



# Preventing Supplier Quality Problems

( A practical approach to defect prevention planning)

**6<sup>th</sup> Annual NASA Supply Chain Quality Assurance  
Conference**

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# Agenda

- Background
- Sandia National Laboratories and Surety Assessment, Engineering, and Analysis Center
- What happened? The burning platform
- What strategy do we need for a National Laboratory (or Federally Funded Research and Development Center)
- Lessons Learned
- Summary



# Objectives

- Share our challenge, journey and rationale
- Share our lessons learned
- Provide you with a few nuggets to change the way you think and eventually those you support



## A few assumptions

- A commission to manage high consequence and technically challenging mission(s)
- You hire the best and brightest
- Organizational structure challenges: the Federally Funded Research and Development Center (FFRDC)



# How did I get here?

(1983-1988)



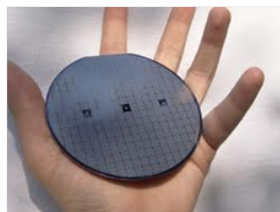
- Start-up venture: (US/Japan)
- Immature process definition
- ISO 9001



(1988-1996)



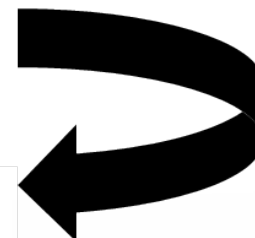
- Mature infrastructure/process
- ISO 9001 registered
- Solid business performance



(1996-1999)



Silmax, Inc.








(1999-2001)

## Honeywell



- Start-up venture (Allied Signal Turbo): Immature process definition
- QS 9000 desire (automotive version of ISO)
- Assembly/Test business model (supplier quality)

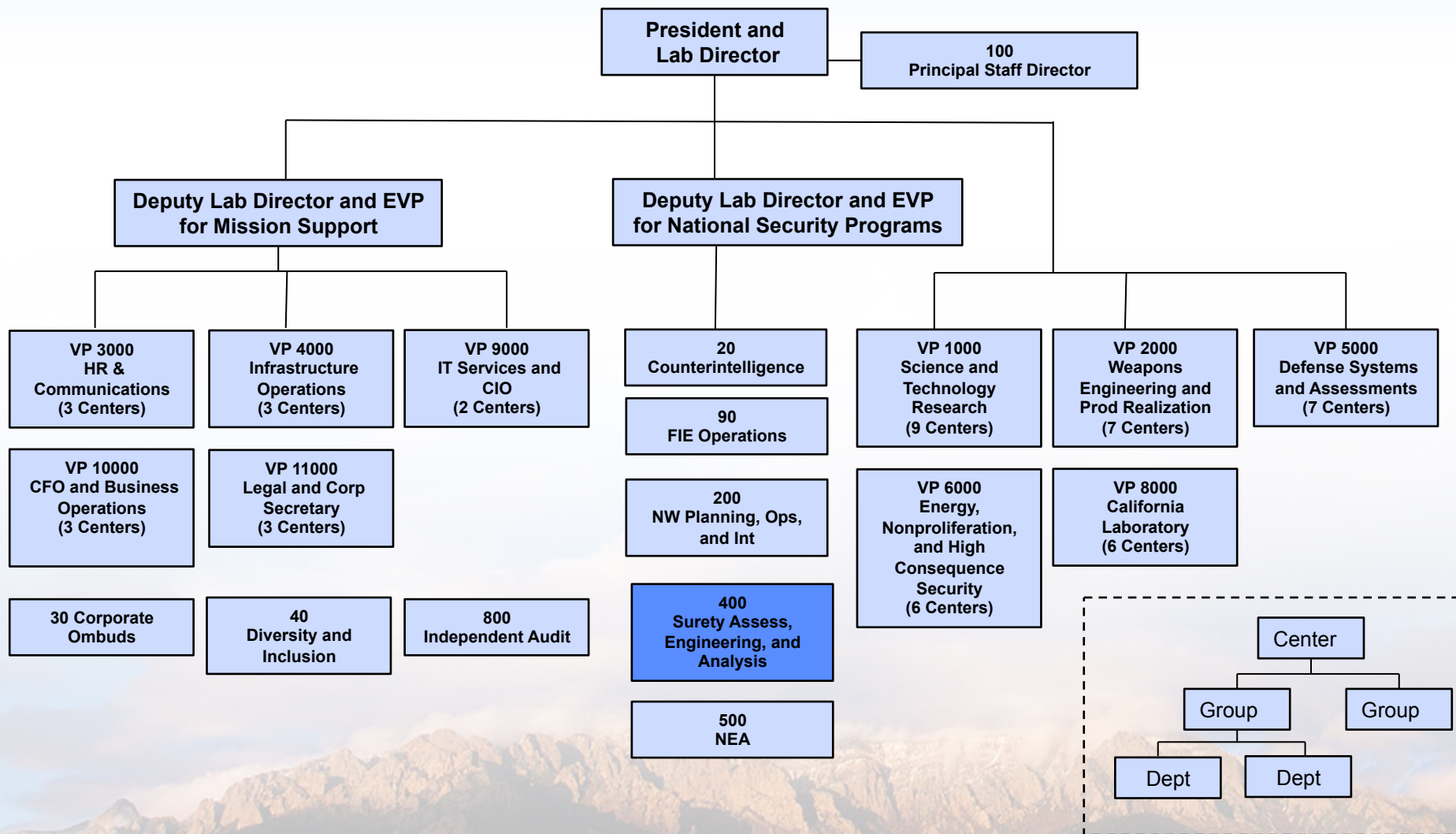
(2001-present)

