Principles for Space Experimentation Success

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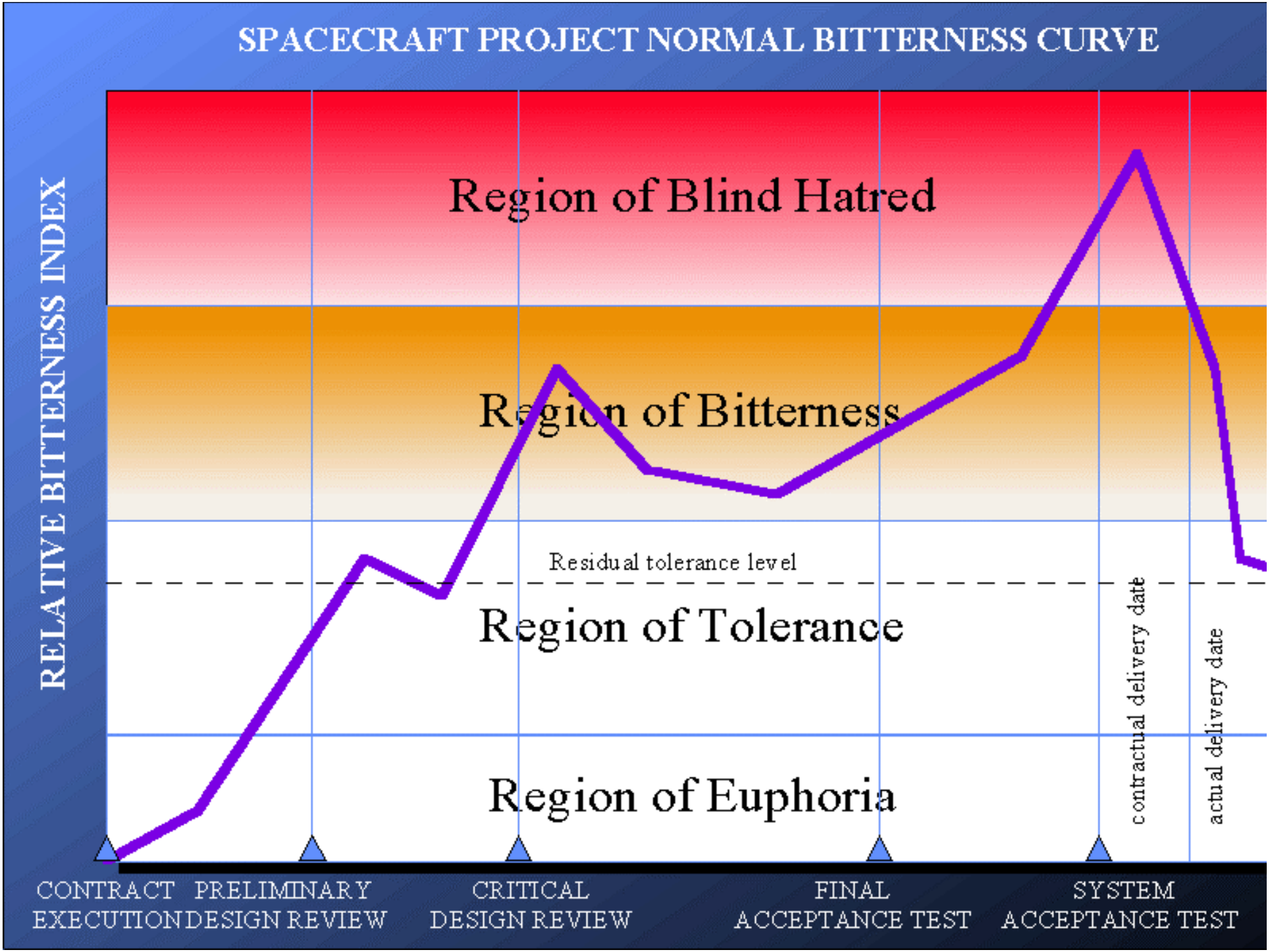
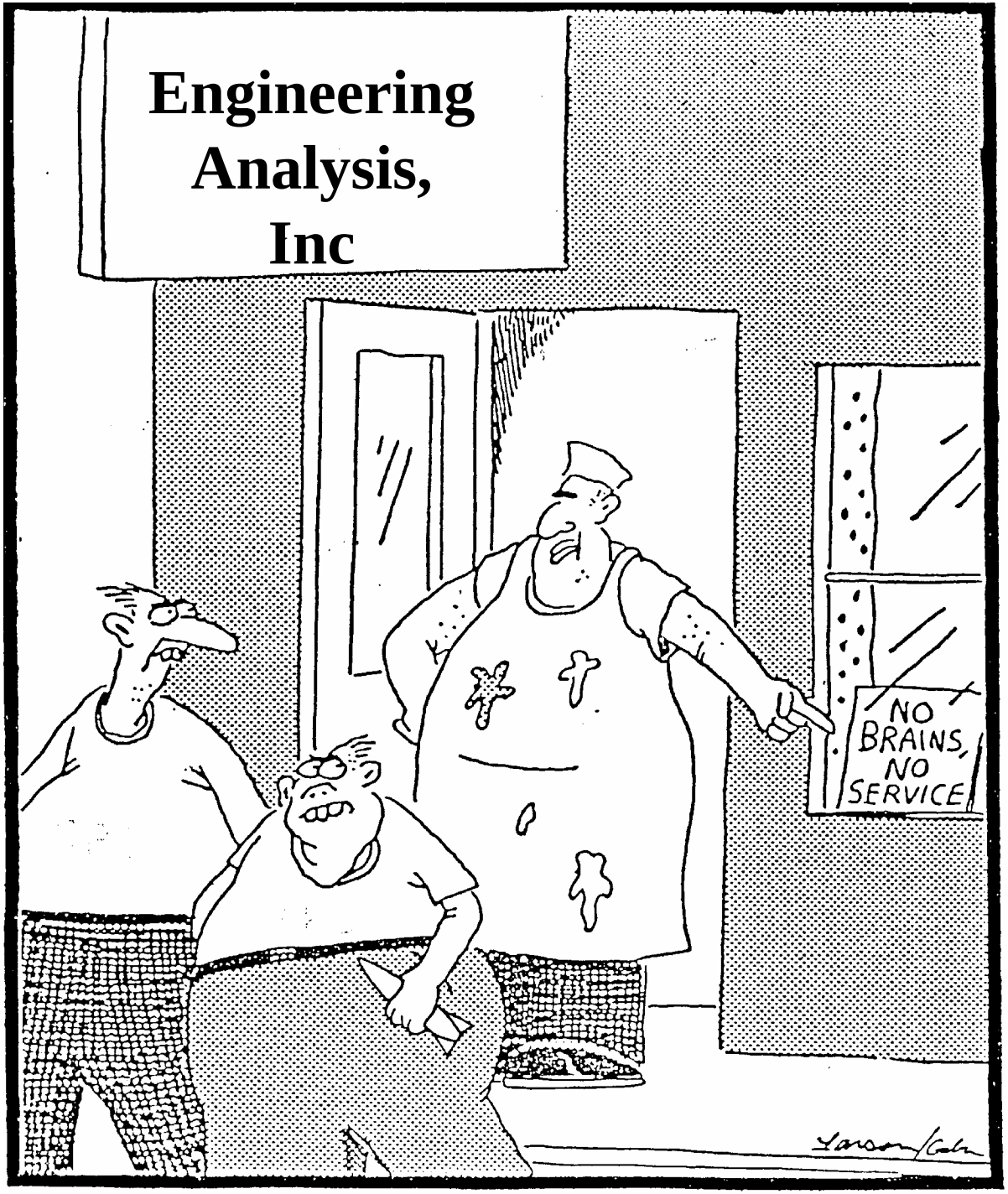
Where Did the Principles Come From?

