SOLEtech

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Welcome to the Year 2002 - May each and every one of you enjoy a happy, healthy, and a prosperous New Year!

In This Issue:

Logistics Requirements: Established From The Beginning

Ben S. Blanchard, CPL, Fellow, Professor-Emeritus, Virginia Tech

Preamble

This is the fourth in a series of short articles pertaining to *logistics*, as defined in the context of the system life cycle. In the October ***SOLEtech***, it was appropriate to commence with a few basic definitions pertaining to a system, *systems engineering,* the *system life cycle*, and the *system engineering process*. It was emphasized that the maintenance and logistic support infrastructure should be considered as a major element of a "system" if the system is to perform its intended function (mission) in an effective and efficient manner. In the November ***SOLEtech***, it was shown that there are key logistics activities in each phase and throughout the entire life cycle for any given system (i.e., from conceptual design through retirement). Further, it was emphasized that these various activities (to include those pertaining to the areas of "business" logistics, "defense" logistics, "supply chain management," etc.) must be viewed as a total *integrated* entity. In the December ***SOLEtech***, it was pointed out that this "integrated entity" must be addressed from the beginning during the early stages of system planning and conceptual design, and that the *design for logistics*, or the *design for supportability*, must be an inherent consideration within and throughout the systems engineering process. Given all of this, it is now essential that emphasis be placed on the early definition of system *requirements.*

System Requirements - A Baseline For Defining Logistics Requirements

Referring to Figure 4 in the article, "Logistics: A Major Consideration In The Systems Engineering Process," published in the December ***SOLEtech***, the major steps in the system life cycle are illustrated and include the *needs analysis* (block 1), *system requirements* (block 2), *functional analysis and requirements allocation* (block 3), and so on. Within the context of **system requirements** (block 2), I usually include such top level system activities as *(1) feasibility analysis, (2) definition of system operational requirements, (3) development of the maintenance concept, (4) identification and prioritization of technical performance measures (TPMs), and (5) preparation of the system specification*. My objective herein is to address the first three areas of activity, and to cover the fourth and fifth areas in subsequent issues of the ***SOLEtech***.

Feasibility Analysis

Through the *needs analysis* (Figure 4, block 1 - refer to the December ***SOLEtech***), the functions that the system must perform in response to an identified customer need(s) are defined. There may be a single function such as "transport product *XYZ* from point *A* to point *B*," or "communicate between points *D*, *E*, and *F*," or "produce *X* quantity of *Y* products by time *Z*." Conversely, there may be a number of different functions to be performed, some primary and some secondary. To ensure a good design, all possible solutions must be identified, the most rigorous functions being selected as the basis for defining system-level design requirements. It is important that *all* known possibilities be addressed to ensure that the proper technologies and design approaches are selected for consideration.

The *feasibility analysis* is accomplished with the objective of evaluating the different technological approaches that may be considered in responding to the specified "functional" requirements. In considering different design approaches, alternative technology applications are investigated. For instance, in the design of a communications system, should one use fiber-optics technology, cellular, or the more conventional hard-wired approach? In designing an aircraft, to what extent should one incorporate composite materials? When designing an automobile, should one apply very high-speed integrated electronic circuitry in certain control applications or select a more conventional electro-mechanical approach?

It is necessary to (1) identify the various possible design approaches that can be pursued to meet the requirements; (2) evaluate the most likely candidates in terms of performance, effectiveness, logistics requirements, and life-cycle economic criteria; and (3) recommend a preferred approach. The objective is to select an overall **technical** approach, and NOT to select specific equipment, software, and/or components at this stage. There may be many different alternatives; however, the number of possibilities must be narrowed down to a few feasible options, consistent with the timely availability of resources (i.e., personnel, materials, and money). In the absence of a possible feasible solution, it may be necessary to initiate some formal research activity in response.

It is at this early stage in the life cycle (i.e., the conceptual design phase) when major decisions are made relative to adopting a specific design approach. It is at this stage when such decisions will have a significant impact not only on the operational characteristics of a system, but on the production, logistics, and maintenance support requirements as well. It is at this early stage, in the accomplishment of a feasibility analysis, when logistics and life-cycle support factors must be addressed along with the more traditional operating characteristics of a system.

