.0083	=RNGNormal(0.981,0.0083)
R9	Mean = 99%, s = 0.0033	=RNGNormal(0.99,0.0033)
R7	Mean = 99%, s = 0.0033	=RNGNormal(0.99,0.0033)

Future investigation into this problem might involve Design of Experiments (DOE). If a DOE experiment should be done we would suggest the factors in order for the test are shown in Table 6:

Table 6 – DOE Factors Recommended (priority order)	
R1	Obtain Accurate System Configurations for Individual Systems and Sum to the Ship's Total Configuration
R2	Obtain Accurate Allowance Parts Lists (APLs) to match the Ship's Total Systems Configuration) (Range of Items)
R6	Stock Depth of APL Items on board Ship
R8	Pull the Anticipated Item(s) from Shipboard Stock for the Maintenance Task As it Occurs during Deployment
R4	Obtain & Maintain Quality Items (Parts)
R3	Forecast Anticipated Maintenance Events & Item Demand for Period of Deployment (Depth of Items)

Several of the factors can be tested by analyzing existing databases. Additional information will need to be collected *from ships* on R3, R4 and R8.

Wait time. Wait time is a *result of* lack of spares availability on board. It is assumed that long wait times will be *caused by* the lack of spares availability on board. The problem to be solved is on-board spares availability which should be a less costly option that decreasing the wait time from off-board support. In fact, minimizing the costs of delivering spares shortages should have the benefit of reducing operating costs. Those operational savings could, in turn, be used to purchase more spares inventory of the correct type, if necessary. A recent commercial emphasis is on measuring and controlling wait time rather than the traditional service level might be effective. If calculated the Navy's goal and the actual average wait time (AWT) is calculated as:

Current Navy AWT = 0.65*2 hrs + 0.35*16.0 hrs = 6.9 hrs (data page 7)
Current Navy goal = 5.6 hours overall average wait time
Actual = 0.54*9.9 hours + 0.46*49.6 hours = 28.2 hours (data page 8)
Future Navy on board requisition percentage to meet Navy wait goal
= (X*2.0 hrs+ (1-x)*49.6 hrs= 5.6 hrs

Note: The on-board wait time must be less than the fleet goal of 5.6 hours. Use the value of 2.0 hours to make the computation.

Calculated **X = 0.9244** > The on-board goal for requisitions must be this high, 92.44%, to meet the fleet average wait goal of 5.6 hours (given both an on-board average wait *goal* of 2.0 hrs & 49.6 hrs *actual* off-ship wait time).

A linear programming solution is given below in a search for the values for the factors that will satisfy the major constraints of the problem.

On board inventory. The excessive amount of idle inventory on board ship is a concern. The annual inventory turn ratio was ($2.9 million*2) / $27.6 million = 0.210. Commercial practice has ITR averaging about 2.5 in electronics supply situations. A very low level of turnover of inventory indicates excessive idle inventory problems. Achieving a 2.0 turnover would free up $16 million of inventory and a ship average of about 90% of stock locations (page 17 of the study). There is less than moderate positive correlation (r = 0.438) of parts on board and used, the dependent variable, and parts held on board, the independent variable (test not shown). In addition, the GAO report did not differentiate among the types of inventory in excess (spares, safety items, accessories, etc.). It is highly probable that a sizeable portion of the on board service parts inventory is no

longer connected to a valid configuration considering the low rates of factors R1 & R2. This inventory represents an opportunity to recycle & reuse some portion if removed and replaced with parts tied to *current* authorized parts list for on board configurations.

To repeat the GAO study's recommendations:

> "In order to improve supply availability, enhance operations and mission readiness, and reduce operating costs for deployed ships, we recommend the Secretary of Defense direct the Secretary of the Navy to
>
> • develop plans to conduct periodic ship configuration audits and to ensure that configuration records are updated and maintained in order that accurate inventory data can be developed for deployed ships;
> • ensure that demand data for parts entered into ship supply systems are recorded promptly and accurately as required to ensure that onboard ship inventories reflect current usage or demands;
> • periodically identify and purge spare parts from ship inventories to reduce costs when parts have not been requisitioned for long periods of time and are not needed according to current and accurate configuration and parts demand information; and
> • ensure that casualty reports are issued consistent with high priority maintenance work orders, as required by Navy instruction, to provide a more complete assessment of ship's readiness." (page 24, GAO-03-887).

