SAND2013-1902C

Assuring Quality in High-Consequence Engineering

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Sandia National Laboratories
ASQ World Conference on Quality and Improvement
May 7, 2013

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The Global Voice of Quality™

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Learning Objectives

At the conclusion of this session, attendees should be able to:

- Anticipate risks to competency-based quality assurance models,
- Identify changes associated with hiring, training, and customer engagement that will mitigate risks,
- Understand the role that the quality engineering organization can play in driving these changes.

Agenda

- Sandia History
- The Challenge
- Traditional Tenets
- The New Environment
- A Strategy
- Results

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Sandia's History

THE WHITE HOUSE
WASHINGTON

May 13, 1949

Dear Mr. Wilson:

I am informed that the Atomic Energy Commission intends to ask that the Bell Telephone Laboratories accept under contract the direction of the Sandia Laboratory at Albuquerque, New Mexico.

This operation, which is a vital segment of the atomic weapons program, is of extreme importance and urgency in the national defense, and should have the best possible technical direction.

I hope that after you have heard more in detail from the Atomic Energy Commission, your organization will find it possible to undertake this task. In my opinion you have here an opportunity to render an exceptional service in the national interest.

I am writing a similar note direct to Dr. O. E. Buckley.

Very sincerely yours,

Harry Truman

Mr. Leroy A. Wilson,
President,
American Telephone and Telegraph Company,
195 Broadway,
New York 7, N. Y.

Sandia National Laboratories

The Quality Assurance Challenge

- An analogy for the quality assurance challenge faced in high consequence engineering

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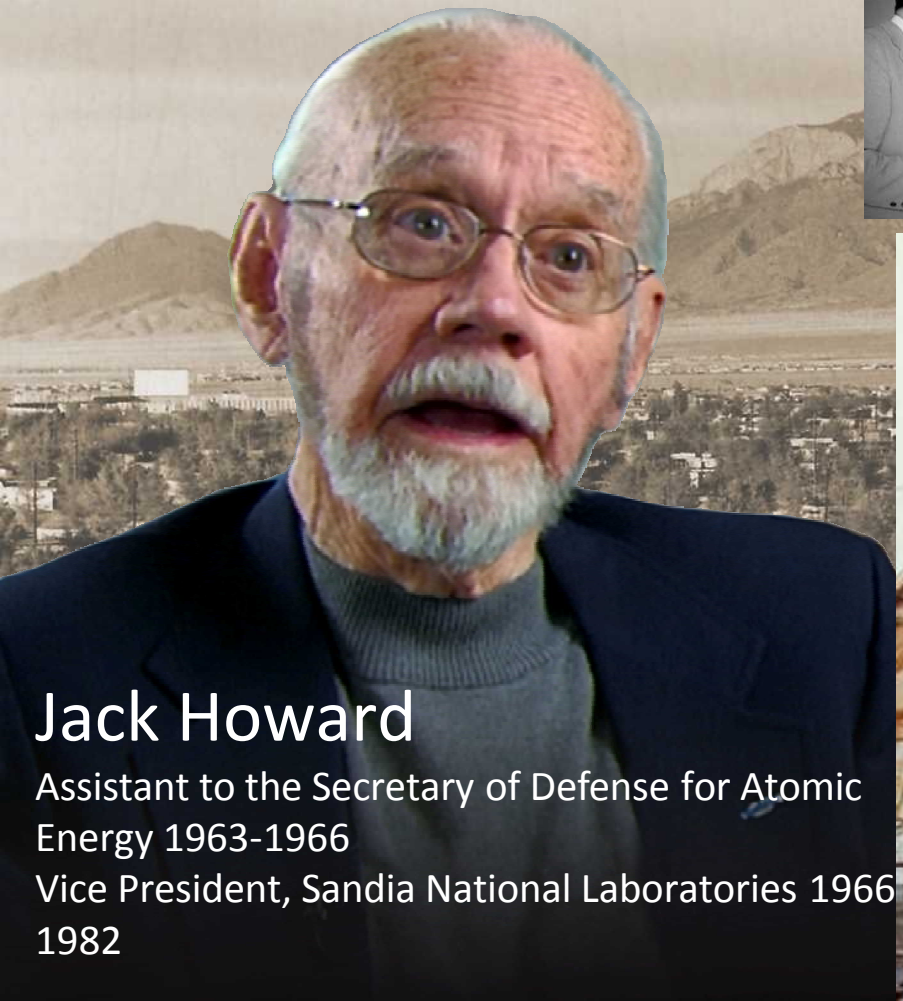
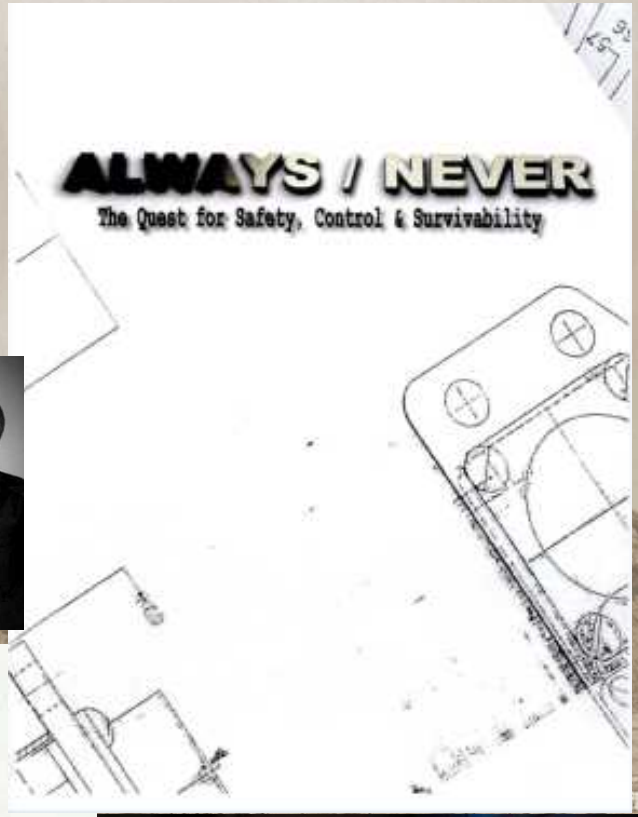
An Additional Quality Assurance Challenge