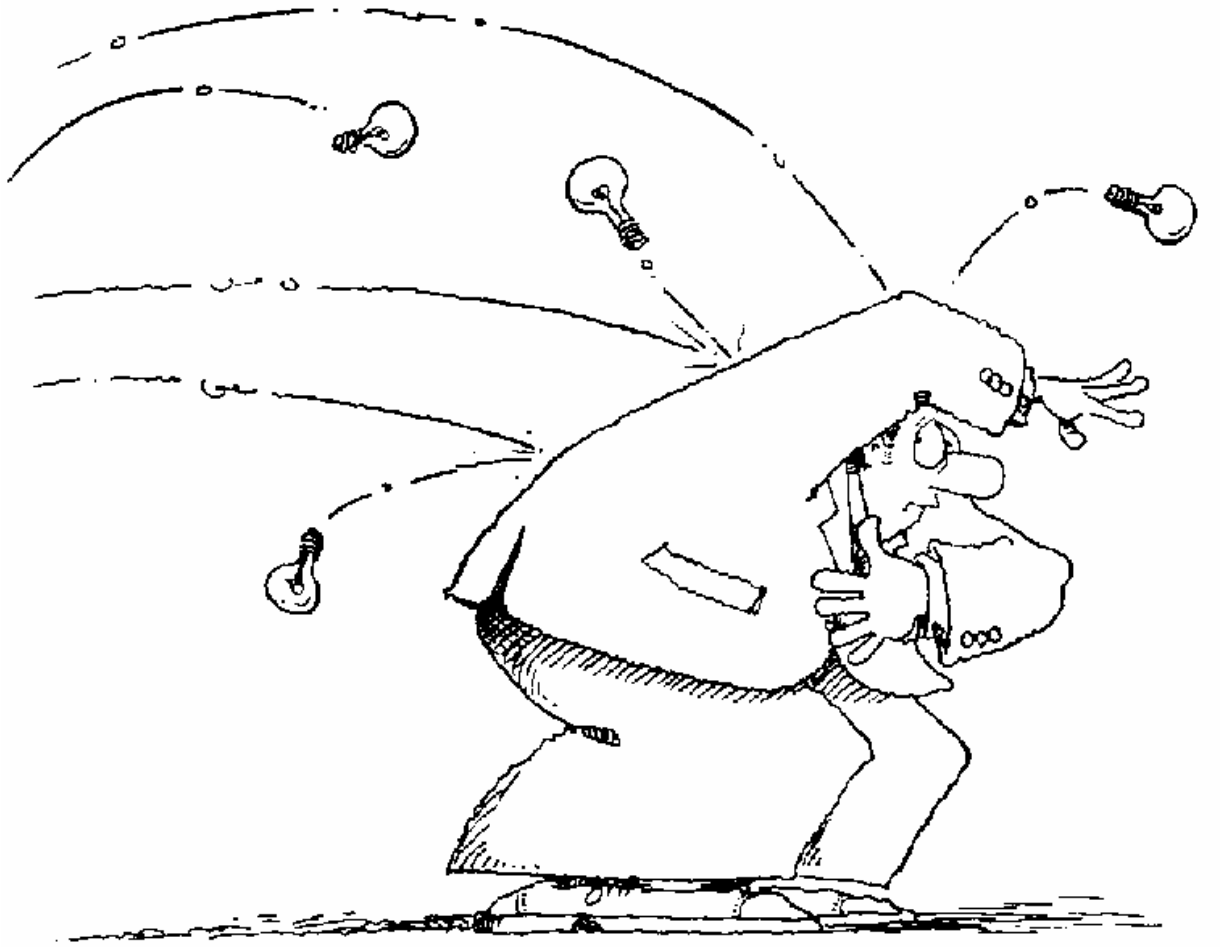
- **The principles are a compilation**
- **Every payload/experiment is different, each has unique requirements and people**
- **During every project I was involved in, what worked and what didn't were noted**
- **The general, guiding insights are the principles**


