Say Reliability So Everyone Understands

Abstract:
Reliability practitioners often provide technical talk that management, operators, maintenance and engineers don't understand.
Techie talk examples will be provided along with suggested clear communication in everyday language so everyone easily gets the message.

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Reliability

- **MIL-HDBK-338 says:**
  (1) The duration or probability of failure-free performance under stated conditions.
  (2) The probability that an item can perform its intended function for a specified interval under stated conditions.
  (For non-redundant items this is equivalent to definition (1). For redundant items this is equivalent to definition of mission reliability.)
- **A business definition says: Reliability is the probability that a device, system, or process will perform its prescribed duty without failure for a given time when operated correctly in a specified environment.**

Reliability Terminates In A Failure

- **MIL-HDBK-338 says:** Failure is the event, or inoperable state, in which any item or part of an item does not, or would not, perform as previously specified.
- **A business definition says:** Failure is the loss of function when you needed it. You must define what is a failure.
- **Example:** ***Is a processing plant turnaround a failure?***
- The maintenance and production staff may conclude a turnaround is a planned event and thus not a failure. **Be careful—don't Enronize your answers just to look good!**
- Financial investors see turnarounds as a massive failure with no income during the outage plus very large outflows of cash which are clearly financial failures.
- Remember we reliability and maintenance professionals are servants of the investors. Define failures for the advantage of the investors—not for our self advantage.

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Some Technical Answers May Be No Practical Answers

- **NASA says:** The next space shuttle failure may occur in 1 to 128 future flights (that is flight number 135 to 262). [based on private communications with NASA experts]
- **A Crow-AMSAA plot says:** Based on two failures (one failure going up hill and one failure coming down hill), predicts next failure shuttle failure at flight number 273 **if** we continued to make more improvements.
- **The practical answer:** We'll run out of money and never reach shuttle flight number 273 to validate the forecast--remember more improvements are needed future on future launches.

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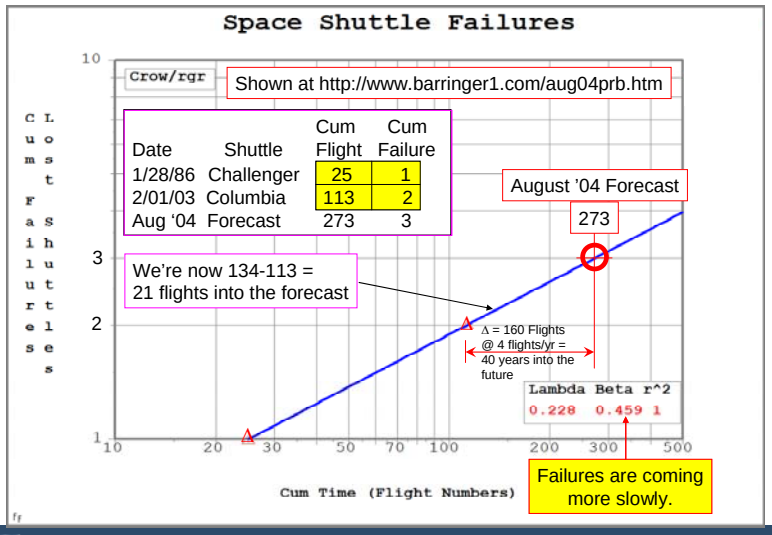
Crow-AMSAA Forecast

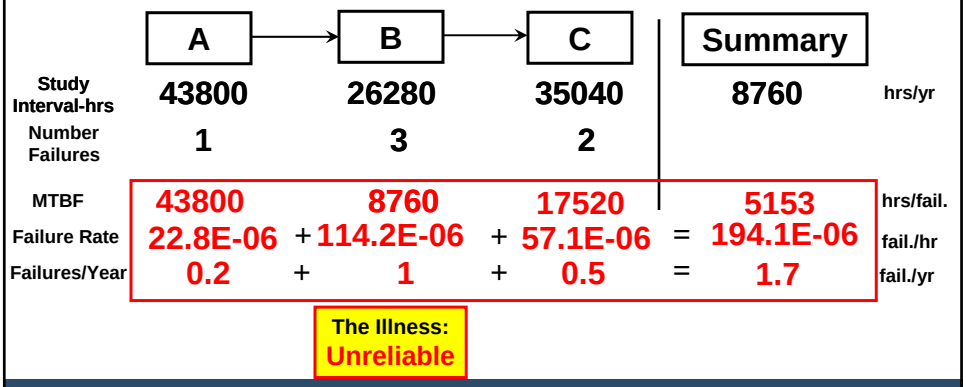


Maintenance And Reliability "Doctors" Must Say The Illness In One Word

- **When you're ill and visit the doctor you want to know your illness in one word**
- **If your doctor describes your illness in a 15 minute lecture are you baffled or covered in BS?**
- **If the doctor says I know what's wrong with you but I don't know what to call it, you wonder if your doctor is competent**
- **As the maintenance and reliability "doctor", do you describe the illnesses in your area of responsibility in one word based on the facts or based on your opinion?**
- **Based on your verbal explanations, "doctor" how do your patients feel about your competency?**
- **Consider the following example**

Doctor, What's Wrong?