|   |   |  |   |   |
|---|---|--|---|---|
| WFO   |   |  | NW  |   |
|  |  |  |  |  |
| Satellites  | STARS   | ARMY TACMS-P   | Tester Support  | Ferro Electric Generator Assembly   |





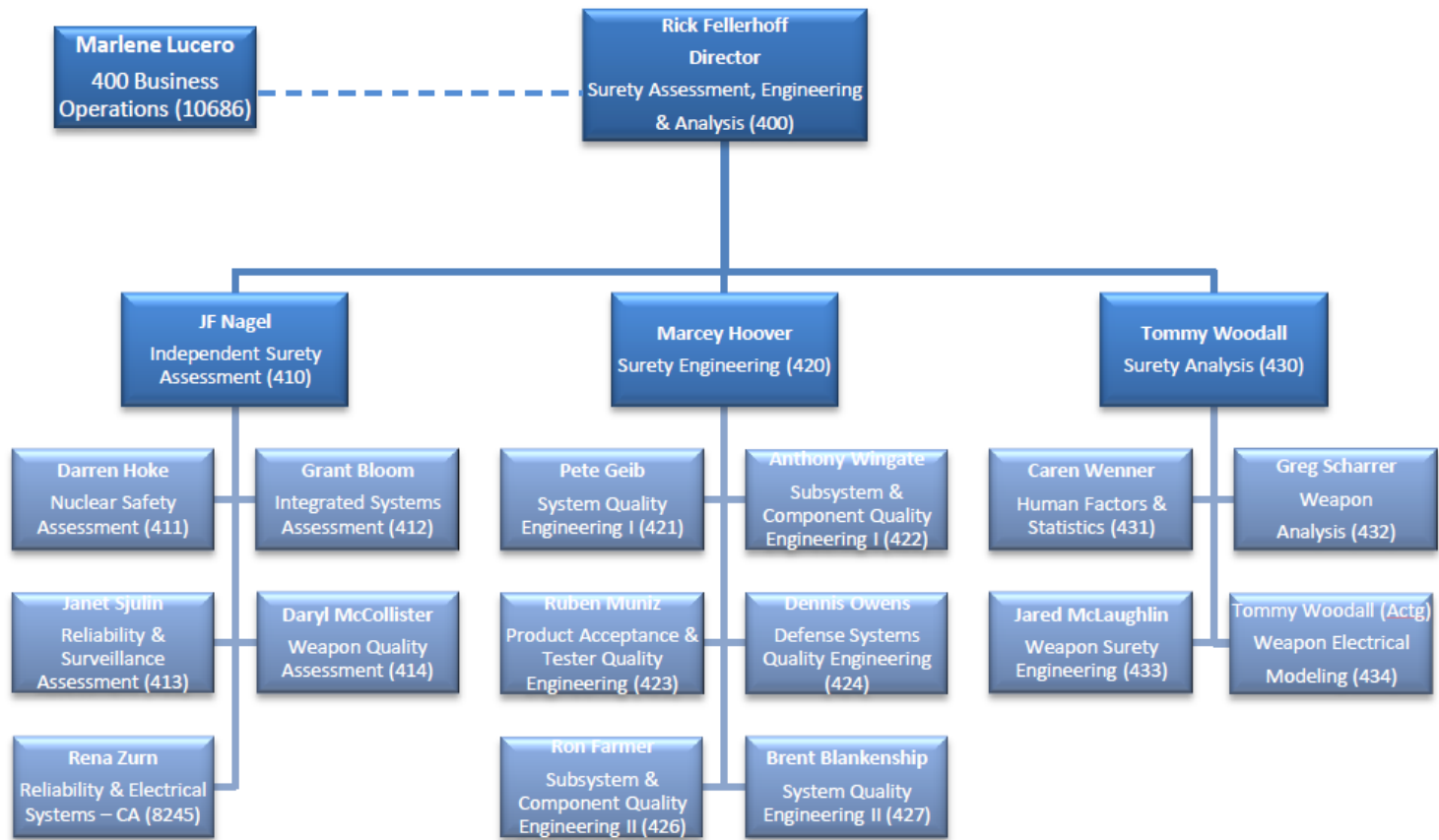
# Sandia National Laboratories corporate structure





