Reliability & Risk Division
The Global Voice of Quality®

Reliability & Risk Newsletter

December 2020 Edition

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Editor'S NOTE

Trevor Cranney
Chair, ASQ Reliability & Risk Division

Chair's Message

Well… this message comes to you with the hope of seeing the end of this pandemic near. Planning for this year was difficult with everything being virtual. With our webinar team, led by David Auda, continuing the excellent monthly webinars, we were able to continue this very desirable regular learning activity. With almost every webinar, we receive emails with people looking for their RUs. With live webinars, this RU email comes automatically a day after the completion of the webinar. For our recorded webinars – for which we have hundreds available – we have often been asked how one can get RU credits for these. Our Chair-Elect Tim Gaens is currently working on updating our website (www.asqrd.org) to add an automated RU certificate generator when you watch our recorded webinars. We had a similar capability in the past. It required a login and was obviously for division members only. We are upgrading this so that it will be functional for anyone. We expect this functionality to be operational by early 2021

. For our live face-to-face events, our conferences, we were left with the only option to cancel RMMR for both 2020 and 2021. We are looking at options for running RMMR virtually in 2021, but switching formats is actually a fairly difficult undertaking and we do expect the conference back to normal in 2022 with the positive news about vaccines. Our primary conference we co-sponsor, RAMS, remains on schedule as planned for a live face-to-face event in January. The RAMS Management Committee has rigorously prepared, in conjunction with the conference hotel, to make RAMS a safe venue for learning, sharing and networking. While I suspect attendance may be down a bit from recent years, I am optimistic of RAMS being a positive experience and useful conference in January. I hope you can attend and enjoy it.

As our division leadership serves two-year terms, our leaders will be unchanged for 2021. Tim Gaens continues as Chair-Elect, preparing to take over as Chair in Jan '22, and Rong Pan continues his current role as Secretary. ASQ continues to manage through this downturn and make changes to prepare for growth in activity as we emerge from this slump. We are using virtual meetings wherever possible. We have in fact been entirely virtual this year since RAMS in January. While in-person activities and meetings will still take place in the future, I believe they will be minimized as many have adopted virtual as an adequate means to communicate while saving time and money on travel.

For a brief update on current plans, please go to page 2…

ASQRRD Plans for 2021

- RAMS 2021 is still planned to be run as an in-person conference in Orlando, FL with no virtual attendance option.
  - There will be no division meeting or awards dinner this year.
- We currently have a business plan and budget for next year. However, as RAMS is our biggest activity of the year and takes place in January, we will have a better idea of financial planning for the remaining eleven months of 2021 after the conclusion of RAMS. Hence, we will delay announcing any new or additional activities until then. The divisions business plan will be delayed to be shown in the Q1 2021 newsletter when we can show something with less chance to have to make numerous changes.
- Our current financial status: The division has approximately $25,000 in its Billhighway account. As we no longer have reserves or investment accounts or allocations from ASQ dues for members who select our division for membership, we simply run our division by creating valuable revenue-generating activities and limiting expenses where possible.
- You can expect to see our webinar series continue, and we are certainly planning on adding to the webinar offerings in 2021. More news to come on this in regular announcements.

While 2020 has generally been a miserable year by most standards, I'll close with wishing you a safe and happy holidays. As always, consider volunteering for the division. We have received some recent interest from folks willing to help. Tim will be in contact with all who volunteer as we properly plan and prepare for our future.

Happy New Year,
Trevor Craney

Webinar Roundup!!

Upcoming ASQ RRD *Webinars*

Date: Thursday December 10, noon Eastern Time
Topic: Prognostics and Health Management; Fundamentals, Elements, Remaining Useful Life (RUL) determination Techniques
BY: Mohammad Pourgol-Mohammad, Ph.D, PE

Date: Thursday January 14, noon Eastern Time
Topic: ISO 9001 2015 audit topic
BY: Bob Deysher