Jack Howard

Assistant to the Secretary of Defense for Atomic Energy 1963-1966

Vice President, Sandia National Laboratories 1966 1982



A History of Quality

1950 1960 1970 1980 1990 2000 2010

1945
Z Division
(Los Alamos)

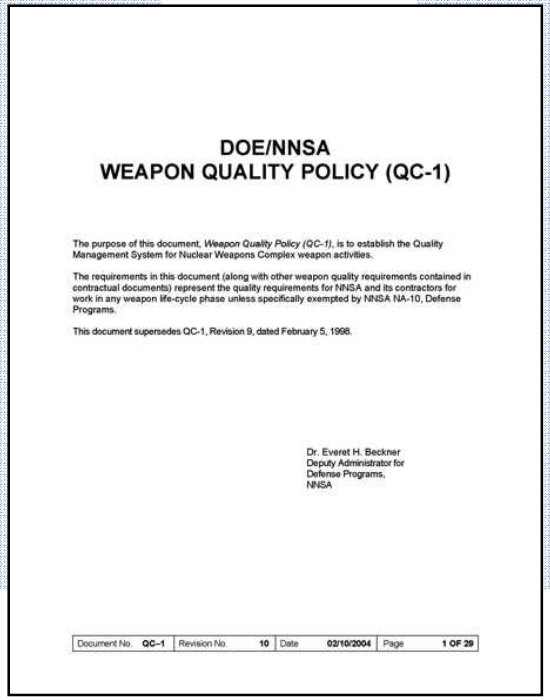
1949
Sandia
Established

1968

Weapon
Manufacturing
Quality
Control/Inspection

Weapon Design
Assurance/ Quality
Engineering

Sandians assembling electronics during the 1950s.



DOE/NNSA
WEAPON QUALITY POLICY (QC-1)

The purpose of this document, *Weapon Quality Policy (QC-1)*, is to establish the Quality Management System for Nuclear Weapons Complex weapon activities.

The requirements in this document (along with other weapon quality requirements contained in contractual documents) represent the quality requirements for NNSA and its contractors for work in any weapon life-cycle phase unless specifically exempted by NNSA NA-10, Defense Programs.

This document supersedes QC-1, Revision 9, dated February 5, 1998.

Dr. Everet H. Beckner
Deputy Administrator for
Defense Programs,
NNSA

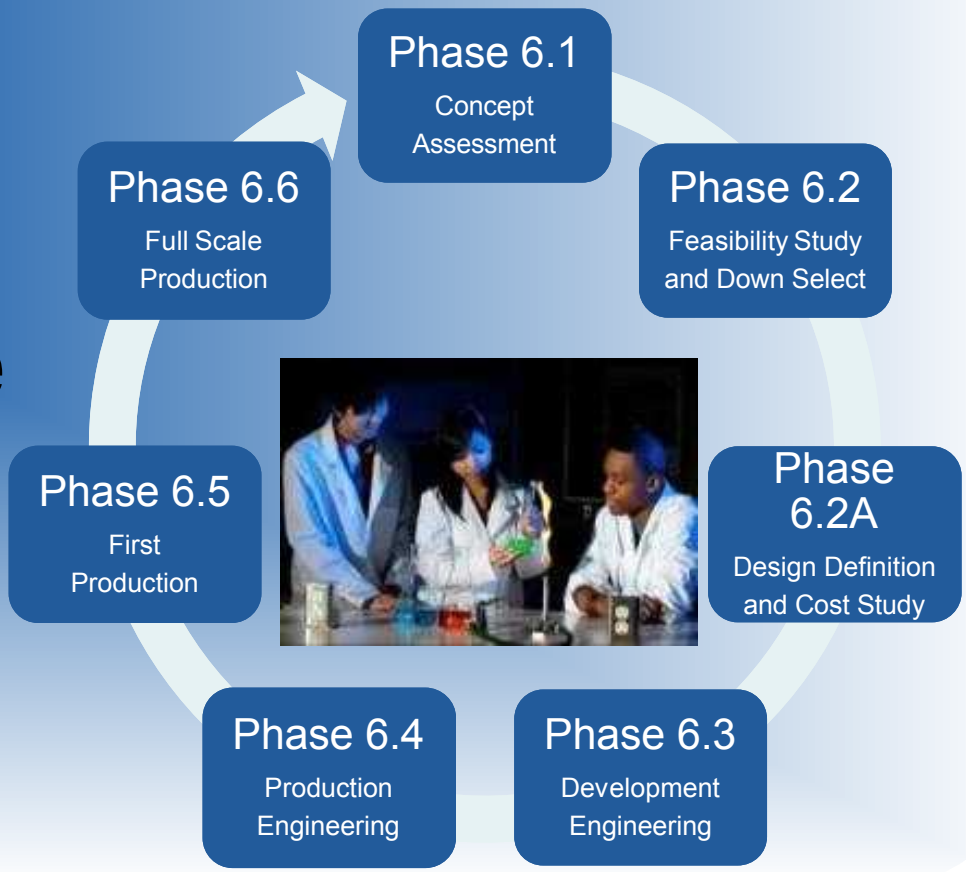
Document No. QC-1	Revision No. 10	Date 02/10/2004	Page 1 OF 29