System Operational Requirements

When defining the *operational requirements* for a system, one should commence by addressing the following questions:

1. *What specific function(s) will the system be expected to perform?*
2. *Where are these functions to be performed?*
3. *When, and for how long, will the performance of these functions be required?*
4. *By whom, and for whom, will these functions be performed?*

If your are to "design" a system (and expect satisfactory results), you will need to know specifically how the system will be utilized, by whom, and for how long? In particular, one needs to address the following:

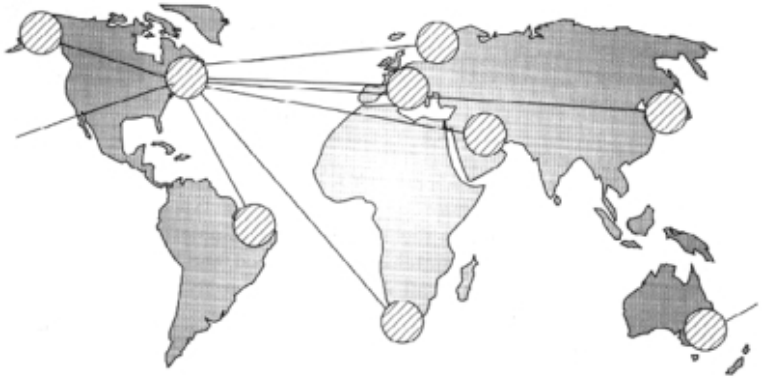
1. *Operational distribution and deployment* - the number of user sites, the geographical distribution and deployment schedule, the type and number of system components at each location, and the length in time of the expected deployment -- where will the system be utilized and for how long? As an example, Figure 1 presents a hypothetical worldwide distribution pattern which, in turn, serves as a basis for the early determination of system support requirements. It is at this point when "trade-offs" are "operational sites" and the location of potential "logistic support" capabilities.

2. *Mission scenarios/operational profiles* - description of the prime mission-related scenarios and operational/utilization profiles, illustrating the "dynamic" aspects in accomplishing a primary and/or secondary mission -- how will the system be utilized and how often? As an example, Figure 2 presents a simple illustration of a few sample profiles. While it is impossible to identify all of the possible operational profiles that will be realized throughout the system life cycle, one needs to describe a few of the more rigorous scenarios, in specific terms, in order to properly *design for reliability, design for maintainability, design for supportability, design for economic feasibility,* and so on. Just defining the operational environment in general broad terms (as often is the case) is not sufficient.

3. *Performance and related parameters* - definition of the basic operating characteristics, or functions, of the system; i.e., the quantitative technical performance measures (TPMs), or metrics, covering such factors as speed, range, accuracy, output, size, volume, weight, throughput, availability, reliability, and related measures of effectiveness -- what will the system be required to accomplish? These TPMs should be related directly to the defined mission scenarios/profiles (e.g., defining a quantitative *availability* requirement in terms of a specific scenario).

4. *Environment* - definition of the environment in which the system and its components are expected to be exposed; i.e., mountainous or flat terrain, arctic or tropics, airborne or ground, temperature, humidity, noise, vibration, shock, salt, sand and dust, etc., as applied throughout both the **forward** and **backward (reverse)** flow of activities shown in Figure 4 in the article, "Logistics In The Context Of The System Life Cycle," published in the November ***SOLEtech*** -- to what environment(s) will the system and its components be subjected during its deployment and operational use and for how long?

In responding to these questions, a **baseline** must be established. Although conditions may change, some initial assumptions are required. For example, system components may be used differently at different locations, the distribution of system components may vary as the need changes, and/or the length of the life cycle may change as a result of obsolescence or the effects of competition. Nevertheless, the information presented as described herein must be available and properly specified so that system design may proceed as planned. While changes may be incorporated subsequently, a good "baseline" needs to be established from the beginning!



Quantity of Systems in Operational Use Per Year

Geographical Operation Areas	Year Number										Total Systems
	1	2	3	4	5	6	7	8	9	10	
North & South America	-	-	10	20	40	60	60	60	35	25	310
Europe	-	-	12	24	24	24	24	24	24	24	180
Middle East	-	-	12	12	12	24	24	24	24	24	156
South Africa	-	-	12	24	24	24	24	24	24	24	180
Pacific Rim 1	-	-	12	12	12	24	24	24	12	12	132
Pacific Rim 2	-	-	12	12	12	12	12	12	12	12	96
Total	-	-	70	104	124	168	168	168	131	121	1054

Figure 1. System operational requirements -- geographical distribution
(source: Blanchard, B.S., Logistics Engineering And Management, 5th Ed., Prentice Hall, 1998, Figure 3.3)