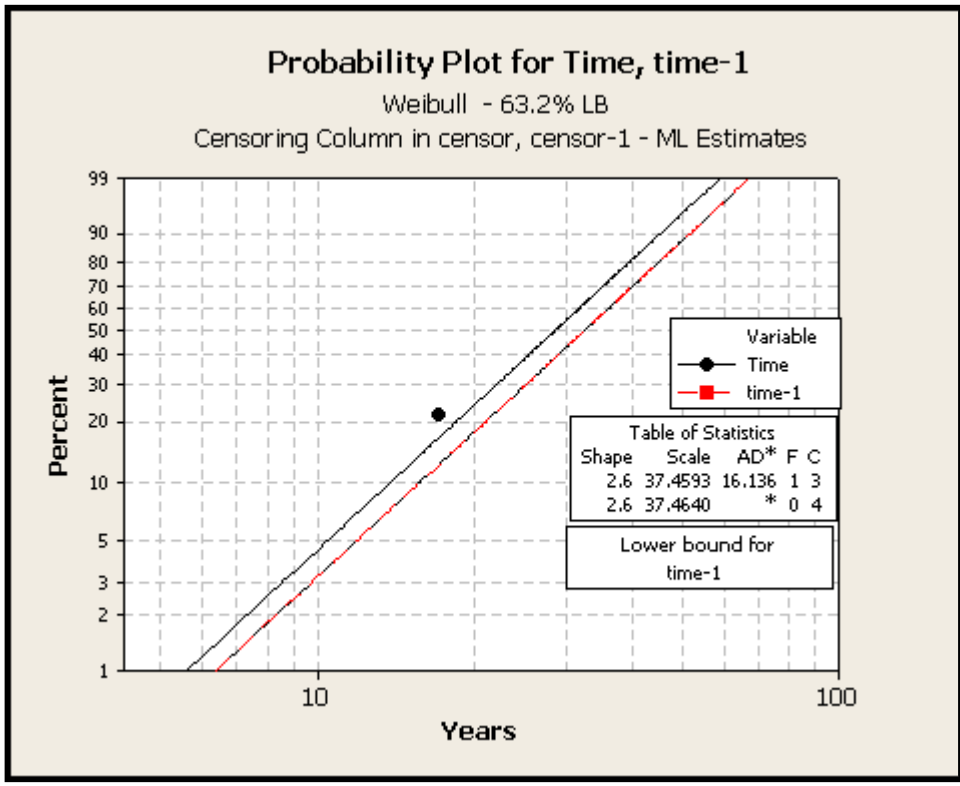
Date: Thursday February 11, noon Eastern Time
Topic: Directed Acyclic Graphs
BY: Bob Stoddard

Reliability Corner-Weibayes 0 and 1 failure

The distinction between zero failure and one failure Weibayes is worth reviewing. For example, assume four redesigned units have been tested without failure.

A Weibayes line is calculated based on the β from the original design. This is a lower one-sided confidence interval for the true unknown Weibull for the redesign.

Now assume the same data set includes one failure and three suspensions. The resulting Weibayes is identical to the first zero failure Weibayes, but the interpretation is different. With one failure, the Weibayes is a nominal, MLE, estimate of the true unknown Weibull, not a confidence interval. However, a lower confidence bound for the MLE Weibayes line may be calculated [Nelson 1985] using:



If r is the number failures (≥1), the lower C% confidence limit for η is:

$$\eta_{Lower} = \eta_{MLE}\left[\frac{2r}{\chi^2_{(C,2r+2)}}\right]^{\frac{1}{\beta}}$$

from Abernethy, "New Weibull Handbook," 5th ed

Calling all Webinar Authors!!

Dave Auda (davidauda@yahoo.com**)**

We would like to extend an invitation on behalf of the ASQ Risk and Reliability Division (ASQRRD). If you would be interested in being a presenter of an ASQRRD webinar, contact Dave Auda. Webinars run every 2nd Thursday of the month at noon EDT for 1 hour,. The content should be something that the attendees can use, Reliability-related knowledge and/or skill.

Why present? A large potential audience that we invite, an additional entry to your resume demonstrating competence, refine your skills, AND earn recertification points.

If you have need of support in developing, preparing and/or presenting at such an event, we can support. Become a recognized subject matter expert!

RELYENCE CORPORATION

Reliability & Quality Software

FMEA · FRACAS · Fault Tree · Reliability Prediction Maintainability · RBD · Weibull

KEY HIGHLIGHTS

- Integrated suite
- Stand-alone tools
- FMEA, FMECA
- FRACAS, CAPA
- Fault Tree
- Reliability Prediction
- Maintainability
- Reliability Block Diagram
- Weibull
- Browser-based
- On-premise or cloud-based
- Online or in-person training
- Implementation services
- Knowledgeable tech support
- Free, no install trial

Relyence offers a complete solution for all your reliability and quality software needs. Along with our software tools, we offer top-notch technical support, implementation services, and training.

The Relyence Solution. Providing seamless integration between FMEA (including Process Flow Diagrams and Control Plans), FRACAS, Fault Tree, Reliability Prediction, Maintainability, RBD, and Weibull analyses, the Relyence tool suite empowers you to effectively manage your products throughout their lifecycle. You can use each module stand-alone, or combine the tools you need in our Relyence Studio integrated platform.

Power & Innovation. Relyence tools offer an impressive list of features. Just a few of the highlights include: customizable cross-module dashboards; user-interface customization; flexible report generation; data importing and exporting; API functionality; device libraries; workflow, approvals, and notifications; user and group roles and permissions; and Relyence innovations such ***always-in-sync***™ technology, smart-layout, ***Knowledge Bank***™ for lessons learned reusability, and FMEA-Fault Tree ***link-sync***™.

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Rely on Excellence. In conjunction with our software tools, we provide world-class services to help ensure your success. Our Implementation and Training teams can get you up to speed quickly, and our Technical Support team consistently provides support that is unparalleled in the industry.

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RAMS® 2021

The 67th Annual Reliability & Maintainability Symposium

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RAMS 2021 Venue
Rosen Plaza Hotel, Orlando

A standout among Orlando's finest meeting, convention and vacation hotels, **Rosen Plaza Hotel** is famous for its high standard of excellence. Impressive Orlando meeting space, impeccable in-house staff and grand accommodations assure a seamless meeting experience for groups ranging from 10 to 2,800.

