THE MINNESOTA LOGGER

Minneapolis/St. Paul Chapter 6 District 6 of the

International Society of Logistics (SOLE)

Minneapolis/St. Paul **Issue No. 256** **Date – November 2003**

Chairman's Corner

I would encourage all members and guests to attend our meeting this month. We are meeting in a joint meeting with INCOSE on November 13th. This is the result of an invitation we received from the Northern Star Chapter of INCOSE to speak on the topic of "Systems Engineering in Systems Deployment and Retirement." Our Chapter will give the presentation. See details elsewhere in this newsletter. I encourage all of you to attend as we can use the collective experiences in our group to answer any questions that might come from the INCOSE members during and following the presentation. Your attendance will be appreciated!!

Last month we described the challenges the military services face in keeping the correct spare parts available for maintenance activity. In particular we noted the problem aboard the Navy's ships. We have received permission to reprint the original article from Naval Institute Proceedings. See it below in this newsletter.

This month we would like to start to break that problem down into its various elements for analysis. If we can look at each element to the problem perhaps we can gain clues to the cause of poor spares support on board ship and suggest an approach to improve the situation.

The emphasis will be on "the last 500 feet of the supply chain". In other words, what events must occur correctly for the supply chain to deliver the necessary items to the operator or maintainer.

At first glance it would appear that a number of events must fall into place correctly to have the correct part at the right time.

- (1) The ship's configuration must be accurate (the configuration in the ship's systems must match each system/equipment configuration actually on board),
- (2) The individual component's allowance parts list (range of part numbers and depth of quantity) must be up to date and match the ship's actual component configuration shown in the ship's consolidated shipboard allowance list (COSAL),
- (3) The kinds of maintenance events requiring parts must occur as expected by the method used to forecast demand for the part (demand model output),
- (4) The quantity put into stock for each part on the ship must match the quantity anticipated for the forecast period of demand and that quantity must be maintained accurately, and
- (5) The quality of the part must be as expected.

Note that the conditions above apply to commercial spares support situations also although it is not often that the maintenance operation is isolated from re-supply for a period of 60 days or longer as is the case for Navy ships. In the commercial world the depth (quantity) of spares stocked locally is less because there is faster re-supply. The range of the part numbers stocked locally (or within response time) is often as large and does have a major impact on ***first pass fix rate***. First Pass Fix Rate percentage is a key measure in the commercial world. The commercial world of field maintenance focuses on increasing FPFR by decreasing the percentage of "broken calls" (those that require wait time or delay and resumption at a later time). A major cause of broken calls is due to the lack of service parts carried to the site by the technician, lack of stock at the maintenance site or availability of parts only after a delay to complete the call.

Each of the above numbered events may have dependent activities that must occur in order for there to be a successful outcome – the right part at the right place (the ship's point of use) at the right time in the right quality.

It seems we could apply the "series reliability model" to this problem and gain some information. For example,

$R(s) = R_a * R_b * R_c * \ldots * R_n$

$R(s=5) = R_1*R_2*R_3*R_4*R_5$

If we can estimate the various dependent activities to the major independent events and load them into this model we might be able to judge where the problem lies.

For example, if each of five major events has a reliability of 0.98 the R(s) = 0.98^5 = 0.904. Now if each of the five components has three dependent activities with a reliability of 0.98 then each of the five major components has a reliability of 0.98^3 or 0.941. But the R(s), for 15 sub- and major activities, would drop to 0.941^5 = 0.7386 (also, 0.98^15 = 0.7386). The perceived "high percentages" on an individual activity results in a drastically reduced output for a reliability series.

The question would be, "What are the sub-activities that lead to the five major activities above and what is the individual "reliability" of those sub-activities?". If we can estimate them we can gain some insight into the problem.

If we can model this situation mathematically we can use simulation of the process to describe how changing percentages of events result in changing results for the whole series of those events. We have a range of supply performance output for the Fleet in the reports on the Navy. It certainly seems reasonable to expect a range of results considering that ships in the Fleet vary from destroyers to aircraft carriers with the resultant complexity increase in size of ship, age of ship, systems supported and other factors.

If we are correct that this problem can be modeled as a series reliability problem then we are headed in a positive direction. This should lead us forward as we narrow in on the reasons for ***low fill rate on maintenance work orders***. See reference to the SCOR-model elsewhere in this issue.

In upcoming columns we will continue the discussion of spares support.

Larry G. DeVries, CPL
Chapter Chairman, Twin Cities 2003-2004

OCTOBER MEETING RECAP

The October chapter meeting was a held at Medtronic on October 9th. The speaker was Jay Carey, System Engineering Manager in Medtronic's Cardiac Division. His topic was "Systems Engineering in the Design and Execution of System Test".

The speaker gave a short background on Medtronic and their products including the changes from an external device first offered in the 1950's to the changes in the internal devices implanted today. He discussed the components of the internal cardiac defibulator (ICD) system (both internal body components: the ICD unit and leads to the heart, and the external components: the programmer, the programmer software, and the RF transmitter unit). He discussed the decreases in size associated with the ICD unit and the much increased capability of the device with the capability changes in electronics.