A Reliance on Workforce Competency

Quality Assurance Tenets

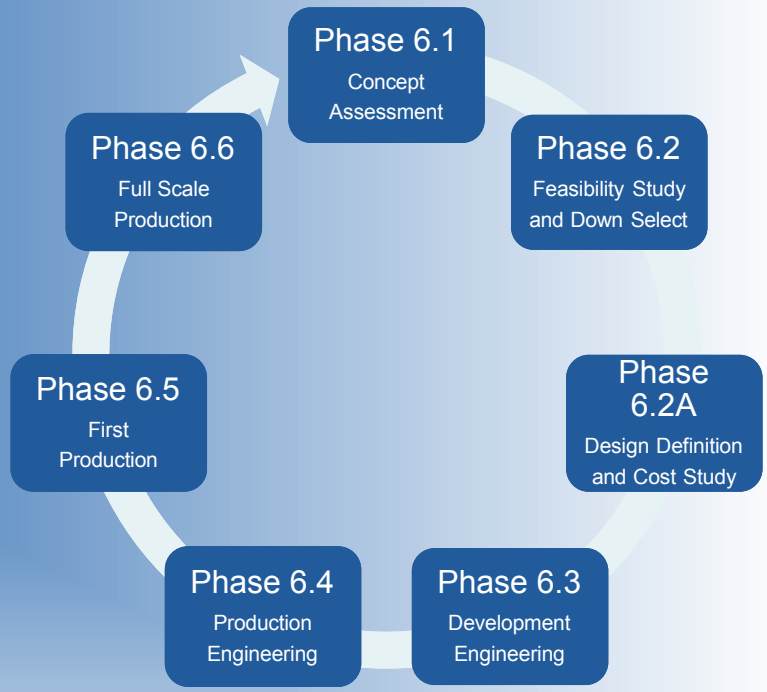
Quality assurance in high-consequence engineering rests on competency-based tenets:

- Engineering principles
- Expert workforce
  - Responsible activism
  - Knowledgeable independence



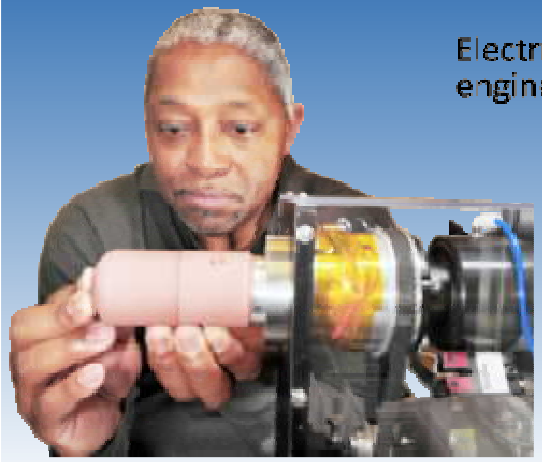
Engineering Principles

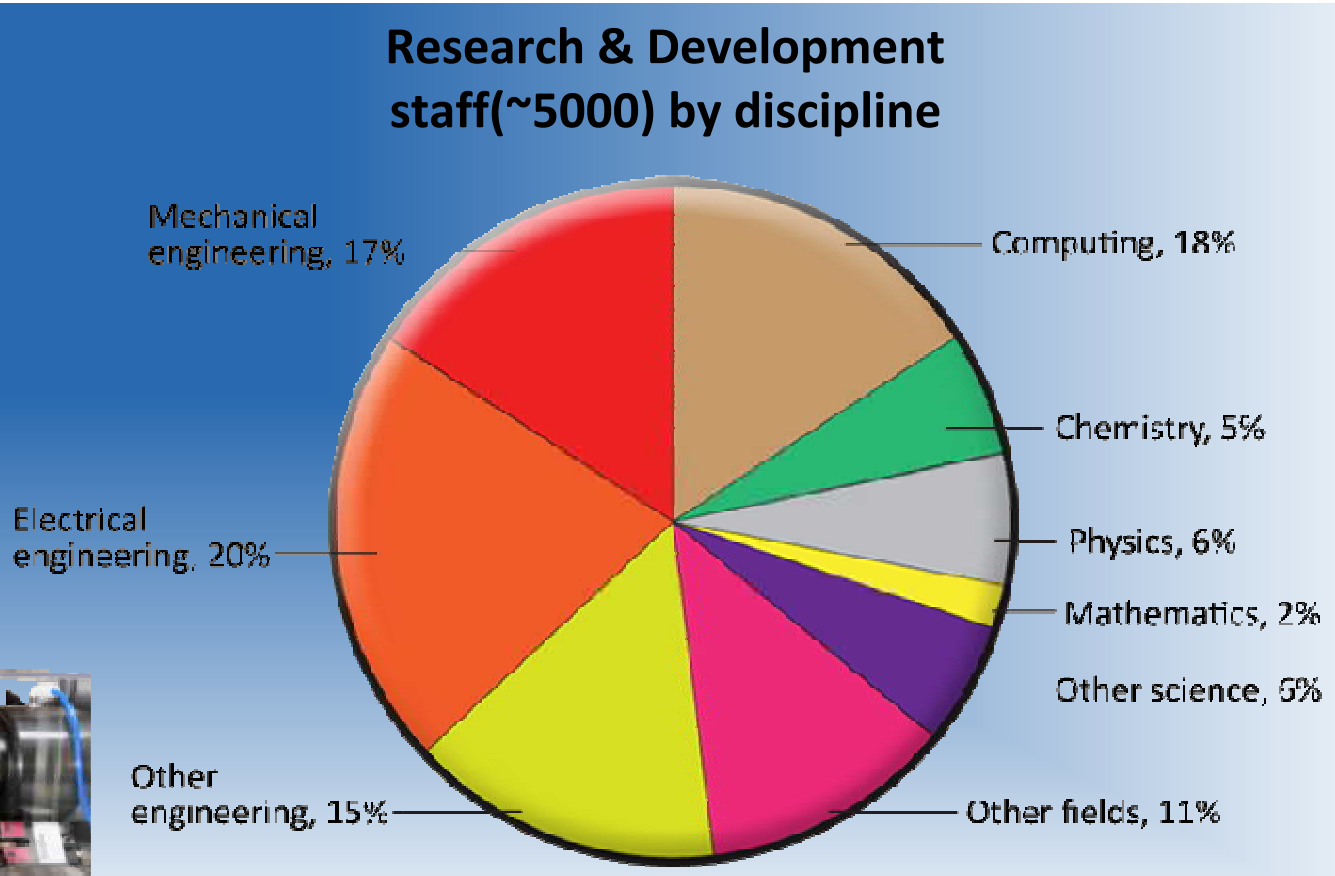
- Thorough verification of designs
- Extensive manufacturing readiness and qualification
- Rigorous product acceptance and configuration control
- Persistent resolution of production issues and performance anomalies