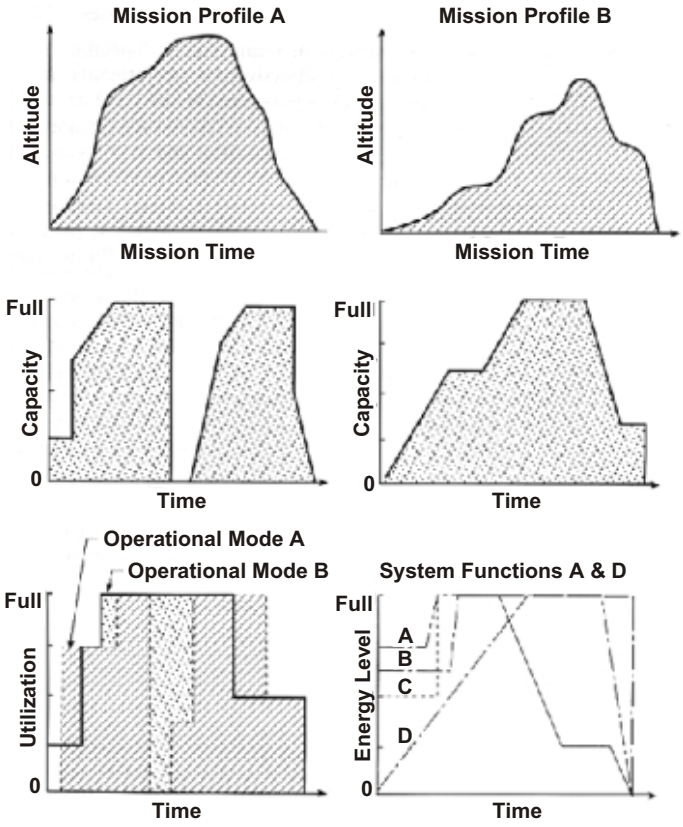


Figure 2. System operational scenarios/profiles -- examples
(source: Blanchard, B.S. & W.J. Fabrycky, Systems Engineering And Analysis, 3rd Ed., Prentice Hall, 1998, Figure 3.4)

The Maintenance Concept

The *maintenance concept* constitutes a "before-the-fact" series of statements and illustrations that deal with the criteria applicable in the design of the maintenance and support infrastructure; i.e., those logistics and maintenance functions, and associated structure, that are inherent within the **forward** and **backward (reverse)** flow of activities shown in Figure 4 in the November ***SOLEtech***. The *maintenance concept* (developed during the conceptual design phase) provides an **input** to design, whereas the *maintenance plan* represents the **result** of design and is developed through the on-going and iterative process of logistics/supportability analysis. When developing the maintenance concept, one should commence by addressing the following questions:

1. *What type (nature) of system maintenance and support is anticipated?*
2. *How often (frequency) and for how long (life cycle) will the system maintenance andsupport capability be required?*
3. *Where, and by whom, will system maintenance and support be accomplished?*
4. *Should the system be designed for two levels or three levels of maintenance?*
5. *To what level in the system hierarchical structure should maintenance (and repair) be accomplished?*

The objective, of course, is to consider the logistics and maintenance support infrastructure as a major element of the system, and to develop such on a concurrent basis and in a timely manner. The *maintenance concept*, which evolves from the definition of "system operational requirements" (with the appropriate "feedback"), provides the necessary emphasis for this very important element of the system. More specifically, one needs to address the following:

1. *Levels of maintenance* - corrective and preventive maintenance may be accomplished on the system itself (or an element thereof) at the user's operational site, in an intermediate shop located relatively near the operational site, and/or at some designated remote facility (e.g., manufacturer's or supplier's plant, third-party maintenance facility, or military depot). As an example, Figure 3 presents what might constitute an effective infrastructure for a given system. In this instance, three levels of maintenance have been assumed, along with an indication of the resources that may be required to support each level of activity. The anticipated frequency of maintenance, the type and complexity of tasks to be accomplished, personnel skill-level requirements, special facilities and support equipment needs, and so on, will, to a great extent, dictate the specific maintenance functions to be accomplished at each level.

2. *Repair policies* - within the constraints of the infrastructure in Figure 3, there may be a number of different possible repair policies specifying the extent to which maintenance of a system component will be accomplished (if at all). A repair policy may dictate that an item should be designed to be *non-repairable, partially repairable*, or *fully repairable*. Repair policies are initially established (through accomplishing early level-of-repair analyses), design criteria are developed, and system/component design progresses within the bounds of the repair policy that is selected. As example of a *repair policy* for a system is illustrated in Figure 4. Again, the anticipated frequency of maintenance, the complexity of tasks, the personnel skill-levels required, safety, cost, and related considerations will influence the ultimate decision.

3. *Performance and related parameters* - consistent with the definition of the basic operating characteristics of the prime mission-related elements of the system, it is necessary to establish the corresponding quantitative performance and associated effectiveness figures-of-merit (i.e., TPMs/metrics) for the logistics and maintenance and support infrastructure as well, particularly since whatever is established for the latter must, of course, support what has been specified for the former. For example, the applicable *MTBM, MTBF, M-bar, MLH/OH, Design LCC, TAT, Transportation Times*, etc., shown in Figure 4 must directly support the overall effectiveness requirements for the system, must be developed in conjunction with these system-level requirements, and must be established as **designed-to criteria** from the beginning.