SPACECRAFT PROJECT NORMAL BITTERNESS CURVE
RELATIVE BITTERNESS INDEX
Region of Blind Hatred
Region of Bitterness
Residual tolerance level
Region of Tolerance
Region of Euphoria
contractual delivery date
actual delivery date
CONTRACT EXECUTION
PRELIMINARY DESIGN REVIEW
CRITICAL DESIGN REVIEW
FINAL ACCEPTANCE TEST
SYSTEM ACCEPTANCE TEST



Design to "end-of-life" needs

If it won't affect the operational characteristics of your satellite – it's not important



Plan what you are going to do, don't let panic set in.

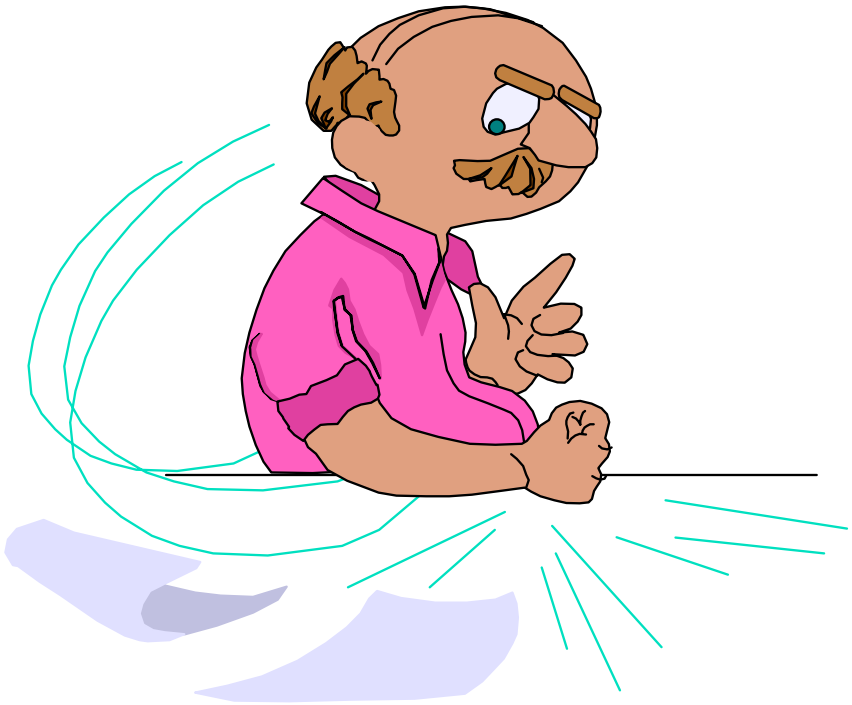
- **Be specific in what you want to do**
  - **avoid generalities and keep asking questions until the answers are very specific**
- **Know or find out what the goal is and what the problems are**
  - **then concentrate your efforts on both**

"THE PERSON WHO AIMS AT NOTHING WILL USUALLY HIT IT"

“EVERYTHING WORKS IF YOU LET IT”

- The people you are working with, on a personal level, want you to succeed.
  - They take pride in what they do and in their individual contribution to mission success, let them help you succeed!
- Don’t defeat yourself!
  - Let the process and the people do what is supposed to be done. Something's you can affect and some you can’t, you must rely on other peoples judgment.
  - Just don’t give up! Always be ready to support the people supporting your payload!

“DON’T TELL ME HOW HARD YOU WORKED, TELL ME WHAT YOU GOT DONE”

