

# Weibull News

## From: Dr. Bob



Second Edition

January, 1990

**Weibull Analysis...Fifty Years Old!!** Weibull published his first paper on the Weibull Distribution in 1939...Fifty years ago. He had actually applied it in 1937, but it took Weibull two years to figure out why it worked (according to a friend at NASA LEWIS, Mr. Erwin V. Zaretsky, who knew Professor Weibull). It discourages me that 50 years later most universities still do not teach Weibull Analysis.

**Do the Dauser Shift...**you will recall the Dauser shift is used when we know the times to failure on the failed parts but we do not know the times on the suspensions. The procedure is easy with WeibullSMITH. Input the failure data and view the Weibull plot. Calculate the proportion of the fleet that has failed, "p". and use the exponential formula to estimate the % failed:

$$p = (1 - e^{-p}) \times 100, MTF = \frac{\sum (T_i)}{N_f}$$

Calculate the mean-time-to-failure from the sum of the failure times divided by the number of failures. On the main menu, use the line plot option to over plot the Fleet Weibull with the failure Weibull. The line plot option is point and slope (beta).

**Word Perfect Grabs WeibullSMITH Plots...** Mr. H. Paul Barringer, Director of Manufacturing, for the Hydril Corporation, wrote to provide a great contribution. Word Perfect 5.0 & 5.1 have a function called Grab.Com. If you execute Grab.Com in your Word Perfect directory before executing WeibullSMITH, you may "grab" the plots into Word Perfect reports. Further, you can scale in both directions to any size desired. I output to my new Hewlett Packard Laser IIP. The procedure is to select CGA monitor & press ALT-Shift-F9 when you have the plot on the monitor. A box appears around the plot. You may move the box with the arrow keys and expand the box with Shift-arrow keys. Then press enter and your graphic will be stored in the current director. Retrieve with Word Perfect. Thank you, Paul.

**Binomial Reliability Demonstrations...**The Poisson is an excellent approximation to Binomial when N is large and p is close to one (or zero). For zero failure demonstrations, the first term of the Poisson and the Weibull with Beta = 1.0, are identical. Therefore, we should be able to employ the Test Requirements option of WeibullSMITH, to design zero failure reliability and quality control demonstrations. Select Test Requirements option, select reliability, beta = 1.0, length of test = 1.0, number of units 2300, confidence = 90%, and determine the lower one-sided confidence bound for reliability.

**LogNormal vs Weibull...**I have been generating log normal data sets from WeibullSMITH's new Monte Carlo option and MINITAB. I compare the three parameter Weibull with the log normal probability paper plot. Conclusions: the three parameter WeibullSMITH correlation coefficient agrees with the log normal correlation coefficient within plus or minus 1%. Does anyone have any data sets that show a larger advantage for the log normal? If so, please send me a copy of the data. With the new LogNormalSMITH program this research will be much easier.



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**From the Editor...** Thank you for your many letters of encouragement and interesting information about Weibull Analysis. I like to hear from you!

SAE will be marketing the new upgraded WeibullSMITH. Wes Fulton and I will be demonstrating the new package at the SAE International Congress in Detroit, February 26th to March 2, 1990. Wes has really outdone himself on this new version. Lots of good things, come see, stop by and say hello...

Please feel free to duplicate the *Weibull News* for your group. Tell your friends to drop me a line labeled "mailing list" if they would like to receive their own copy.

**Letters to the Editor...** Do you have any good contributions, tips, problems, strange data, comments on the Weibull News, that you would like to share with our readers?

Several readers would like to be able to network with their peers in their industry or everywhere. Trade ideas, solutions, problems... They have asked me to include my reader's names, addresses, and telephone numbers in the Weibull News. Weibull/RMS Engineering networking. Why not? If you agree that this is a good idea, and would like to be included, drop me a line with your address and phone number, labeled "Weibull Network".

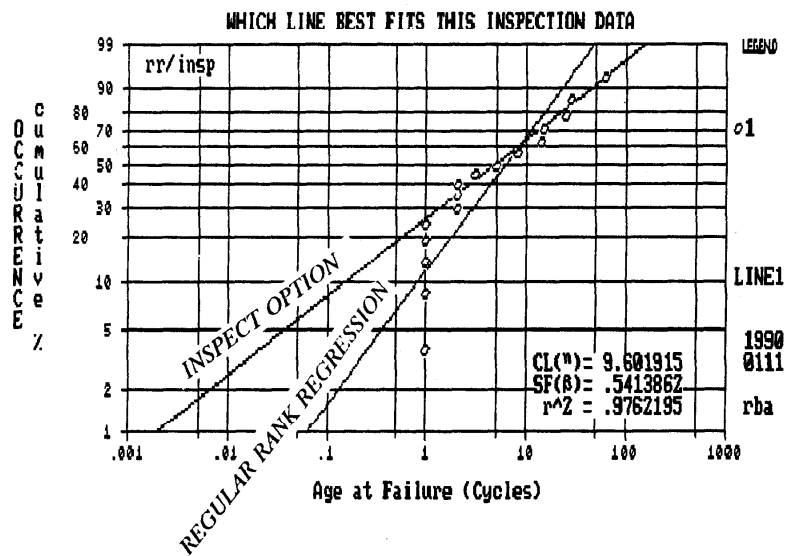
**"Playtime with WeibullSMITH"...** This new PC tutorial is a major addition to the workshops. The students gain hours of hands-on experience interpreting all kinds of Weibull plots, reinforcing the methodology. For on-site workshops, special "Playtimes" based on client data bring the applications into the student's backyard. A four day workshop doubles the "Playtime" and allows more seminar discussion of the students problems.

**Public Workshops...** ■ ASME (212) 705 7123, Measurement Uncertainty, New Orleans, February 19-21, 1990.

■ SAE (412) 776 4841, Weibull, Detroit, February 28-March 1,2

■ Society of Reliability Engineers (504) 389 8410, One Day-Weibull, Baton Rouge, March 7.

■ Space Institute & ASME (615) 455 0631, Weibull, April 4-6 & Measurement Uncertainty, April 9-11.



**Inspection Failure Data...** Failures found at inspections produce some real "dirty" data. If you look at the plot above, ("Grabbed" with Word Perfect), you will notice the vertical sets of points. These failures occurred before the inspection, so their times to failure are in error. The uppermost point should have the minimum error. Therefore, some analysts recommend fitting the least squares line to the uppermost points only. We have discussed the idea with many of you and received a favorable response. Wes Fulton has responded with a new option, called INSPECT, which should provide much more accurate analysis. If you have inspection data, try this option and let me know what you conclude.