Expert workforce

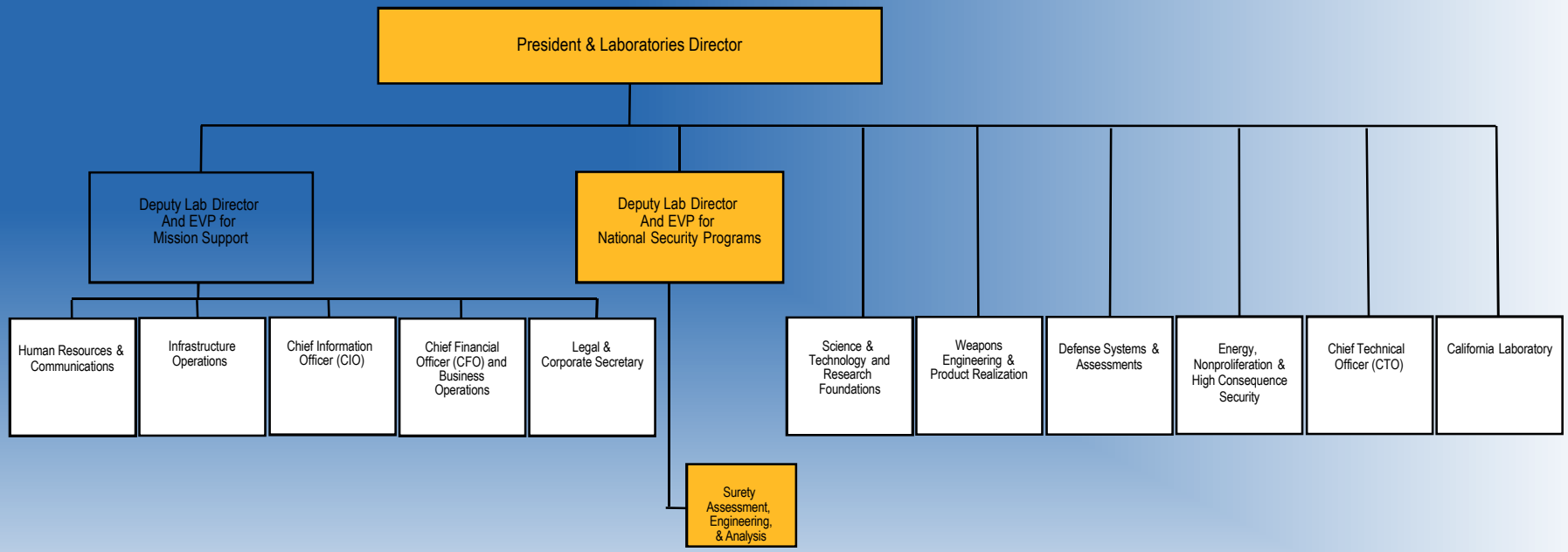
Responsible activists





Expert workforce

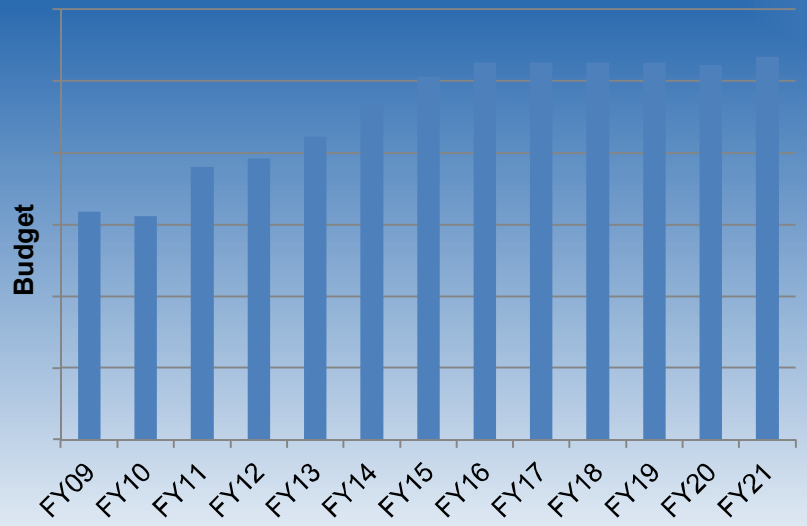
Knowledgeable independence

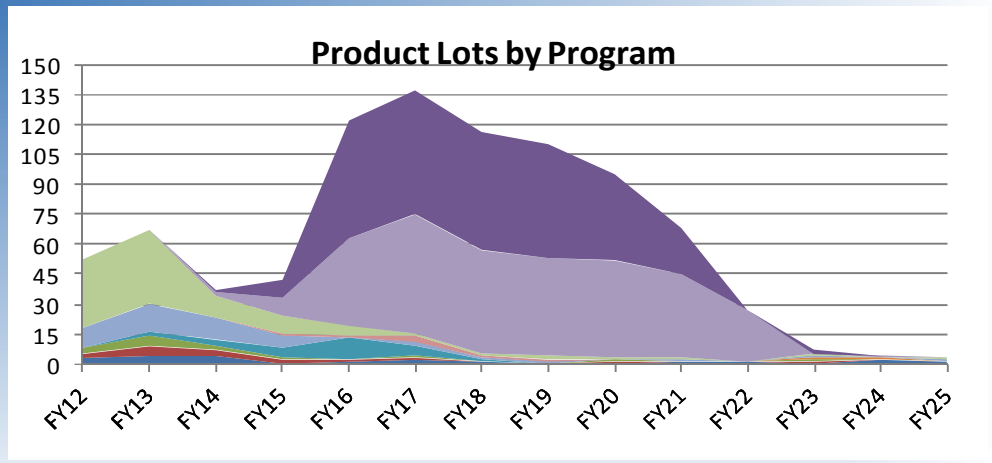


Current Environment