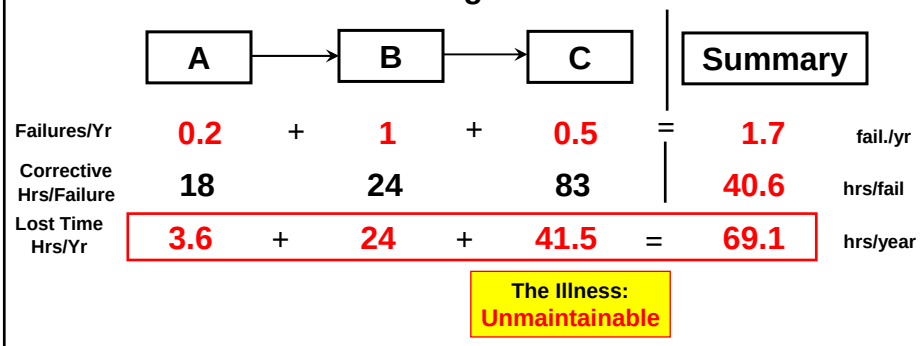
Block Diagram Of Plant



The Illness:
Unreliable

Really Doctor, What Is Wrong?

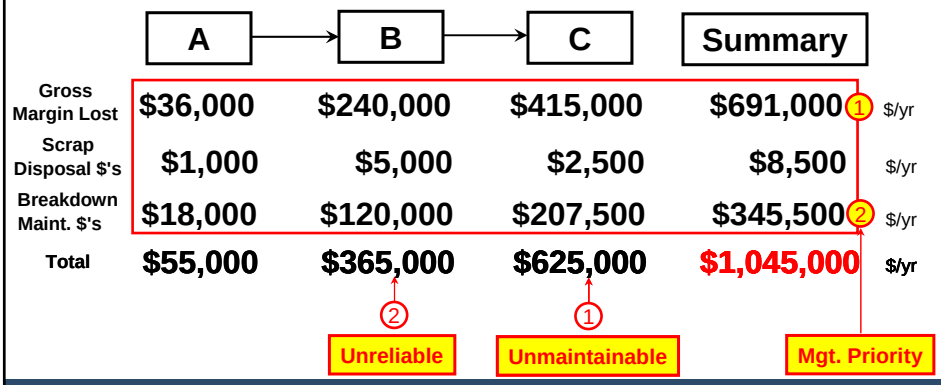
Block Diagram Of Plant



The Illness:
Unmaintainable

What's The Price Of Misery?

Block Diagram Of Plant



Get To A Bottom Line: Time/Money

- We've got a $1-million loss per year with our small, sold out, and profitable processing plant
- $625,000 loss is due to a maintainability problem in area C—repair it faster ←The #1 problem on an annual basis
- $365,000 loss is due to a reliability problem in area B—prevent failures ←The #2 problem on an annual basis
- Use different resources to correct problems in Pareto order based on money: 1st in area C and 2nd in area B
- Management may perceive the problem differently than the maintenance and reliability staff. Their priority will be to keep the plant running and reduce maintenance costs.

Reliability Means?

- A reliability of 90% depends upon the mission time—when you see a reliability value always ask for the defined mission time.
- For a given mission time, a 90% reliability means you have a 90% probability of successfully completing the mission without a failure…it also means you have a 10% probability of a failure.
- Simple exponential reliability at 90% reliability requires:

Mission Time	MTBF (hrs/failure)	# Failures/year
1 decade = 87,600 hrs	831,431.0	0.0105
1 year = 8,760 hrs	83,143.1	0.1054
1 month = 730 hrs	6,928.6	1.2643
1 day = 24 hrs	227.8	38.4566

- Notice that 90% reliability requires MTBF ~10*mission time?
- Few people understand reliability. Most people understand failures/yr, and the cost of unreliability.

Download a copy of these slides at:
http://www.barringer1.com/pdf/Barringer-IMEC-2009-Toronto.pdf

Summary

- Use the KISS principle and the Pareto principle for easy communication of reliability issues
- Let reliability technology drive the analysis, but simplify results into time and money for quick grasps of issues
- Speak in terms your listeners can understand by reducing complicated issues to an understandable level
- Ordinary business audiences do not understand statistics or complicated analysis—say reliability issues simply with time, money, and important events
- Communicate! What the speaker says about reliability may not be what the listener hears with understanding