The Integrator

INCOSE North Star Chapter

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North Star Newsletter

INCOSE North Star Newsletter Communication

Ed Anderson will be providing a series of articles on alternative transportation this year. His third article in the series follows under "Systems Engineering at its Best!" Contact Eileen.Arnold@incose.org to contribute additional articles, topic suggestions, and usable information for this Newsletter.

Eileen Arnold, Editor BAE Systems

"A good scientist is a person with original ideas. A good engineer is a person who makes a design that works with as few original ideas as possible"
- Freeman Dyson

Systems Engineering at its Best!

This is the third in a planned series of articles on the Systems Engineering behind the development of a much improved form of urban transportation. The process was started many years ago by a few engineers who did something about the oft-repeated conjecture: "There must be a better way to move around in cities!"

Steps in the Development of a New Way to Move People in Cities

Following is a list of general criteria needed to guide the design of a new form of urban people movement, one aimed at answering the oft repeated observation "There must be a better way." In 1989 the chairman of the Chicago Regional Transportation Authority commented that he could not solve the problems of transportation in Chicago with more highways and more conventional rail systems. There must be, he commented, a rocket scientist out there somewhere with a better idea. The criteria listed below resulted from years of observation, analysis, discussion and debate about the urban transportation problem by a

Continued on page 2

Chapter Presidents Corner

Bob Hunter ATK

I hope that you have been enjoying this year's chapter events as much as I have. We've had a number of good presentations on specific topic areas and an overview of the educational programs available to us here in the Twin Cities. The chapter board is currently working on the program for the second half of the year which will focus more on the 'ilities."

We are also making plans for the fall tutorial. We will have a formal topic announcement soon, but I can tell you that we will, for the first time, be issuing Continuing Education Units (CEUs). These CEUs can be used to satisfy the continuing education requirements for registered professional engineers.

I remind you that we are always looking for new topics for programs and tutorials. We recently distributed a survey on potential tutorial topics. Please be sure to take a look at it, think about what would interest you and your employer and send us your feedback. Your input is required for us to be able to bring you the most professionally beneficial experience possible.

I was recently kicking around the International web site and noticed the community resources page. This page features two systems engineering books (**Engineering Complex Systems with Models and Objects** by David W. Oliver, Timothy P. Kelliher, and James G. Keegan, Jr., 1997 and **The Systems Approach: Fresh Solutions to Complex Problems Through Combining Science and Practical Common Sense** by Simon Ramo and Robin K. St.Clair, 1998.) which you can download for free. Be sure to check this site regularly for other interesting information.

Which reminds me, thinking of the international organization, don't forget that it is membership renewal time; check your dues reminder for instructions on how to renew on-line. Individual members qualify for the Senior category if they are at least 64 years of age at the start of the membership year (June 1) and have maintained their individual membership for the five membership years prior to applying for the Senior category.

Continued from page 1

wide variety of individuals. Site planning must be included. It is the only way to appreciate all of the problems. The most successful people worked in interdisciplinary teams not biased in favor of conventional transit systems.

It has been necessary to consider without prejudice a new transit system as a field of criteria and possible characteristics. For example, suspension is a characteristic. Possible methods within it could be wheels, air, magnetic fields, sled runners, sky hooks, etc. Once identified, the systems engineer must list within each, the possibilities or alternatives, such as the way a vehicle can be suspended. He or she must then study each of the alternatives in sufficient detail that the choice becomes obvious to all who understand the process. The systems engineer must not become fascinated with specific technologies, but must view each with the same degree of objectivity. Failures of various attempts to find a new solution almost always have pointed to an unfortunate lack of objectivity or impatience to build something too soon. Once built, the designer becomes stuck with the solution. Experience has shown that he/she has never been able to convince the investors that they are better off starting over. Such an exacting process is called “Morphology” and was made famous by Cal Tech Professor Fritz Zwicky during WWII through his book “Morphology of Propulsive Power.” Criteria for the transit systems follow:

- The system must be genuinely attractive to auto users.
- Capital and operating costs must be low, desirably low enough to be recovered by fares.
- The system must be visually acceptable.
- The energy efficiency must be high.
- The land requirement must be small.
- The system must meet accepted ride-comfort standards.
- The design must meet the requirements of the Americans with Disabilities Act.
- The system must be available at all hours of the day to everyone.
- The trip time must be competitive with auto trips.
- The system must be designed to perform in a typical urban environment, which includes temperatures from -40 deg F to +120 deg F, dust, rain, snow, ice, salt air, and winds.
- The system must operate in winds up to at least 60 mph, with degraded performance permissible at the higher wind speeds; and must withstand hurricane winds with its vehicles stored in winds above 60 mph.
- The system must be designed to horizontal accelerations experienced in earthquakes, a

specification of course site dependant.
- The system must be able to operate using renewable energy sources.
- The air and noise pollution must be very low.
- As little material as possible must be used.
- The new system must be at least two orders of magnitude safer than present systems.
- There must be less than about 1 hour of delay in every 10,000 hours of operation.
- The system must not be an attractive target for terrorists.
- The system must not compromise personal security and privacy.
- The system must be expandable without limit.

Meeting these criteria has required a great deal of optimization, a process that is too often ignored, mainly because it requires a good deal of engineering mathematics. Specific criteria needed to design the various subsystems come later. If the reader wishes to jump ahead, punch my name into Google and read the debate papers.

J. Edward Anderson

2006 Meeting Calendar

13 July	**INCOSE International Symposium**	Orlando, FL
10 August	**Summer Social and Symposium Debrief**	Anderson Renewal
7 September	**Environmental Engineering**	Environ Labs
12 October	**Logistics and Life Cycle**	Eaton
9 November	**Human Engineering**	Eco Labs
14 December	**Member Holdiay Party + Guest**	

Hope to see you in Orlando! North Star Leadership