Competency based tenets for quality assurance are at risk in the current environment.

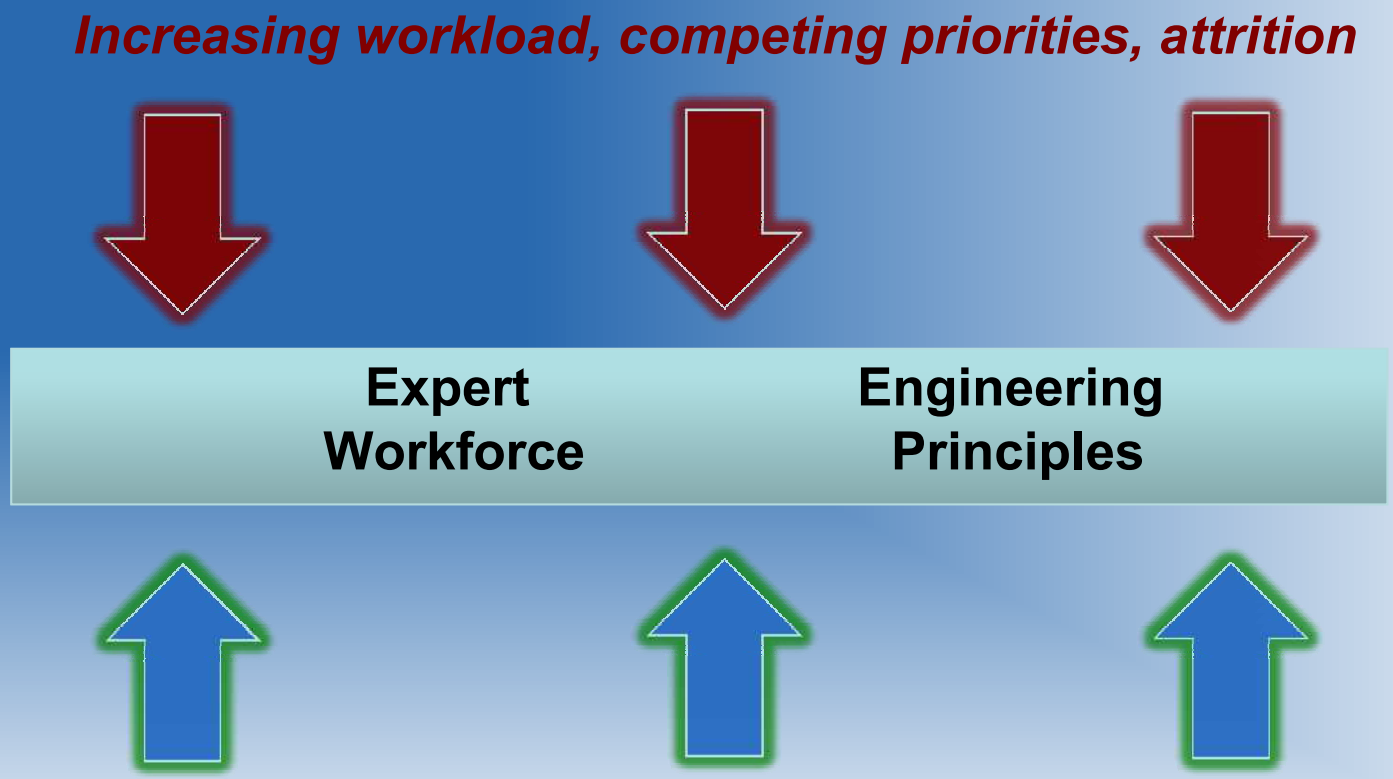
- Unprecedented attrition and hiring
- Rapidly increasing workload
- Competing program priorities