4. *Environment* - definition of the environment as it pertains to logistics and the maintenance and support infrastructure; i.e., temperature and humidity, shock and vibration, noise, etc., as it applies to the **forward** and **backward (reverse)** flow of activities shown in Figure 4 in the November ***SOLEtech***. Sometimes, one will find that the environmental conditions during the accomplishment of maintenance and support activities are more rigorous than what is experienced during normal system operations and, of course, this possibility must be addressed in the design process.

The maintenance concept, which is often ignored altogether until later on and "after-the-fact," provides the basis for establishment of the *design for logistics and supportability* requirements, which should be specified from the beginning

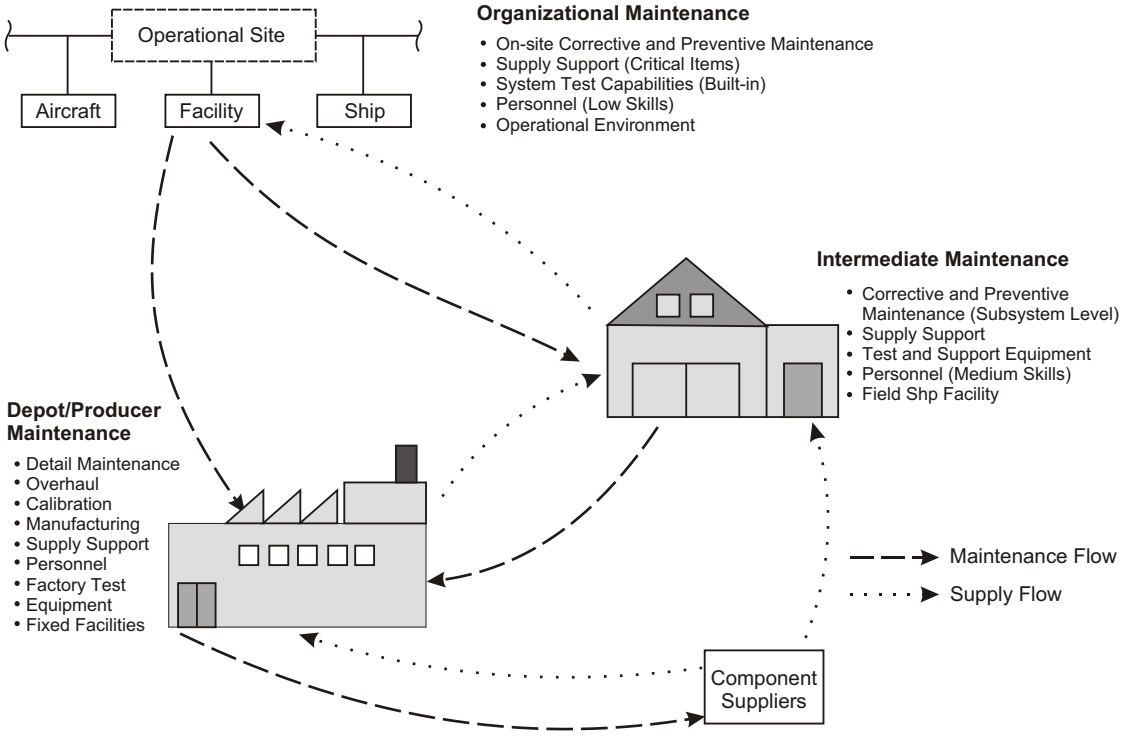


Figure 3. System maintenance and support infrastructure example (source: Blanchard, B.S. & W.J. Fabrycky, Systems Engineering And Analysis, 3rd Ed., Prentice Hall, 1998, Figure 3.5)