In summary, we recommend the following:

1. **Factor Data**. Obtain detailed rather than summary data on factors R1 and R2 *at the ship level*. This is needed to confirm the basic descriptive statistics of the sample of the data collected. We noted earlier that this data is not available from GAO and the GAO contact indicates that all of the data used for the report was in the report. The R1 and R2 factors remain the two most important factors to the problem. Both factors must be improved significantly to affect the Supply Rate.
2. **Goals Setting**. The following relates to goals for requisitions:

Table 7: Goals	
R1 and R2	Both factors R1 and R2 require significant increases in value in order to affect the Supply Rate as the outcome. The product of R1 and R2 is required to be over 0.95 to obtain a Supply Rate of over 0.900 (considering the other factors). The fleet goal for Supply Rate has been 65% so the goal for the product of R1 and R2 must be about 0.95 or individually about X^2 = 0.95, R1 and R2 = 0.9746 or 97.46% (if the factors R3 to R9 are correctly estimated).
R3 through R9	Factors R3 through R9 will downgrade the product of R1 and R2 by approximately 0.7245 unless improved. So a product of factors R3 and R9 should be improved to reach about 0.95 in order to have a reasonable outcome for Supply Rate and Job Order Completion Rate.
Supply Rate	The Supply Rate must be high because the job order completion rate is computed as = (Supply Rate)^2.44 based on data in the study.
Job Order Completion Rate	The job order completion rate should be above 80%. The commercial electronics "job first pass fix rate" averages about 85% for a field service work force.
Wait Time	Average wait time of 5.6 set as an overall fleet goal for *priority requests*.

Using linear programming techniques we would hope to find the optimum values. We made the assumption that R1 and R2 were set to be variable but equal to each other and the product of R3 through R9 was set as equal to 0.950 (a reasonable goal not currently achieved). We have the following results:

TABLE 8: Linear Programming Results						
Model Factor >	R1	R2	R3-9	Goal	Limit	Units
Requisition Supply Rate	0.9834	0.9834	0.9500	91.87%	<=100%	Pct.
Job Order Completion Rate				81.32%	<=100%	Pct.
Average Wait Time	3		35	5.600001	=5.6	Hours
On Board Wait Time					>=2	Hours
Off-Ship Wait Time					<=100	Hours

The above is computed by setting the Average Wait Time = 5.6 hours as stated as the Navy fleet goal *for priority items* in the study. We state this because about 48% of requisitions are classified as *priority orders*. The on board wait time and the off-ship wait time resulted in 3 hours (maximize; Navy goal = 2 hours) and 35 hours (minimize; Navy goal = 16 hours), respectively, based on page 8 of the study. The linear programming results are obtained by using MS Excel's *Solver*. Note that we set the target cell to be the overall wait time equal to 5.6 hours. The changing cell variables in the LP problem are on-ship and off-ship wait times and the factors R1, R2, and R3-9 combined. We did not maximize the Requisition Supply Rate value as it produced unreasonable R-factor results. The resulting requirements for R1 and R2 are shown. The resulting values represent *significant improvement requirement goals for the process.*

3. **Correlations.** Exploit the strong correlation between depth of spares (independent variable) and supply rate (dependent variable) at the ship level. We will assume causation (cause-and-effect) following the test in last month's column. Exploit the strong correlation between requisitions supply rate (independent variable) and job order completion rate (dependent variable) at the battle group level.

4. **Job Orders**. The Supply Rate goal (for requisitions) should be set high enough to have a significant, positive outcome for job order completion rate. The study fact is that nearly 2.5 requisitions on average are required for each Job Order. The implication is that for the Fleet Supply Rate goal of 65% (see above) the Job Order completion rate will be still lower by the power factor of 2.44. Setting a significantly higher goal for requisition supply rate will have a direct impact on an improved job order completion rate. Table 6 shows the relationship if the correlation were 100%. The coefficient of correlation computed above for this relationship was 89%.