Message from RAMS 2021 General Chair

On behalf of the RAMS Management Committee, I invite you to join other industry subject matter experts and share your knowledge in Reliability and Maintainability in the Era of Big Data with a cutting edge paper or tutorial and help advance the industry. Take full advantage of this premier international forum to exchange the latest R&M knowledge and ideas and network with other subject matter experts from around the world.

The RAMS 2021 venue in beautiful Orlando, Florida is the perfect time and place to be further inspired, inspire others and be refreshed in spirit as well.

-- Sean Carter

67th Annual Reliability and Maintainability Symposium

The 67th Annual Reliability & Maintainability Symposium (RAMS®) will be held at the Rosen Plaza Hotel, Orlando FL during the week of January 25-28, 2021. The theme for RAMS® 2021 is "**RAM in the Era of Big Data**".

With the advent and emergence of significant data availability for fielded equipment, reliability assessments can now be accomplished through the collection and timely analysis of equipment-specific field data and health monitoring systems. Engaging advanced techniques, such as machine learning and other advanced analytics, with these data sets enable the state-of-the-art to evolve to a much more proactive, effective, and cost-efficient reliability management approach.

With this in mind, we invite you to share your theoretical or practical findings of your research, engineering case studies, success stories, lessons learned, R&M based analyses and simulations, or R&M discoveries at RAMS® 2021 Orlando. Tell us how you are designing, optimizing, and supporting systems (both hardware and software) through the execution of RAMS disciplines.

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2020-2021 ASQ-RRD LEADERSHIP POSITIONS

Elected Positions

Chair
Trevor Craney
tacraney@yahoo.com

Chair-Elect
Tim Gaens
tim@asqrrd.org

Secretary
Rong Pan
rong.pan@asu.edu

Appointed Positions

Membership Chair
Tim Gaens
tim@asqrrd.org

Nominating Chair
Jim Breneman
weibullman@gmail.com

QE Best Paper Award Chair
Rong Pan
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English Hosts: David Auda, Arun Gowtham Sampathkumar
Spanish Host: Norma Antunano (normaantu@aol.com)
Data Analysts: Rachel Stanford (stanford.rachel@gmail.com), Tim Gaens
Video Editor: Tim Gaens (tim@asqrrd.org)

Contact Trevor (tacraney@yahoo.com) to volunteer with us today!

TECH SPOT: SAMPLE CRE QUESTIONS (Part 12)

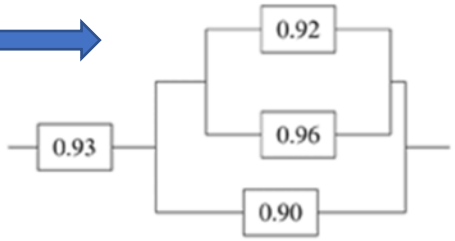
1. A stand-by redundant system uses two identical units. The failure rate of each unit is 0.0007 failures per hour. What is the system reliability for 200 hours (Assume the sensing and switching reliability is 0.9).

   A. 0.991 B. 0.983 C. 0.979 D, 0.965

2. Which of the following is true if all the subsystems in a series system have a constant failure rate?

   A. The failure rate of the system is constant
   B. The failure rate of the system will increase as more subsystems are added
   C. The failure rate of the system is the sum of the subsystem failure rates
   D. All of the above

3. What is the reliability of this system?



   A. 0.9191 B. 0.9244. C. 0.9297 D. 0.9856

4. A parallel system has three subsystems each with a reliability of R. The system reliability can be calculated as

   A. 3R B. R^3 C. $1 - (1 - R)^3$ D. $1 - (1 - R^3)$

5. To place confidence limits on a prediction which of the following is true?

   A. The Chi Square distribution is used B. The F distribution is used
   C. The t distribution is used D. A prediction is probabilistic, therefore confidence does not apply

6. 50 electronic devices have been tested for 3,000 hours without failures. What is the approximate MTBF of this device at 90% lower confidence ?

   A. 65150 hours B. 25500 hours C. 6500 hours D. 6500 hours

7. Which one is not the reliability prediction technique?

   A. Weibull plot B. Duane plot C. Uniform Precision Design D. Fix effectiveness Model?

8. In success testing, how many samples need to operate for one lifetime without failure to demonstrate 95% confidence with 99% reliability?

   A. 298 samples B. 90 samples C. 59 samples D. 458 samples

9. The following data is used for thermal stress evaluation of ICs using Arrhenius Equation. What is the acceleration factor ?
   Wearout Activation Energy is in eV
   - Ea = 0.5 eV k is Boltzmann's Constant,
   - 8.617 x 10-5 eV / K
   - T1 is Temperature in degrees C = 70 deg C (343°K)
   - T2 is Junction temperature during test in degrees C= 125 deg C (398°K)

   A. 10.4 B. 5.2 C. 9.5 D. 10.0

10. The reliability of a system consisting of two units in parallel is 0.96. If the reliability of each component is increased by 10%, what is the percentage increase in the reliability of the system?

    A. 10% B. 5% C. 3.33% D. 2.66%