# Surety Assessment, Engineering, and Analysis Center 400

## Matrixed





## Let's set the mood

*“Relationships with suppliers can be like a marriage and breaking up something like divorce. How well the marriage or well the breakup goes depends on how conflict is managed and how well the rules of engagement were in the first place (e.g. the contract)”*

Sherry R. Gordon

Author of Supplier Evaluation and Performance Excellence (A guide to meaningful metrics and successful results)





## So, what happened? ( the burning platforms)

- The 2008 Lockheed Martin Corp (LMC) Supplier Quality Assessment
- The 2011 National Nuclear Security Administration (NNSA) Performance Evaluation Report (PER)
- The 2011 Sandia Site Office (SSO) Periodic Contractor Performance Report (PCPR)
- The 2012 SSO Quality Assurance Plan (CAP) Compliance Based Assessment

**No major mission failure(s) to put us in the news but there seems to be a reoccurring theme here**



## Have you ever experienced this?

### The Seven Laws

- **I'm in charge (you are not the boss of me)**
- **I get to expect perfection out of you**
- **I never admit my mistakes (even when it is obvious)**
- **When there is a problem I get to assign blame**
- **Your creativity/dreams stifle my control so I will deny them**
- **You have to trust me but I don't have to trust you**
- **We will never talk about these laws, ever!**