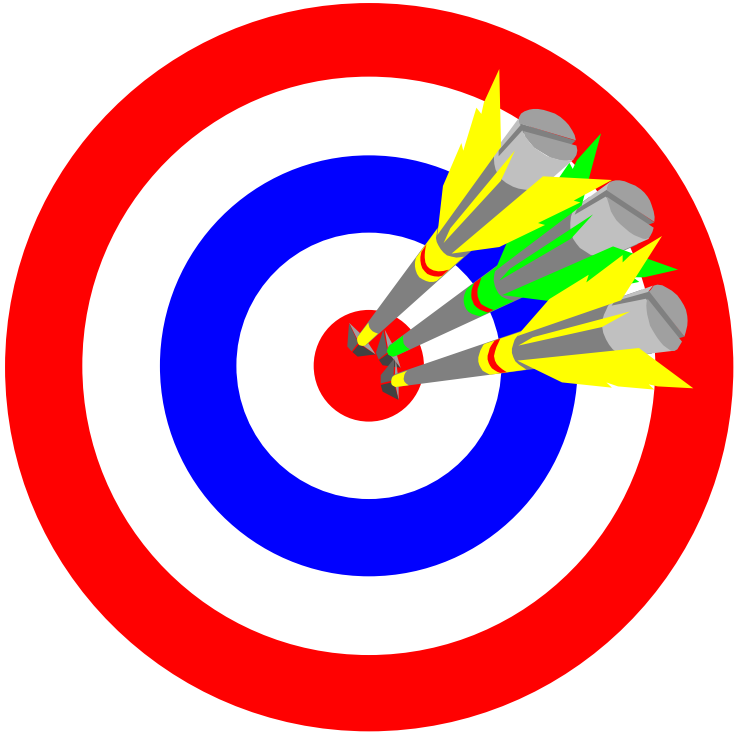


- **All of your documentation should be relevant**
  - **Know what’s important and what people need to know, then give it to them!**

“It is a good answer that knows when to stop”
Italian Proverb

Remember what you intended to do, daily remind yourself.

If you don't care where you are, then you're not lost

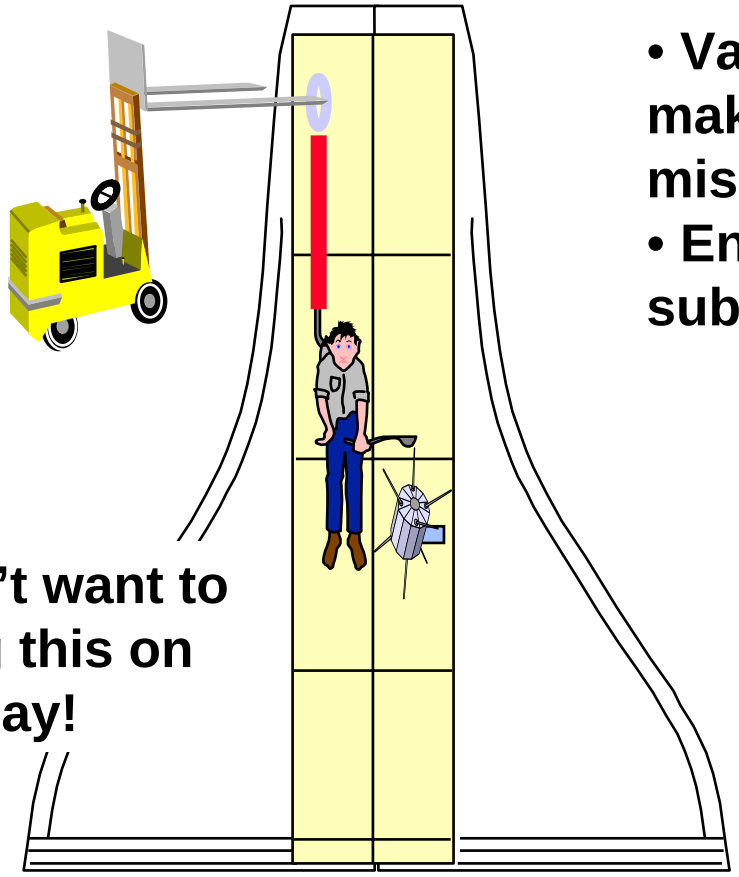


There comes a time in every project to shoot the engineers and begin production.

“TIME TO DO DATA REVIEW IS SACRED”

- **How do you know if your test/experiment is successful if you don’t evaluate it?**
- **How can you learn from the past if you never evaluate it?**
- **If the data was so important you had to do the experiment to get it, how come you can’t analyze it?**

“NEVER DO ANYTHING FOR THE FIRST TIME”



You don’t want to be doing this on launch day!