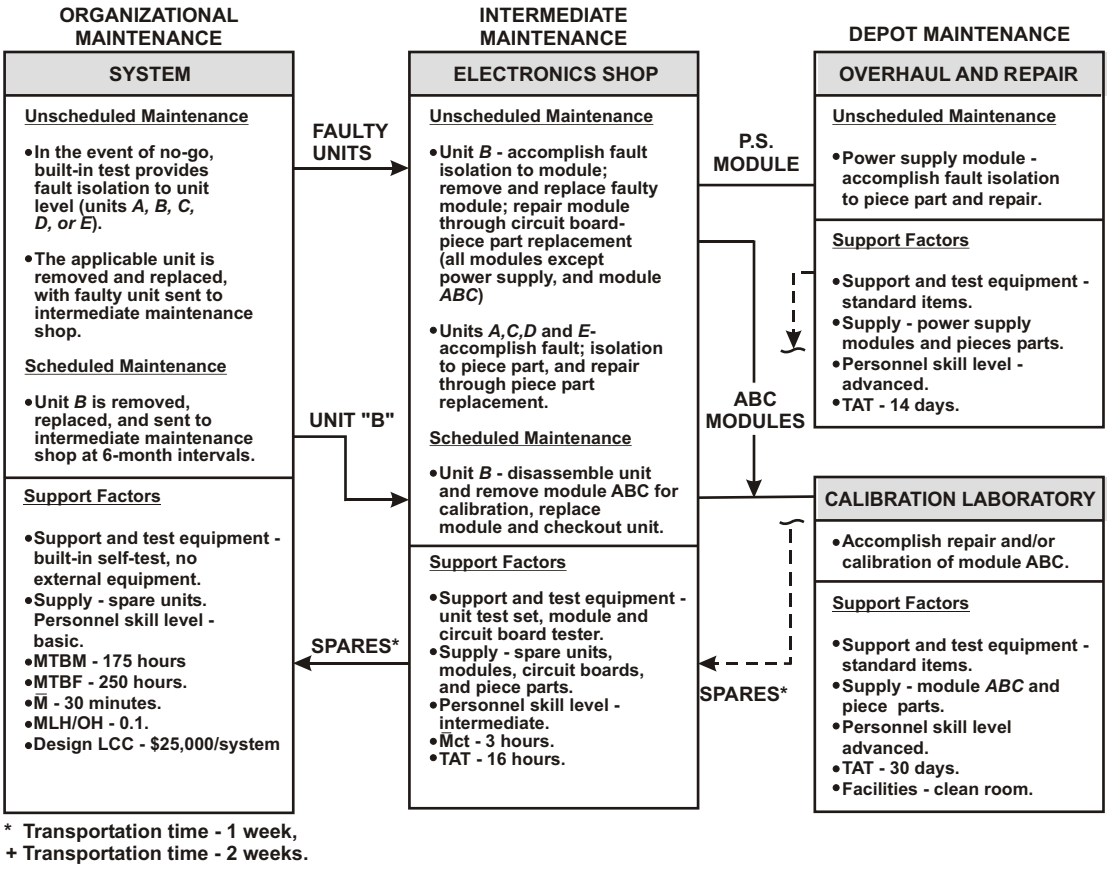


Figure 4. System maintenance and repair policy - example (source: Blanchard, B.S. & W.J. Fabrycky, Systems Engineering And Analysis, 3rd Ed., Prentice Hall, 1998, Figure 3.7).

during the conceptual design phase early in the system life cycle. Not only do these requirements impact the prime mission-oriented elements of the system, but they provide guidance in the design of the development of all of the elements of logistics as described in my article, "Logistics In The Context Of The System Life Cycle," published in the November ***SOLEtech***. Additionally, the maintenance concept forms a baseline for the detailed maintenance plan which, in turn, is prepared during the later stages of system detail design and development.

Summary

In summary, the intent herein has been to provide a brief review of some of the early steps necessary, as an integral part of the system engineering process, in defining the basic requirements in the design and development of any type of system. These steps are equally applicable whether we are addressing an aerospace system, a communications system, an information system, a healthcare system, a manufacturing system, or whatever. Once again, the emphasis is on the system *logistics and maintenance support infrastructure*, which must be addressed as an inherent element of the system and from the beginning. As conveyed in earlier messages, there is nothing new here -- we just don't implement good engineering design practices by following a *systems life-cycle approach from the beginning!*

What's Next

The objective for the next issue is to continue with the development of system *requirements*, and to concentrate on the *identification and prioritization of technical performance measures (TPMs).*

Transportation Management Focus Group Reveals Top Selection Criteria

The following information was taken from a November 12th (2001) press release by the Georgia Institute of Technology covering a survey involving 16 industry-leading companies in logistics.

The Logistics Institute (**www.tli.gatech.edu**) at Georgia Tech announced the results of a transportation management focus group that included representatives from 17 companies. The focus group, conducted as a part of the Logistics Management Series of courses at the Logistics Institute, examined key performance indicators and top selection criteria for choosing transportation modeling tools, distribution sites, freight forwarders, and carriers. Dr. Ed Frazelle, Director of the Institute's Logistics Management Series and President of Logistics Resources International, facilitated the transportation management focus group. The group included representatives from American Cancer Society, Avon Products, BP, CCW Logistics, FedEx, Fleetguard, Invitrogen (Life Technologies), Kraft Foods, Office Depot, PCS Nitrogen, PPL Services, Riverwood ShipChem, Tiffany, U.S. Defense Logistics Agency, U.S. Department of State, and Verizon Logistics. The focus group addressed the following questions and concluded with the following findings:

1. **What are the most important performance indicators for transportation?**
   The results, in order of priority, are: (1) on-time pickup and delivery; (2) total transportation costs; (3) quality/damage claims; (4) safety; (5) asset utilization (fleet, cube, etc.); (6) perfect documentation; (7) communication (info-sharing, tracking,customer feedback, etc.); (8) turnover of transportation personnel; and (9) customer complaints.