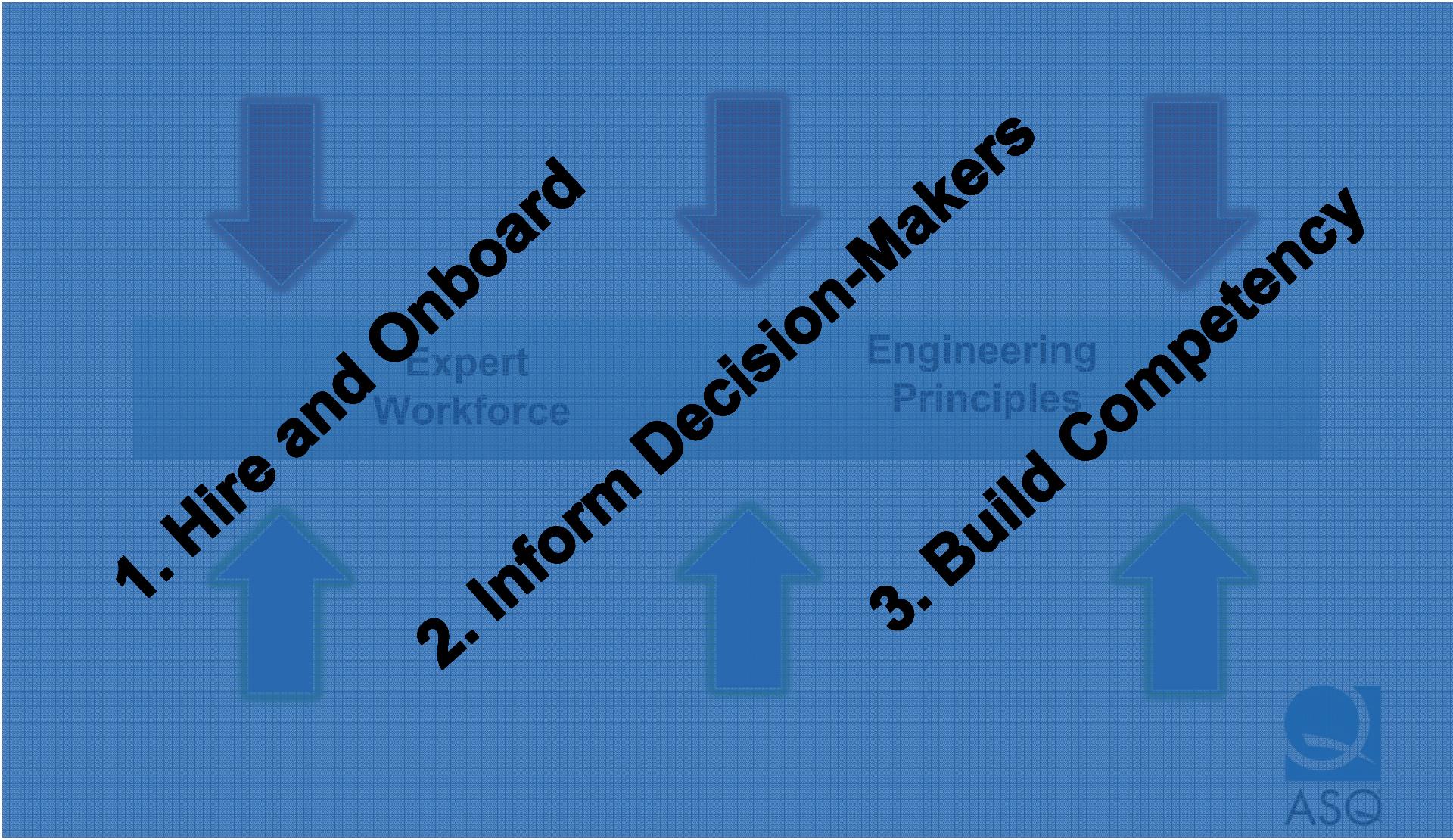


Mitigating Risks

The quality organization is well-equipped to mitigate risks in the current environment.

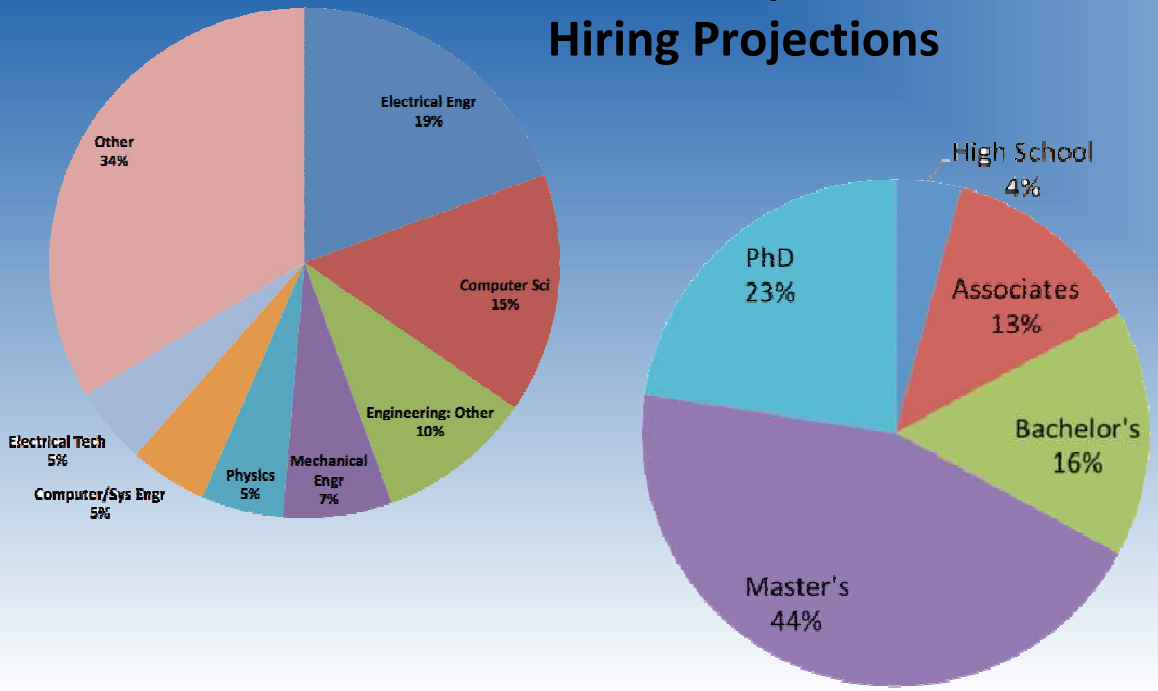


A Strategy for the Quality Organization



1. Objective: Hire the Best

- Goal: Efficiently hire quality engineers with credentials on par with project teams



1. “Hire the Best” Results

- Goal: Efficiently hire quality engineers with credentials on par with project teams
- Result: Streamlined processes were developed and used to hire quality engineers

Surety Assessment, Engineering, and Analysis Center Procedure

Procedure Name: SAEA Center Hiring Process	**Status:** Released
Identification Number: CAP-107	**Issue:** B
Owner: J. Rick Fellerhoff, Director	**Issue Date:** March 26, 2012
Author: Ramona Cordova	**Last Self-Assessment Date:** March 26, 2012

CHANGE HISTORY

Issue	Change Description	Issue Date
A	Initial Release	08/01/11
B	Center Records Administrator performed Annual Review. Updated to current format, recent Center name changes.	03/26/12

Overview:

In order to have consistency within the Surety Assessment, Engineering, and Analysis (SAEA) Center, there is a need to have a single hiring process for the Center. This is mainly due to some confusion on process, points of contact, etc.