The current implanted devices have a battery life of about 7 years. The implanted ICD has a much larger range of features and capability that did the devices of several years ago due to a number of factors including the advances in microchip capability.

The "users" of the ICD include the patient, the patient's doctor, the nurse, the researcher, and others in the chain of individuals and organizations involved in heart care.

Jim described the System Engineering Process "letter V" going over the activities from *System Concept* to *Component Development* coming down on the left branch of the V and *Component Integration* to *System Validation* going up on the right half of the V.

He made a point that Medtronic's mission statement is to provide "…the greatest possible reliability and quality in their products". The components and system as well as the various processes described reflect that goal.

He discussed the System Testing Methods which range from Human Factors User Testing, End User Validation, Simulation and Analysis, Bench Testing, Animal Testing, and Human Clinical Testing (if necessary).

He continued with a discussion of the activities involved in Systems Integration which is an informal verification validation activity and is done incrementally as the system is being developed.

The Formal System Verification step activities follow a prescribed set of activities following a plan for that phase. This may include animal lab testing, if necessary.

There are a number of *System Use Scenarios* that must be considered including the Implant step, Patient Follow-up, Therapy/Delivery, Therapy/Setup and Device System Check.

The *Formal System Validation* step activities (1) confirm the system is meeting the user needs, (2) follow the plan written by the Quality Organization, (3) includes all external components, and (4) uses final clinical grade components (verified and from final manufacturing processes).

Following the presentation the programmer and ICD were demonstrated to the audience and several heart events and the response of the system were displayed on the overhead screen.

The meeting was sponsored by the Northern Star Chapter of INCOSE with over 75 attendees.

UPCOMING CHAPTER MEETING - -

This Month: November 13, 2003

Joint Meeting with INCOSE

The November meeting will be a joint meeting with INCOSE where our Chapter will be the main presenter on the topic, "System Engineering in Systems Deployment and Retirement". We were asked by the Northern Star Chapter of INCOSE to make this presentation.

Presenters for the Chapter will be Joe O'Brien and Larry DeVries.

The meeting will be held on Thursday, November 13, (details of start time and location are elsewhere in this newsletter).

Considering the topic and anticipating questions from INCOSE members we would like a maximum of participation from our members. We know that collectively we have the backgrounds and can answer nearly all questions that they might pose.

We hope all Chapter members can attend this unique opportunity to attend and participate in a joint meeting with another professional association.

We hope to see you there!!

Chapter Web Page

The chapter web site:

- Chapter Officers name for 2003-2004 have been added.
- Newsletters are posted as .pdf files as they are released.
- Photos will be added to the site with a link.

To view the site go to http://www.sole.org > Member Services > SOLE Web Pages > C6D6

Navy Isn't Square with Spares

By Tom Philpott

Navy ships deploy with large inventories of spare parts, but because of poor record keeping, they lack about half the parts needed to maintain and repair onboard equipment and weapon systems, say congressional auditors.

The General Accounting Office, in the latest (GAO-03-887) in a series of reports on parts availability throughout the military, said a review of 132,000 parts requisitions from ships in six Atlantic and Pacific battle groups showed only 54% could be filled from shipboard inventories.

The Navy's goal of having 65% of needed parts on board ship has not been met in more than 20 years, the GAO said.

Readiness suffers from the shortfalls because parts not found on board take an average of about 18 days to reach the ship, triple the Navy's wait-time goal of less than 6 days.
The process of sending replacement parts to ships at sea, or to nearby ports, is costly. Ships also end up wasting millions of dollars stocking parts they cannot use. Auditors found two major causes for the parts problem.

One reason is that ship configuration records, which identify the types of equipment and weapons on board, are not kept current. When systems are upgraded, the GAO said, the Navy has a bad habit of not updating ship configuration records in a timely way. Therefore, ships can continue to stock parts for equipment no longer on board and fail to upgrade inventories to maintain newer gear. To make matters worse, the Navy does not audit its ship configuration records regularly to update supply computers on the types of equipment and weapons on board.

A second reason is that supply personnel do not keep good historical records on spare parts usage. Therefore, when inventories are reviewed or parts restocked, personnel rely on outdated, incomplete, or erroneous usage data to determine what parts were needed during past deployments.

Because of poor record keeping, ships routinely plug inaccurate parts data into computer models to estimate what they need, the GAO said, resulting in ships "not stocking the right parts for the equipment on board or not carrying the right number of parts that may be needed during deployment."

The Navy spends about $750 million a year on ship spare parts, including $200 million for initial spares and the remainder to replenish supply bins. Over a 10-month period, auditors reviewed parts requisitions from six battle groups that deployed in fiscal years 1999 and 2000.

More than 60,000 total requisitions, or 46% of their parts orders, could not be filled from onboard inventories. Of those missing parts, almost 27,000 were on the ships' parts allowances but the Navy had decided not to carry them on board. Another 23,000 were on the parts allowance lists but out of stock, and more than 10,000 parts were not even on the allowance lists.