2. **What are the most important criteria to use when choosing a logistics network modeling tool?**
   The results are: (1) total cost of software, hardware, and implementation; (2) system compatibility/interfaces; (3) functionality/degree of sophistication; (4) customer service/support; (5) ease of implementation; (6) modeling flexibility; (7) graphics;(8) upgrades; and (9) track record/success.

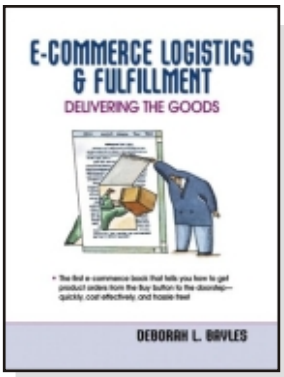
3. **What are the top criteria for choosing a distribution site within a county?**
   The results are: (1) real estate (availability, costs); (2) labor (availability, costs); (3) infrastructure (roads, airports, rail, etc.); (4) proximities (customers/suppliers); (5) taxes/local regulations/political environment; (6) quality of life; and (7) development/expansion capability. (8) upgrades; and (9) track record/success.

4. **What are the top criteria for choosing a freight forwarder?**
   The results are: (1) cost; (2) tracking capabilities/IT; (3) reputation; (4) experience; (5) origin/heritage; (6) scope/geographic coverage; (7) expertise in a specific region; (8) customer service /7x24x365/ responsiveness; (9) relationships with carriers; (10) knowledge of language/customs; (11) capacity; (12) communication; (13) documentation accuracy; (14) claims; and (15) import/export consolidation capabilities.

5. **What are the top criteria for choosing a carrier?**
   The results are: (1) on-time delivery; (2) cost; (3) safety; (4) tracking/communications;(5) reliability; (6) reputation; (7) claims; (8) service range; (9) company stability (financial/years in business); (10) quality of operating personnel; (11) area coverage; (12) backhauling capability; (13) equipment availability; (14) security; (15) driver representation/retention; (16) transportation infrastructure; (17) traffic lanes/services and speed; and (18) scheduling flexibility.

The institute's focus groups are conducted as part of its professional education programs. Each focus group addresses keys issues in supply chain management, inventory management, transportation management, warehouse management, global logistics, and third-part logistics. For additional information, please contact Tammy Artosky, Manager, Logistics Management Series, The Logistics Institute at Georgia Tech (tel: 404-894-1713; e-mail: **tammy.artosky@isye.gatech.edu**).

Book Reviews



E-Commerce Logistics & Fulfillment: Delivering The Goods

Bayles, Deborah L., Prentice Hall, Upper Saddle River, NJ, 2001 (ISBN: 0-13-030328-3)

by Dr, Lloyd H. Muller, CPL, SOLE's Director Of Education

Many books are saturating the market on the wonders of e-commerce or e-business. Most of them are merely advertising vehicles for consultants in that they extol the virtues of this phenomenon without going into details. Of course, the purpose of all of this is to excite entrepreneurs about entering this field and then contracting the author to help. This book is different.

Deborah Bayles is also a consultant and would love to have entrepreneurs hire her expertise, but her book offers specific ideas about entering the business venue. She also provides guidance on finding more information that will be needed by any e-commerce logistician. As such, her book is an invaluable addition to the library of anyone wanting to start a business.

Here are some issues discussed in her book. She starts with a broad overview of this new business venue. How does the internet alter traditional business practices? From there, she leads the reader through a review of rules and regulations, privacy issues, children, and the internet. Once the reader understands the broad legal aspects of the business medium, she covers the basic financial commitments that must be expected to include taxes, fraud, and credit card processing.

Customer service then gets a big play as this is the keystone for success. If customers are happy, they will provide the return business so badly needed to sustain success.

Logistics as we understand the term is introduced. It is important that she do so when she did, because logistics without a firm business foundation is an effort going for naught. Logistics must support the business plan and without this context, all logistics efforts will fail. Ms. Bayles is very clear on this point.

An important part of the business plan is accepting returns and logistics plays a critical role here. "Reverse Logistics" is a fact of life for an e-commerce enterprise. By year 2004, she estimates that returns will be valued at $12 billion. Customers buying on-line do not have the opportunities to examine goods as much as at traditional stores. Therefore, return rates tend to be high, thereby generating the extraordinary costs cited above. The question then, is how to absorb this fact of life without destroying the business. Ms. Bayles discusses options in clear detail.