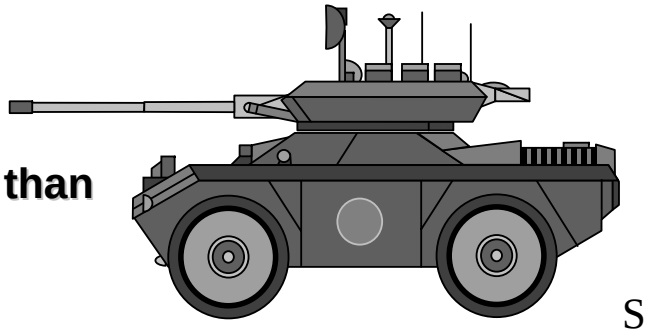
- Dry runs, practices, pathfinders, trailblazers are important
  - never, ever skimp on these
- Valuable because this is when making a mistake won’t cost you the mission
- Engineering mockups are a good substitute for real hardware
  - you don’t want to find out you need six foot arms at the last minute

"AN OUNCE OF PREPARATION IS WORTH A POUND OF PANIC"

- **When you are following a plan and looking ahead, it is much easier to succeed**
- **Knowing where you are going is sometimes just as important as getting there**
- **The plan won't always work, but you can always work with the plan**

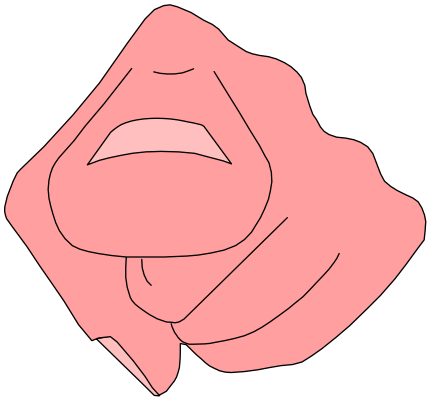
"A good plan violently executed now is better than a perfect plan next week"

George S. Patton



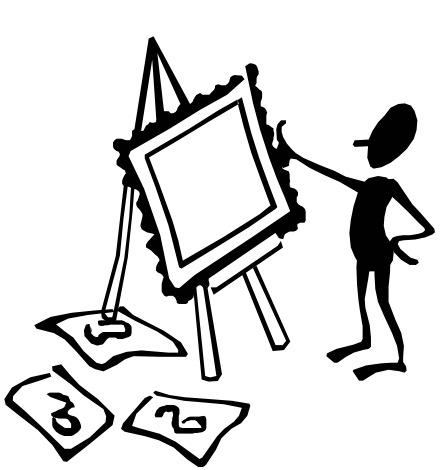
"RELEVANCE INCREASES MOTIVATION AND CONCENTRATION"

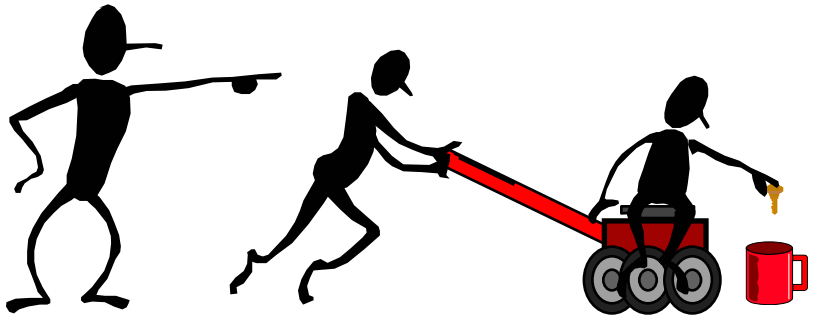
- **When the people helping you understand <u>what</u> you are doing and <u>why</u> you are doing it they perform much better**
- **Never begrudge someone an explanation, remember they are interested in your success, too**

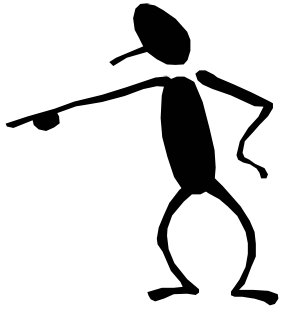


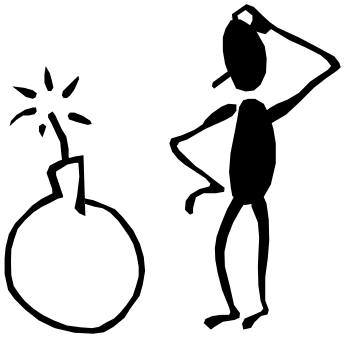
For example: "THE FOLLOWING MATERIAL IS TESTABLE"