*As told by a wise Sr. Manager  
who shall remain anonymous*



# What strategy do we need for a national laboratory (or FFRDC)

**Get smarter:** Your research will help you weather the storm or in other words, debunk criticism

**Think critically:** In an engineering/science environment, tech talk and thinking rules the day

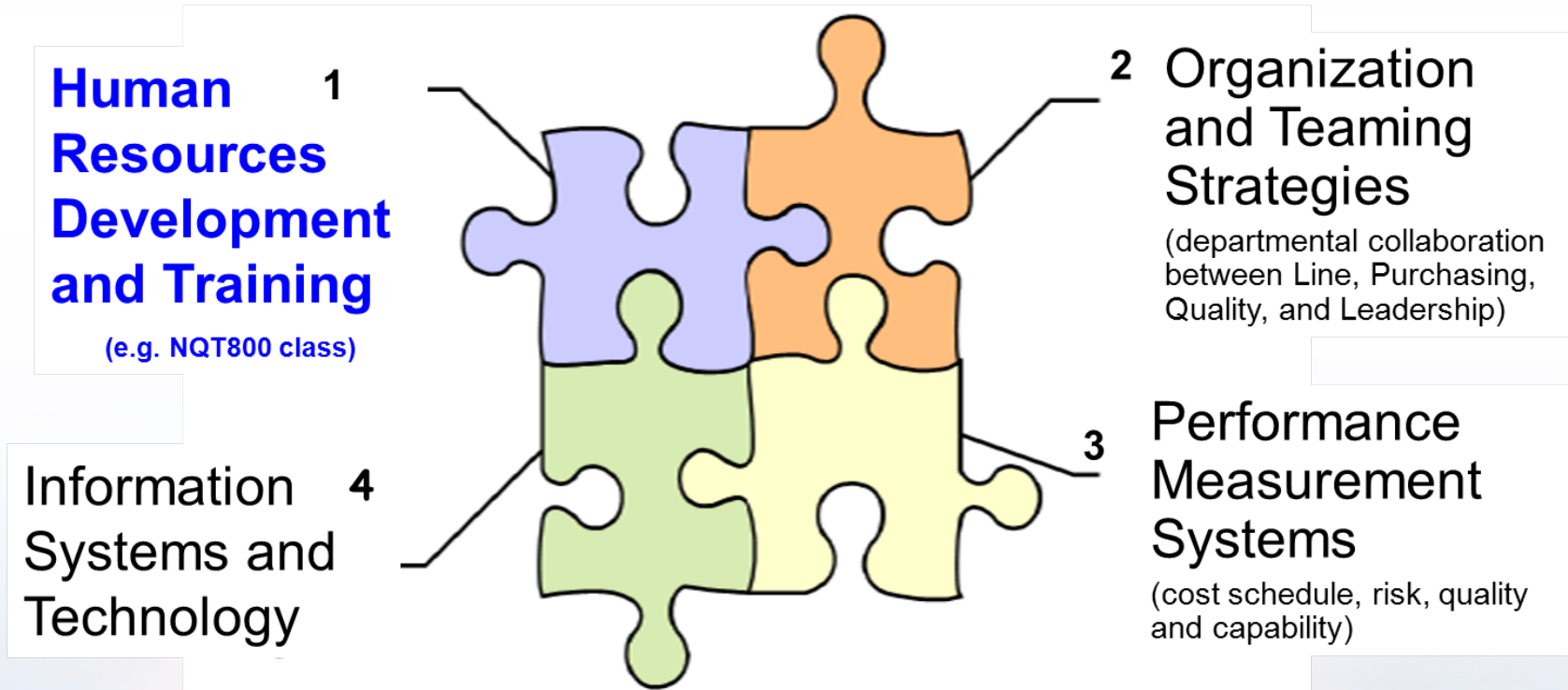
**Frame the discussion:** Your fighting the way people think or in other words, their mental models developed over time

**Find your champions:** they're everywhere and at every organizational level. You need all of them to sustain this journey. Remember, make them apart of your success.



# Key Enablers to Build a World Class Supply Chain and Supplier Quality Management

In order of importance



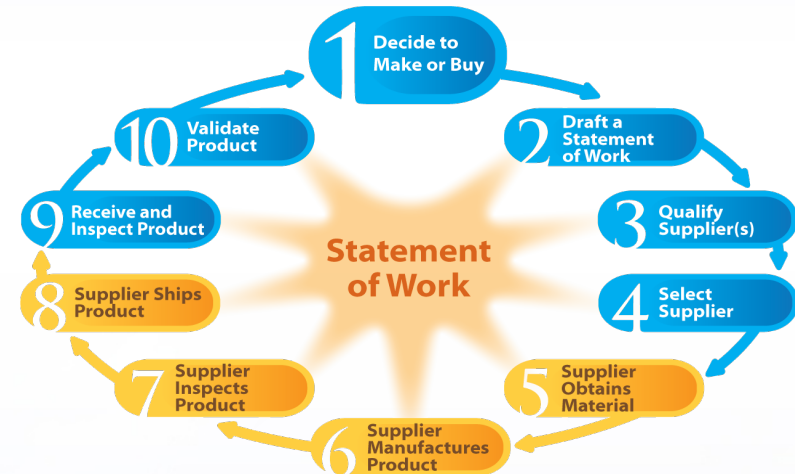
**Training alone cannot solve Sandia's systemic issues around SCM and SQ therefore, other key areas must be addressed**