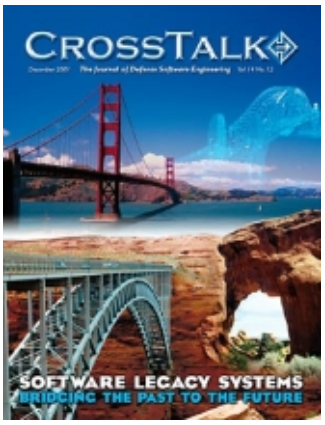
Finally, she discusses the possibility to outsource all of these activities, thereby leaving the entrepreneur as a marketer of products. She cites Nike and Hewlett Packard as two companies who opted for 3PL services so that they could concentrate on their core strengths. But, despite the successes of these two companies, there are downsides that Ms. Bayles presents about outsourcing. When the reader is done, the choices are clearly outlined.

Earlier, I touched on how Ms. Bayles offered specific guidance on finding more information. Among these resources are dozens of web addresses and titles of books and articles. She also provides an excellent range of checklists that planners should develop and use before embarking on avenues of action.

In summary, if anyone is convinced that e-commerce is the way to go in business, then E-Commerce Logistics & Fulfillment should be required reading. It will provide the basis for asking many, many more, questions that must be answered if a new venture is to be a success.

Elsewhere . . .

CrossTalk - The Journal Of Defense Software Engineering



The theme of the December 2001 issue (Vol. 14, No. 12), published by the Software Technology Center (STSC), Ogden Air Logistics Center, Hill AFB, UT 84056-5205 (**www.stsc.hill.af.mil**) is "Software Legacy Systems: Bridging The Past To The Future." Includes in this issue are the following articles which may be of interest: *Reengineering: An Affordable Approach For Embedded Software Upgrade* by Kenneth Littlejohn, Michael V. DelPrincipe, Jonathan D. Preston, and Dr. Ben A. Calloni; *The IULS Approach To Software Wrapper Technology For Upgrading Legacy Systems* by Dr. David Corman; *A COTS-Based Replacement Strategy For Aging Computers* by Jahn A. Luke, Douglas G. Haldeman, and William J. Cannon; *Automated Transformation Of Legacy Systems* by Philip Newcomb and Randy A. Doblar; and *Balancing Discipline And Flexibility With The Spiral Model And MBASE* by Dr. Barry Boehm and Dr. Daniel Port. For additional information, visit the web site **www.stsc.hill.af.mil.**

CLM Web Site Updated

The web site for the Council of Logistics Management (**www.clm1.org**) has recently been updated and includes the following information: *executive committee organization chart, membership profile, CLM presidents, press contacts, committee member information, roundtable event dates, roundtable guidebooks and brochures, links to certification programs, careers in logistics, 2001 conference book display listing, 2001 conference cassette order form, information on CLM's research in progress, three new case studies, and links to schools that offer logistics-related coursework (education).*

Calendar of Events

1. *2002 Annual Reliability And Maintainability Symposium (RAMS) - The International Symposium On Product Quality And Integrity*, sponsored by 10 technical societies (to include SOLE), Seattle Westin Hotel, Seattle, WN, January 28-31. The theme is "Beyond 2001: The Reliability And Maintainability Odyssey Continues." There are 22 tutorials, 21 paper sessions, and seven panel sessions scheduled for this four-day event. Contact L.M. Rabon, 2002 RAMS General Chair (**wrabon@belvoir.army.mil**) or Dr. Raymond W. Sears (tel: 603-863-2832; e-mail: **r.w.sears@ieee.org**).

2. *Enterprise Supply Chain Summit*, organized by Synergy Summits, Sheraton El Conquistador Hotel, Tucson, AZ, February 4-6. For additional information, contact Suzanne Costa at 312-977-1426, or visit **www.ESCSummit.com.**

3. *International Conference ON COTS-Based Software Systems*, Orlando, FL, February 4-6. Visit web site **www.iccbss.org.**

4. *9th Annual Technical Conference - Florida LOG 2002*, sponsored by the Florida SOLE Chapters, Delta Orlando Resort, Orlando, FL, February 15-16. The theme is "New Logistics Visions." The General Chair is Ray Hoopes (**rthoopes@aol.com**), the Technical Program Chair is Gaines Corbett (**gaines.w.corbett@lmco.com**), and the Registration Chair is Michele Smith (**michele.smith@honeywell.com**). Please contact any of the above for more information.

5. *18th Annual DoD Logistics Symposium And Exhibition*, sponsored by the National Defense Industrial Association (NDIA), Jacksonville, FL. March 11-14. Contact Sam Campagna at 703-247-2574, or call the Operations Department at 703-522-1820.

