

## Reliability By The Numbers

Written by Terrence O'Hanlon, ReliabilityWeb.com  
Tuesday, 01 April 2003 20:35

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In the early years of aviation, pilots would fly only in daylight, or when the weather was clear so they could see a road or other landmarks. Now pilots use advanced computer guidance systems and sophisticated instrumentation. Today's professional pilot would reject yesterday's logic of visible flying as obsolete. One now pilots an airplane by the numbers. Flying is more science than art.

Unfortunately, maintenance decisions in many plants still rely on a clear line of sight or other obvious landmarks to determine priority. Precious maintenance resources are spent reacting to immediate conditions that negatively affect production. Maintenance managers use daily emergencies to navigate maintenance activities. Today's maintenance management often resembles the pilot practices of yesterday.

Proactive techniques such as reliability centered maintenance (RCM) were originally designed to ensure reliable aircraft operation and have recently been applied to industrial maintenance management. In many cases,

RCM

treats the industrial plant like an aircraft and requires that all systems, no matter how insignificant, be evaluated for possible failure modes. Addressing any and all failure modes can require a great deal of time and energy from subject matter experts (who are usually already busy doing their normal jobs). It is during this resource-intensive process that many RCM initiatives fail.

However, if you want a great deal of bang for the reliability buck you may want to look at some of the statistical methods for reliability from noted experts such as Dr. Robert Abernethy, Wes Fulton, and Paul Barringer. Fortunately, these enlightened professionals have published web sites with a virtual treasure trove of information and resources.

Statistical reliability approaches focus your efforts on the failure modes that cost the most money, separating the vital few from the trivial many like a laser-guided missile.

Barringer has more than 35 years of engineering and manufacturing experience in design, production, quality, maintenance, and reliability of technical products. Note his experience in both the technical and bottom-line aspects of operating a business with an understanding of how reliable products and processes contribute to financial business success.

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According to Barringer, "Reliability and money are a wonderful combination—one hand washes the other. The problem of life cycle cost is to know when things fail so you can price-out the failure costs with an Excel spreadsheet for life cycle cost considering the time value of money in NPV calculations. You find when things will fail by exercising the reliability calculations."

The Barringer & Associates [web site](#) features a generic Weibull database for many popular systems as well as a challenging "Problem of the Month." A new problem concerning reliability issues is posted on the site each month, and a solution is proposed. The problem is designed to test and challenge your knowledge of statistical reliability methods.

Additional information on the site includes reliability and life cycle cost, Crow/AMSAA Reliability Growth Plots, and a great article about the cost of unreliability that you may want to copy and place in your boss's inbox.

Do not miss the [paper](#) that states that availability IS NOT equal to reliability except in the fantasy world of no downtime and no failures .

Another great site is <http://www.weibullnews.com> , the official web site of Dr. Bob Abernethy and Wes Fulton. Abernethy wrote the first Weibull Handbook; Fulton wrote the first widely used Weibull software. They have been developing Weibull PC software for more than 20 years, much longer than anyone else.

The site contains an incredible amount of information about Weibull analysis, created by Walodi Weibull, a renowned Swedish engineer. Be sure and visit "The Weibull World from A to Z" for more information about Monte Carlo Simulation and Confidence, a special technique for simulation made possible with fast computers. It is used as a prediction tool and can provide a reference for analytical techniques. You can also learn more about Weibull analysis. Weibull has the special capability to diagnose failure types such as infant mortality (particularly for electronics), age-independent (accidents and natural occurrences), or wear-out type mechanisms (bearings, filters, etc.).

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Join the ranks of professional pilots who use information and numbers to navigate accurately and use statistical reliability methods and tools to land your maintenance department on a world class runway.

Both of these sites and more are on the Reliabilityweb.com Top 100 list of maintenance and reliability web sites. **MT**

### **Internet Tip: E-mail Web pages**

Have you ever visited a web site only to wish you could show it to a friend or a co-worker who you know would find it interesting?

If you use Internet Explorer (IE) and your e-mail client (Outlook, Eudora, etc.) is set for HTML, it is easy to send a link or an entire web page by e-mail:

- From the IE menu bar select File
- Select Send
- Select Page by E-mail or Link by E-mail

Either option will invoke your e-mail client and create the web page or link so you can input an e-mail address and send.