Information from Michigan State University,  
Broad Graduate School of Management



# NQT 800: Preventing supplier quality problems

- Process Lifecycle (planning to delivery)
- Roles and Responsibilities (collaboration between Centers)
- Vulnerabilities (“gotcha’s” at each major milestone)
- Best Practices (preventive measures guaranteed to minimize risk)

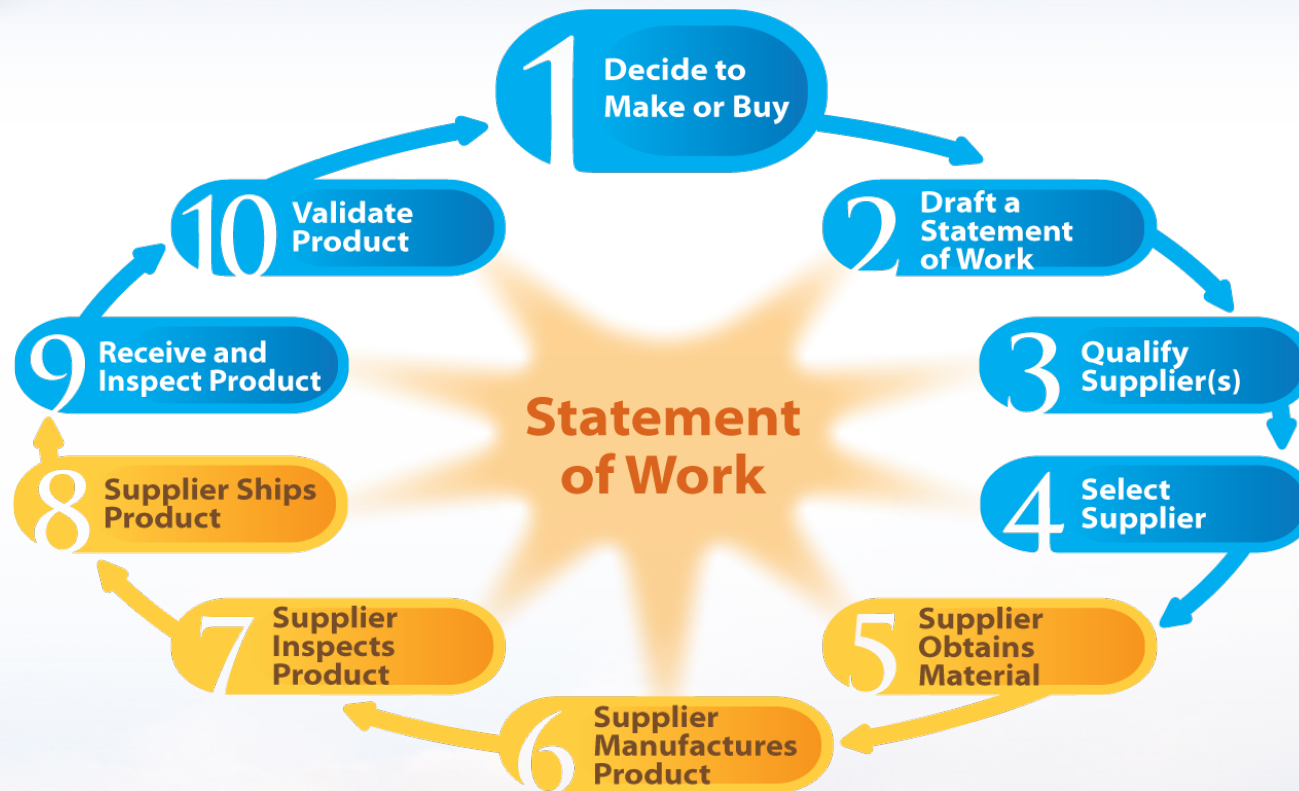


NQT 800 is a two day course that will take Designers and PRT Leads through the major activities required to successfully manage suppliers

**Class Objective:** Improve Sandia supplier performance by educating quality engineers, buyers (SCRs) and technical staff (SDRs) on current world-class approaches to supplier quality.