6. *4th Annual Mid-Atlantic Professional Development Workshop And Technical Conference*, sponsored by the SOLE Chapters in District 2, Holiday Inn, 1815 West Mercury Blvd., Hampton, VA 23666-3229, April 12-13. The theme is "Logistics Beyond 2002." The General Chair is Richard Smith (**smithlog@att.net**), the Technical Chair is Eric R. Nelson (**ernelson57@hotmail.com**), and the Registration Chair is John Davids (**john_h_davids@mail.northgrum.com**). Also, visit web site **www.mid.atlantic-log.addr.com**. For additional information, contact any of the above.

Calendar of Events *(Concluded)*

7. *11th Annual TACOM/Industry Logistics Symposium - "Innovative Logistics-Achieving The Army Transformation*,"sponsored by the U.S. Army Tank-Automotive And Armaments Command and NDIA, Northfield Hilton Hotel, Troy, MI, April 16-18. For additional information, contact Cherice Carter, TACOM Co-Chair (810-574-4175), or Ignacio Cardenas, NDIA Co-Chair (810-574-8250).

8. *14th Annual Software Technology Conference*, Salt Palace Convention Center, Salt Lake City, UT, April 28-May 2. The theme is "Forging The Future Of Defense Through Technology." Visit web site **www.stc-online.org** and/or call 800-538-2663.

9. *Institute Of Industrial Engineers (IIE) Annual Conference 2002*, sponsored by the IIE, Hilton Hotel, Walt Disney Resort, Orlando, FL, May 20-22. For additional information, contact **cs@iienet.org** and/or visit web site **www.iienet.org.**

10. *International Conference Of Maintenance Societies (ICOMS-2002)*, organized by the Maintenance Engineering Society of Australia (MESA), Hilton Hotel, Brisbane, Queensland, Australia, May 21-24. The theme is "Changing The Future." The Conference will include a variety of workshops and exhibits, in addition to many technical paper presentations. Papers presented in Brisbane will be broadcast simultaneously to a conference venue at the Central Queensland University's campus in Gladstone. For further information, contact Sally Nugent, P.O. Box 634, Brentford Square, Victoria 3131, Australia (**icoms@corrprev.org.au**) and/or visit web site **www.mesa.org.au.**

11. *EUROMAINTENANCE 2002: 16th International Maintenance Congress*, Helsinki, Finland, June 3-5. For additional information, contact Hannu Vallanen (tel: +358 9276 7688; fax: +358 9290 0081). Also visit **http://www.kunnossapito.fi/Congress/call-pap.htm.**

12. *8th IEEE International Symposium On Software Metrics (Metrics 2002)*, Ottawa, Canada, June 4-7. Visit web site **www.software-metrics.org.**

13. *12th Annual International Symposium On Systems Engineering,* sponsored by the International Council On Systems Engineering (INCOSE), Riverina Hotel, Las Vegas, NV, Jule 28-August 1. The theme is "Engineering 21st Century Systems: Problem Solving Through Structured Thinking." For further information, contact INCOSE Headquarters at **incose@halcyon.com** and/or visit web site **www.incose.org.**

14. *2002 International Military And Aerospace/Avionics COTS Conference, Exhibition, And Seminar*; sponsored by Johns Hopkins University - Applied Physics Lab, Naval Surface Warfare Center - Crane; and the Jet Propulsion Lab; Mission Valley Marriott Hotel, San Diego, CA, August 7-9. For additional information, contact Edward B. Hakim (tel: 732-449-4729; fax: 775-855-0847; e-mail: **ebhakim@bellatlantic.net.**

15. *37th Annual International Logistics Symposium: Technical Workshop, Conference, And Exhibits (SOLE-2002)*, Point South-South Mountain Resort, 777 South Mountain Parkway, Phoenix, AZ 85044, August 10-15. The theme is "21st Century Logistics: The Global Bridge." For additional information, contact John Davis, General Chair (**JDavisCPL@aol.com**) or SOLE Headquarters (**solehq@erols.com**).

16. *15th International Congress & Exhibitions On Condition Monitoring And Diagnostic Engineering Management (COMADEM)*, University of Birmingham, Birmingham, United Kingdom, September 2-4. The theme is "Innovative Trends & Sharing Best Practices In World-Class Manufacturing And Industrial Assets Management." For additional information, contact Professor Raj. B.K.N. Rao (**rajbknrao@btinternet.com**) and/or visit web site http://**www.comadem.com.**

17. *18th International Logistics Congress,* sponsored by SOLEurope and hosted by the Munich Chapter, Munich, Germany, October 6-9. For further information, contact Geoffrey Bonosevich (**geoffrey.bonosevich@at.siemens.de**) and/or SOLE Headquarters; or go to **www.soleurope.org/congress.htm** (**solehq@erols.com**).

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