Table 6: Theoretical Job Order Completion Rate vs. Supply Rate			
Average Number of Requisitions per Job	Requisition Supply Rate (65% is a fleet goal)	Calculation	Job Order Completion Rate (100% correlation)
1	65%	=0.65^1.0	65%
1.5	65%	=0.65^1.5	52%
2	65%	=0.65^2.0	42%
2.5	65%	=0.65^2.5	34%

5. **Future experiments**. Several improvements to the above analysis are recommended:
    a. Improve the sample data for the factors R1 and R2 from ships.
    b. Estimate the data for factors R3 through R9 based on additional operational data from Navy ships.
    c. Conduct an experiment in the form of a more rigorous Design of Experiments study (multivariable testing) to determine the effect on the output of the process from the contributing variable factors and with that testing determine any interaction among factors. The results of a DOE study would either substantiate the intuitive conclusions offered by the GAO or suggest other strategies to improve both the Supply Rate and the job order completion rate. The raw data of the same periods of that used for the GAO study is a likely source of data for any future DOE studies.
    d. Examine the different kinds of inventory stocked aboard ship into segments – service parts, safety items, accessories, etc. with the goal of understanding what can be removed.

This ends the discussion of the August 2003 GAO report on Navy spare challenges. I hope that the results were thought provoking and that the total analysis will lead to better understand the Navy's spare parts availability solutions.

As the Chapter breaks for the summer months of July and August I hope each of you will consider attending the 2004 SOLE Conference & Exhibition in late August. This annual event has much to offer to the member. We hope to see you there in Norfolk!!

Have an enjoyable Minnesota (or North Central states) summer.

Larry DeVries, CPL
Chapter Chairman, 2003-2004
Minneapolis – St. Paul

20th Anniversary of 1984 SOLE Symposium & Exhibition

This year we note the 20th anniversary of this 1984 SOLE event sponsored by the Minneapolis – St. Paul Chapter. The theme was "Innovative Support – The Continuing Challenge". The event was held in August 1984 at the Hilton Hotel, Minneapolis. We were led by members Jim Sindt, CPL and Cal Gehan, CPL. The list of all of the names of those Chapter members who headed the various symposium committees are listed on our web page under C6D6 History. Over 500 attendees made the event a technical and financial success.

May 2004 Chapter Meeting Recap

Tuesday, May 20th.

The meeting was held to show the progress Jack Povlock has made in a scale model railroad and railway setup.

He began building the current version on Sept 12, 2001, when he expanded the floor area to provide more room than the prior version. This is his third version of a layout.

The layout consists of four main tracks on basically two levels separated by a one-foot elevation connected with a grade track to tie in the two levels. The shape is an L-shaped configuration approximately 32 feet by 27 feet. The end result is a very interesting 3-rail O-gauge layout based on Lionel and Mike's Train House system components.

Power is supplied to the set in two separate paths: one transformer to power the rails (power to each track) and a separate transformer to power the auxiliary switches and lights.

There are scale bridges, tunnels, rail yards, switches and specialty tracks. There are a number of model rail yard displays even including a mobile freight container handling crane for moving standard freight containers to and from rail cars to container truck trailers!! This model looks and operates like the real mobile container cranes.

The number of engine and car combination he has is impressive as is the variation in types. The configured trains can reach up to 120 Scale MPH on the track. Engines are controlled via RF handheld controllers. There are authentic sounds coming from each engine. Computer software downloaded via the web from the supplier is used to update the software resident in the system including that in each engine.

The meeting and demonstration was very interesting and impressive. Thanks, Jack.

2004 SOLE Conference & Exhibition, Norfolk, VA

The focus of all SOLE members this summer should be on attending …

The 39th Annual
International Conference
and Exhibition
"Future Logistics: the Integrated Enterprise"
Norfolk, Virginia
31 Aug - 2 Sep 2004

Check the web site at
http://www.sole.org for details.