Applicability:

All Managers, Persons of Interest (POI), Administrative, Staffing Support will follow this Process.

Procedure Inputs:

- Checklists and Tools created at Kaizen Event
- Current Process Procedure
- Customer information
- Vision and Objectives

Procedure Outputs:

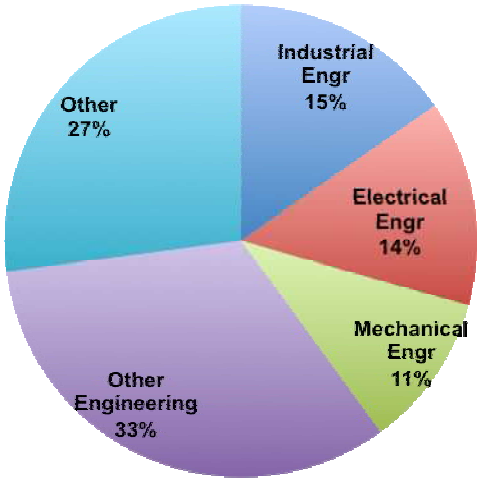
- A Lean Process to identify and hire qualified Candidates to meet SAEA Center's staffing needs.
- A Procedure with defined Roles and Responsibilities.
- A single repository such as SharePoint site to house all required/pertinent documentation.
- Ability to measure the effectiveness of Staffing Process

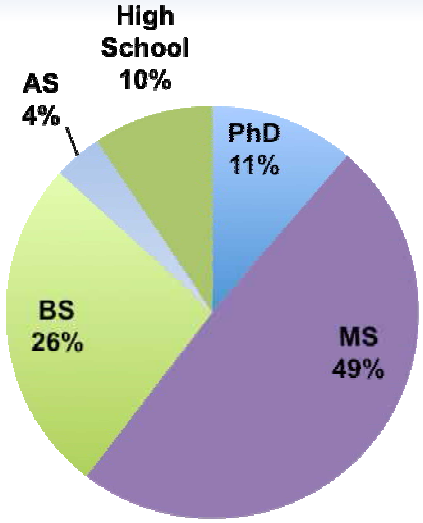
Total Applicants 4/12 – 2/13	Screened Applicants	Selected for Interview	Offers Extended
773	137	55	41

75% of interviews resulted in a job offer.

1. “Hire the Best” Results

- Goal: Efficiently hire quality engineers with credentials on par with project teams
- Result: Quality engineers were hired with commensurate technical credentials





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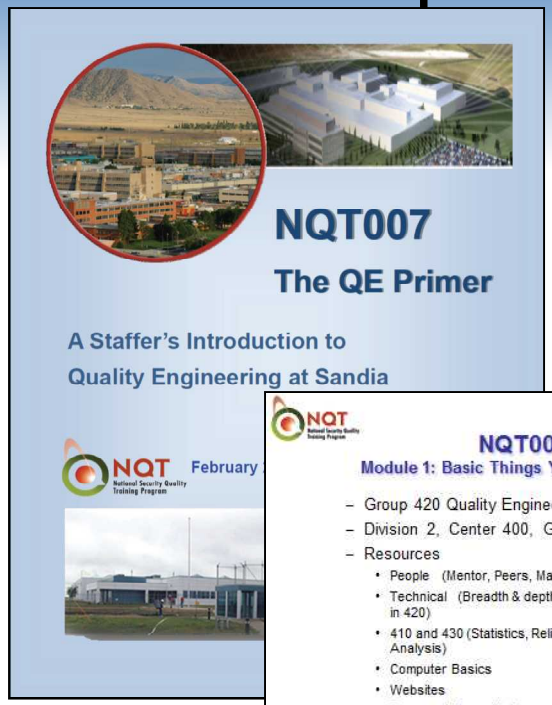
Quality of hires exceeded corporate objectives (Apr 2012 – Feb 2013 data).

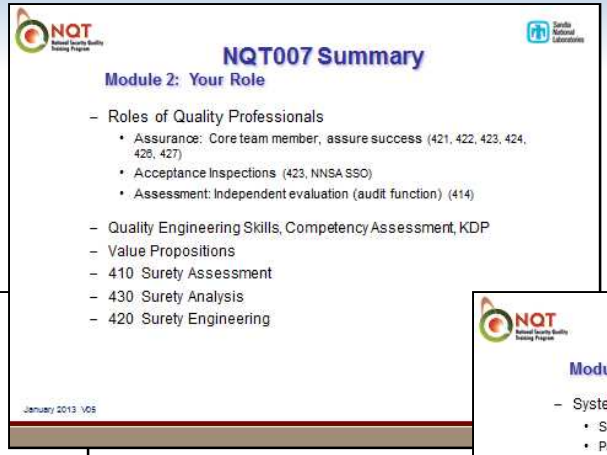
1. Objective: Rapidly Onboard

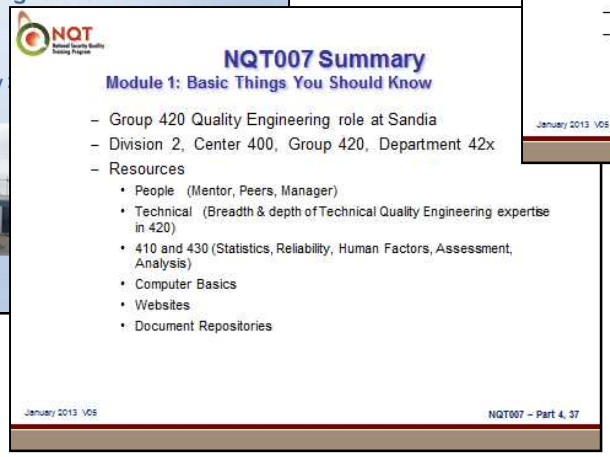
- Goal: Provide a quick-start (aka boot-camp) to new quality engineers