# Critical thinking and collaboration for technical staff



Combining this model with FMEA will help define a solid defense for your quality budget. In engineering terms “ risk reduction” with objective evidence



## Lessons learned

- Never ignore or minimize the effect of culture (address it in your planning/collaboration strategy)
- Your greatest enemy is a faulty mental model (its not always personal)
- Find those people who want to be in this fight for the long haul and then get them ready
- Make sure you have the best “ mouse trap” available. This will come “directly” from the effort you put into your research and engagement strategy.
- Support the vision and success of others.

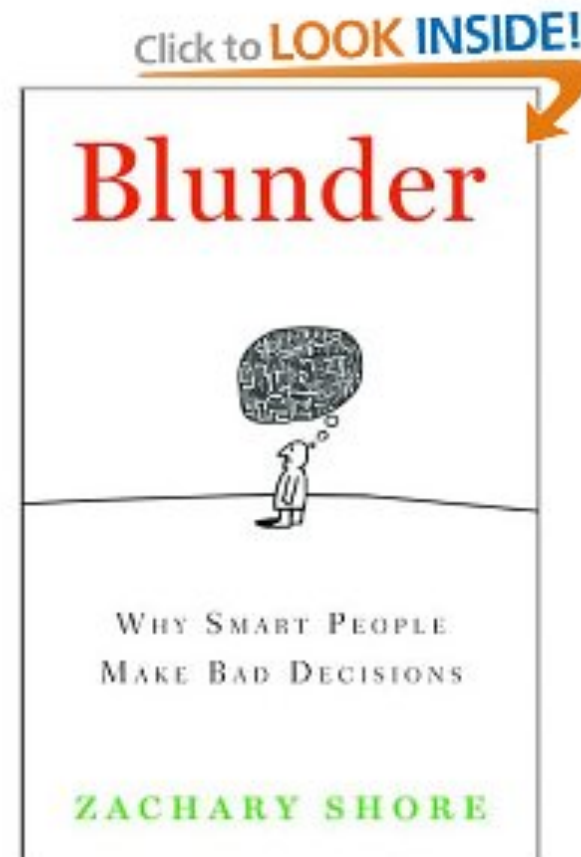
By no means is our challenge over **but** we are making headway





## Great resource for your reading pleasure

- **Exposure Anxiety:** fear of been seen as weak
- **Causefusion:** confusing the causes of complex events
- **Flat View:** seeing the world in one dimension
- **Cure- Allism:** thinking that one size solutions can solve all problems
- **Infomania:** an obsessive relationship to information
- **Mirror Imaging:** thinking the other side thinks like you do
- **Static Cling:** the refusal to accept circumstances have changed







# Other ways we, Quality Engineering, influence

## National Security Quality Training (NQT) Program

“Why spend all this time finding and fixing and fighting when you could prevent the incident in the first place?” — Philip Crosby, *Quality is Free*

### Meeting the Challenge

The challenge we face as a national laboratory, for both our Nuclear Weapon and Work for Others customers, surpasses delivering high-performance, highly reliable products. We must also incorporate approaches to preventing defects early and at all stages so that we deliver high-performance, highly reliable products on budget, on schedule, and with the absolute highest standard of engineering excellence. The NQT program provides a strategy for this challenge, supplying the tools to help make your product development team successful.