Everyone has a job, let them do it





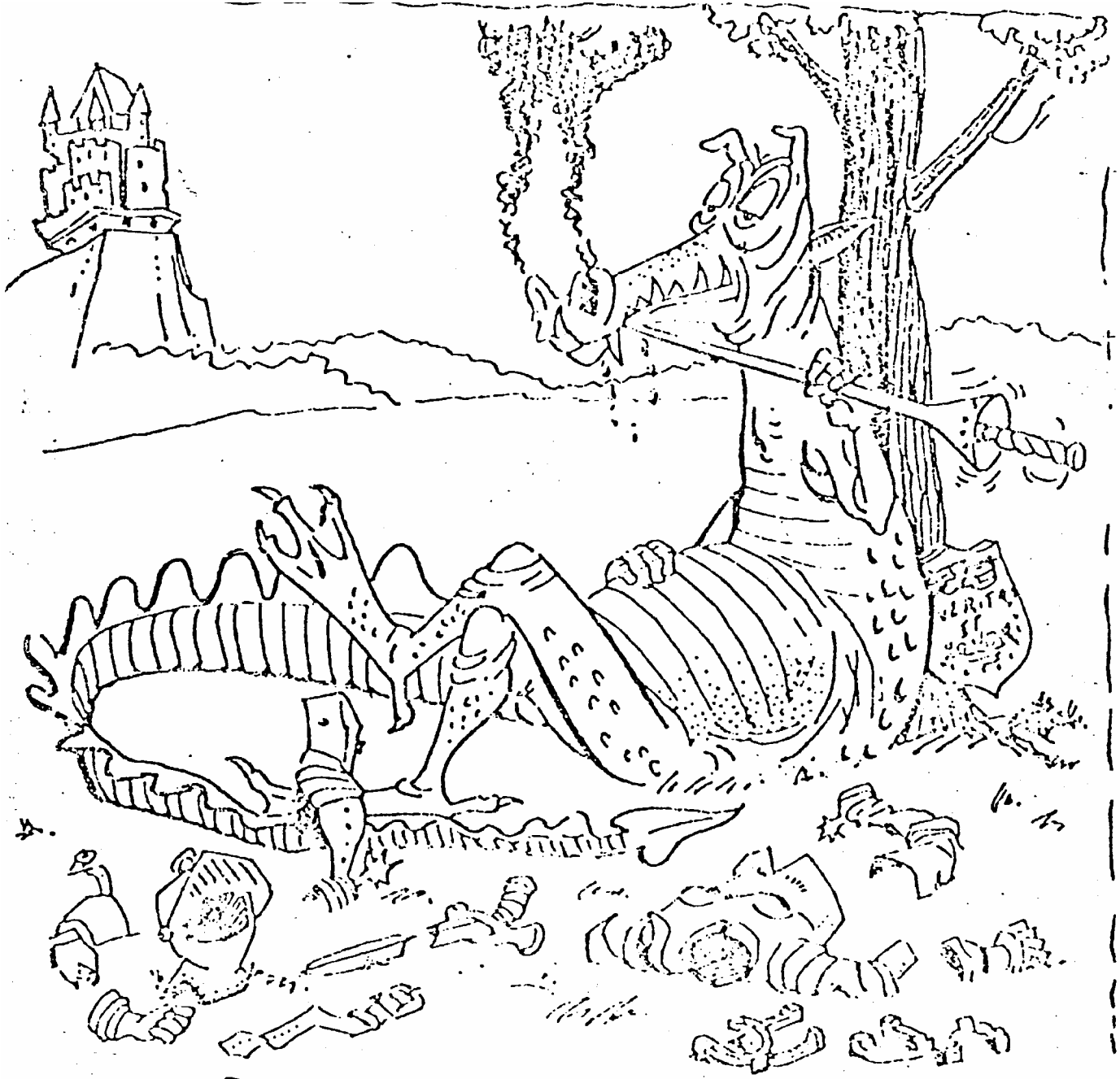




“Every successful enterprise requires three men - a dreamer, a businessman, and a son of a bitch”

Peter McArthur, British Newspaper Publisher

Some People, Like Data, Are More Significant Than Others



Sometimes the Dragon Wins