Joe O'Brien, CPL, Retires

Joe O'Brien retired in January from Lockheed-Martin in Eagan where he worked as a Senior Logistics Engineer for the past for ten years. Prior to L-M he worked as a Logistics Engineer for Control Data Corporation, Bloomington.

Joe O'Brien has been an active member of the Minneapolis – St. Paul Chapter and SOLE. He joined the Chapter and SOLE on 1 Oct 1978 so this year will be his 26th year as a member. He led several workshops in the early 1980's. He became a CPL in May 1981. Joe has been Chapter Chairman for several terms (1991-92, 1992-93). He has been newsletter editor several times and during his terms as editor the *Minnesota Logger* won SOLE national award recognition in 1989 and 2003. He was active at the national level having written and presented papers, won a Best Paper in the *Logistics Spectrum* Award (1981), was guest editor of a special issue of the *Spectrum* on environmental issues (1996), and led panel discussions on environmental issues at several Conferences. We won't forget either his role as Technical Committee Chairman of the 1984 SOLE Symposium held in Minneapolis.

In retirement Joe and Phyllis intend to split their time between Florida and Minnesota.

Congratulations, Joe!!

Chapter Web Page

News of our Chapter is on our SOLE web page http://www.sole.org then Member Services > SOLE Web Sites > Dist 6 Cha 6 Minneapolis – St. Paul (Twin Cities)

Chapter entered into 2004 SOLE Chapter Awards Competition

The entry package for the Chapter into SOLE's annual Chapter Awards competition was forwarded to the SOLE awards committee on April 15, 2004. The package consisted of a cover letter and a zip file containing the required documentation.

The operations of the chapter are documented under a point system for twelve months. The chapter gained points this year by having ten meetings, meetings with speakers, newsletters, and points for an event like the logistics presentation three of our members made in April 2003 as guest lecturers to a University of St. Thomas adult education class.

This submission represents an effort to recognize our chapter at the national level via the Society's Awards program. The announcement of winning chapters will be made at the 2004 SOLE Conference & Exhibition in Norfolk (conference details elsewhere).

The Chapter last won a SOLE Chapter Award in 1996 when it achieved Silver Chapter status.

FUTURE CHAPTER MEETINGS

2003-2004 CHAPTER SCHEDULE & TOPICS

Date	Event	Remarks
Thursday, June 17. 2004	**Mill City Museum, Minneapolis.**	**Tour of the museum.**
The chapter takes a meeting and newsletter hiatus during the months of July and August each year.		
Sept TBD 2004	**Chapter Meeting**	**Annual awards meeting.**

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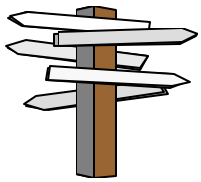

MINNEAPOLIS/St. PAUL CHAPTER MEETING

MEETING DATE: **Thursday, June 17, 2004**

LOCATION: Mill City Museum, **704 South Second Street, Minneapolis**.

TIME: 6:00 pm

COST: $8.00 per person. Half ($4.00) will be covered by the Chapter.

MEAL: None at the museum.
Optional stop after the tour.

MEETING TOPIC: "Tour of the Mill City Museum"

- **Directions to the tour site:** Mill City Museum is located in downtown Minneapolis on the west bank of the Mississippi River, just north of the Hubert H. Humphrey Metrodome, near the corner of Portland Avenue and 2nd Street.

  Look for the Gold Medal Flour sign. The museum is right next door.

  From the South: Take I-35W north to the 3rd Street/University Avenue exit #17C. Follow sign for West Bank. Turn left onto Washington Avenue. Turn right onto South 10th Avenue South. Turn left onto South Second Street. Mill City Museum is on the right.
- **Parking is at the site.** Parking meters are available on Second Street in front of the museum, on several adjacent streets and at the west end of the Stone Arch Bridge.
- **We hope to see you there!!**

RSVP: Call if you wish to attend not later than June 16, 2004 to (612) 743-3509.

Honeywell	Lockheed Martin	United Defense	Other
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PLEASE POST

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