### A Strategy for Prevention at Every Phase of the Product Realization Process

|                               |   |
|-------------------------------|---|
| <b>Requirements</b>           | <ul style="list-style-type: none"> <li>▶ <b>NQT 101 - Requirements Traceability</b><br/>Prevents ill-formed requirements</li> <li>▶ <b>NQT 102 - Fagan Inspections</b><br/>Detects inconsistent, ambiguous, or misplaced requirements</li> </ul>  |
| <b>Design and Development</b> | <ul style="list-style-type: none"> <li>▶ <b>NQT 400 &amp; 401 - Product Qualification</b><br/>Prevents common pitfalls in nuclear weapon qualification</li> <li>▶ <b>NQT 510 &amp; 512 - Highly Accelerated Life Testing (HALT) and Other Preventive Methods</b><br/>Detects design, supply chain, and manufacturing defects through preventive methods and “best practice” engineering techniques</li> <li>▶ <b>NQT 600 - Systemic Mistake-proofing</b><br/>Prevents manufacturing and assembly mistakes</li> <li>▶ <b>NQT 800 - Supplier Quality Management</b><br/>Prevents supplier quality issues</li> </ul> |
| <b>Production</b>             | <ul style="list-style-type: none"> <li>▶ <b>NQT 200 - Product Acceptance</b><br/>Detects inconsistencies between as-built product, design definition, and the supplier contract</li> <li>▶ <b>NQT 510 &amp; 512 - Highly Accelerated Stress Screening (HASS)</b><br/>Detects defects in supply chain, manufacturing, and assembly</li> </ul>  |

### NQT Courses Offered (Sign up through TEDS)

- **NQT101 – Defect Prevention through Requirements Traceability**  
*A 1-day course where technical team leads and engineers learn to plan for traceability to prevent defects.*
- **NQT102 – Using Fagan Inspections to Remove Defects from Product Definition**  
*This 1-day course will focus on the inspection process and why its design is optimized for maximum value.*
- **NQT200 – Preparing for Successful Product Acceptance**  
*Describes the product acceptance process and provides the tools to prepare a defect-free product acceptance evidence package.*
- **NQT400/401 – Preparing for Successful Qualification (Overview)**  
*This course defines in detail, how to prepare for a successful qualification.*
- **NQT510 – Mastering HALT & HASS**  
*This 2-day course provides the skills to use preventive methods to detect and remove defects in the product realization process.*
- **NQT512 – Realizing a Robust Product, Tools to Prevent Production Problems**  
*This 1-day course provides many “best practice” engineering techniques for developing reliable products.*
- **NQT520 – Demonstrating Reliability with Accelerated Testing**  
*This 2-day course provides the skills to demonstrate product reliability while minimizing test time, sample size, and cost.*
- **NQT600 – Using Systemic Mistake-proofing to Prevent Defects**  
*Applying the concepts of mistake-proofing to product design, test equipment, fixtures and tooling, interactions with suppliers, information systems to improve the ease-of-use of your product.*
- **NQT800 – Preventing Supplier Quality Problems**  
*This 2-day course will discuss strategies for supplier quality management.*



# The team that made this a success for us

Unlimited Release

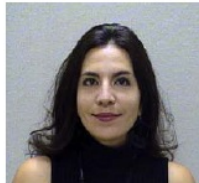
## The NQT-800 Team



Goal 2011



Ken Nunez



Jessica Montoya



John Sikkens



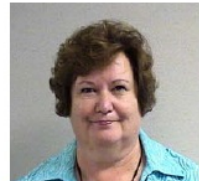
Maureen Baca



Naomi Christensen



Dennis Owens



Nora Armijo



Roger Emanuel



Steve Othling

NOT SHOWN:  
Jonathan Price

### Accomplishments

2009: Benchmarked Universities ranked by World News Report in the top 10 of supply chain management programs (Arizona State, Michigan State, and Penn State)

2009: Benchmarked other FFRDC supplier quality programs (Jet Propulsion Lab and JHU-Applied Physics Lab)

2010: Peer reviewed NQT-800 course with Lockheed Martin through the LMC/Sandia Reach back program (received strong positive reviews)





## Summary

- I've shared with you about our challenge, journey and rationale
- I've shared with you our lessons learned
- Hopefully I've provided you with a few nuggets to change the way you think and eventually those you support

Questions?