Carelessness in updating ship configuration records, to reflect equipment or systems actually installed, occurs on both new and older ships, the GAO said. Navy officials conceded they incur "substantial costs" to obtain replacement parts from off-ship supply sources. Meanwhile, the GAO said, the six battle groups audited spent almost $25 million "to maintain large inventories that are not requisitioned during deployments."

Navy supply officials told the GAO they also are concerned about lengthy average wait times, which can be 12-14 days even for critical parts, when parts are not found on board ships.

The full impact on readiness of mismatched parts inventories could not be learned, the GAO said, because auditors found major discrepancies between the number of maintenance work orders deemed "high priority" and the number of casualty reports filed by ships.

Casualty reports, not work orders, show up in a ship's readiness report. Navy officials told the GAO that casualty reports tend to be underreported by ship commanders for fear too many will reflect negatively on their commands.

The GAO urged the Navy to develop plans to:
• Begin to conduct periodic ship configuration audits and to ensure that records are updated and maintained.
• Ensure that parts demand data are entered into ship supply systems promptly and accurately.
• Periodically purge unneeded parts from ship inventories.
• Ensure that casualty reports are issued consistent with high-priority maintenance work orders.

The Department of Defense concurred with the first three recommendations and the intent of the fourth. It disagreed that a casualty report should be filed in every instance of a high-priority work order.

The article above appeared in "Naval Institute Proceedings" magazine, U. S. Naval Institute, http://www.navalinstitute.org, October 2003, page 122.

Supply Chain Operations Reference-model (SCOR)

In the Chairman's column this month we are discussing "the last 500 feet of the supply chain" for spare parts on Navy ships. A new model for the supply chain is being developed called SCOR. We can be guided in this review of spare parts support by using the Supply Chain Operations Reference-model (SCOR) http://www.supply-chain.org as it relates to "Delivery" within the larger model.

The Delivery portion of the model is in the table (*) below:

Performance Attribute	Performance Attribute Definition	Level 1 Metric
Supply Chain Delivery Reliability	The performance of the supply chain in delivering: the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer.	Delivery Performance
		Fill Rates
		Perfect Order Fulfillment

(*) The table is from ***SCOR-model 6.0*** slide presentation available at the web site.

FUTURE CHAPTER MEETINGS

2003-2004 CHAPTER SCHEDULE & TOPICS

Date	Event	Remarks
Thursday Nov. 13	"SE in Systems Deployment & Retirement"	Joint Meeting with INCOSE
December TBD	Christmas Party	Location TBD
Thursday Jan 15, 2004	"How Six Sigma and Supply Chain Integrate"	Dinner Meeting and Case Study with CLM
Tuesday Feb. 10	"Supplier Qualification"	Joint meeting with ASQ
TBD March 2004	"Tour of SuperValu, Distribution Center"	Hopkins Plant
Tuesday, April 13	"QS9000/TS1 6949/DOE maybe FMEA"	Joint meeting with ASQ
TBD May 2004	Technical Meeting TBD	
TBD June 2004	Tour TBD	

Don't forget the Christmas meeting and party.

- Joe O'Brien

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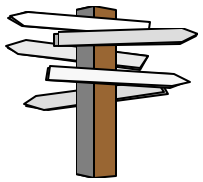

MINNEAPOLIS/St. PAUL CHAPTER

MEETING DATE: **Thursday November 13, 2003**

LOCATION: Lockheed Martin, Eagan – 3333 Pilot Knob Road

TIME: 6:15 pm, Networking
6:45 pm, Chapter Meeting and Introductions
7:00 pm, Presentation
8:00 pm, Break
8:15 pm, Questions
8:45 pm, Adjourn

PRESENTERS: Larry DeVries and Joe O'Brien are both from the Minneapolis area and represent SOLE, the International Society of Logistics Engineers. Larry is the current Chairman of the Minneapolis/St. Paul chapter. Larry is also a CPL (Certified Professional Logistician) and is a member of McNeil and Associates, Inc., Service Management Consultants. Joe is also a CPL and is a Staff Logistician with Lockheed Martin. Both gentlemen have extensive experience with the operation and support of complex systems in the field. Their presentation will be both informative and entertaining.

MEETING TOPIC: "Systems Engineering in Deployment and Retirement"

The presentation will center on the application of systems engineering principles to the phases of systems and products downstream from the production phase. The presenters will discuss the Operations, Maintenance & Support phase and the Retirement & Disposal phase of products & systems. They will focus on the work tasks required for repairable systems with significantly long periods of operational service.

Directions to Lockheed Martin:

- From any direction, find your way onto I494.
- Take I494 east past the airport and across the River. If you came down I35E, go west on I494.
- Exit at Pilot Knob and head South. After a mile or so, you will see Lockheed on your right.
- Continue past Lockheed to the next light and turn right onto Yankee Doodle Road.
- Again, go past the Lockheed on your right to the second light and turn right onto Federal Drive.
- Make an immediate right into the Lockheed lot, find a spot and come in the South entrance.

RESERVATIONS: Call for reservations not later than 12 November 03:

Honeywell	**Lockheed Martin**	**United Defense**	**Other**
Jack Povlock	**Joe O'Brien**		**Ken Dacas**
(763) 954-6263	**(651) 456-3977**		**(952) 887-3855**

PLEASE POST

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