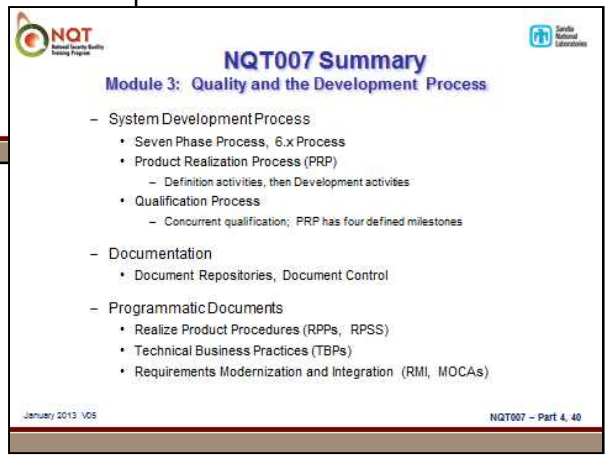
1. “Rapid Onboard” Results

- Goal: Provide a quick-start to new hires
- Result: “Boot-camp” developed and rolled out to quality engineers



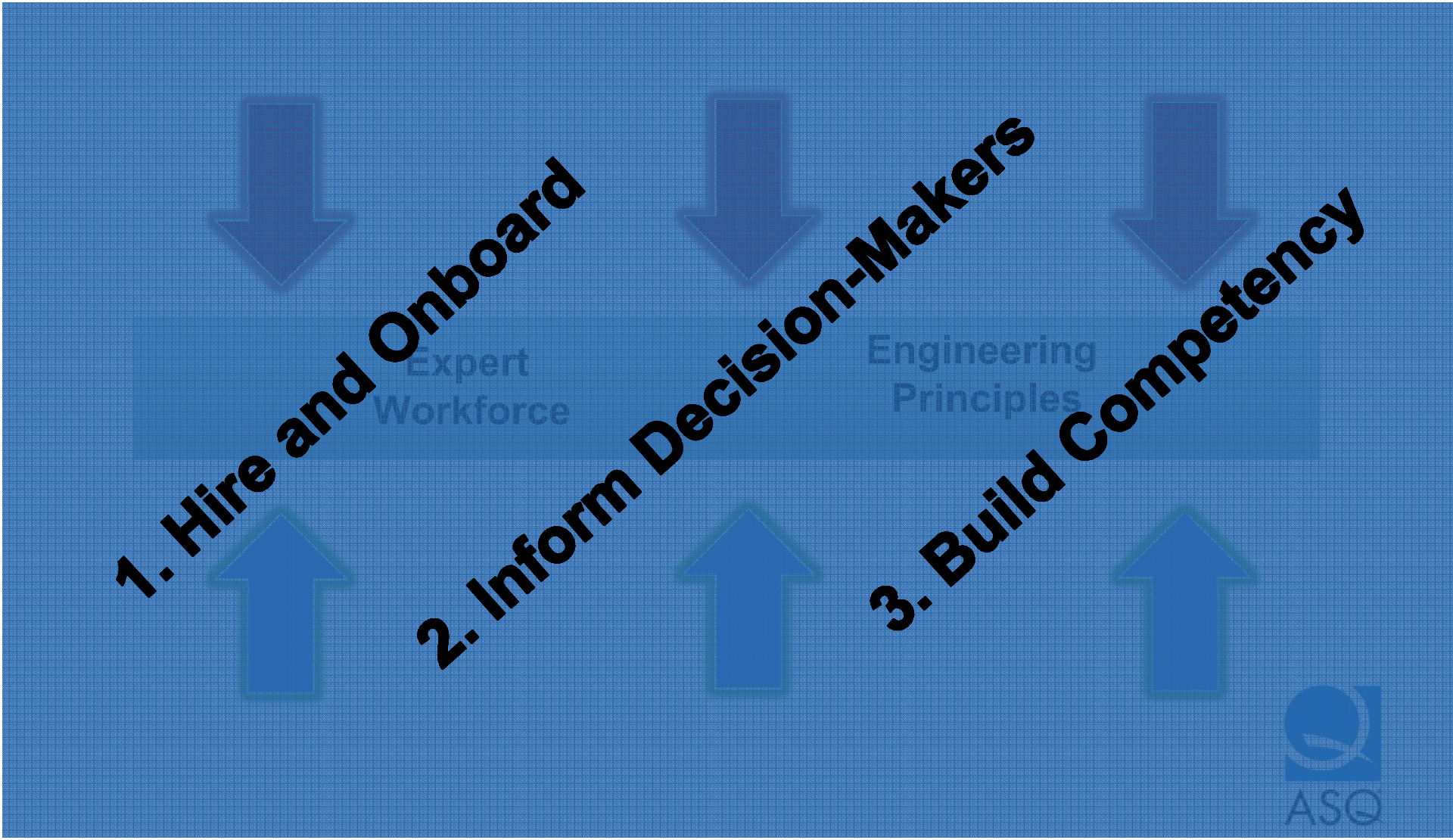






>80% of staff completed the “boot-camp” in the first 9-months of offering.

A Strategy for the Quality Organization



2. Objective: Inform Decision Makers

- Goal: Establish clear lines of communication and proactively engage customers

2. “Inform Decision Makers” Results

- Goal: Establish clear lines of communication and proactively engage customers

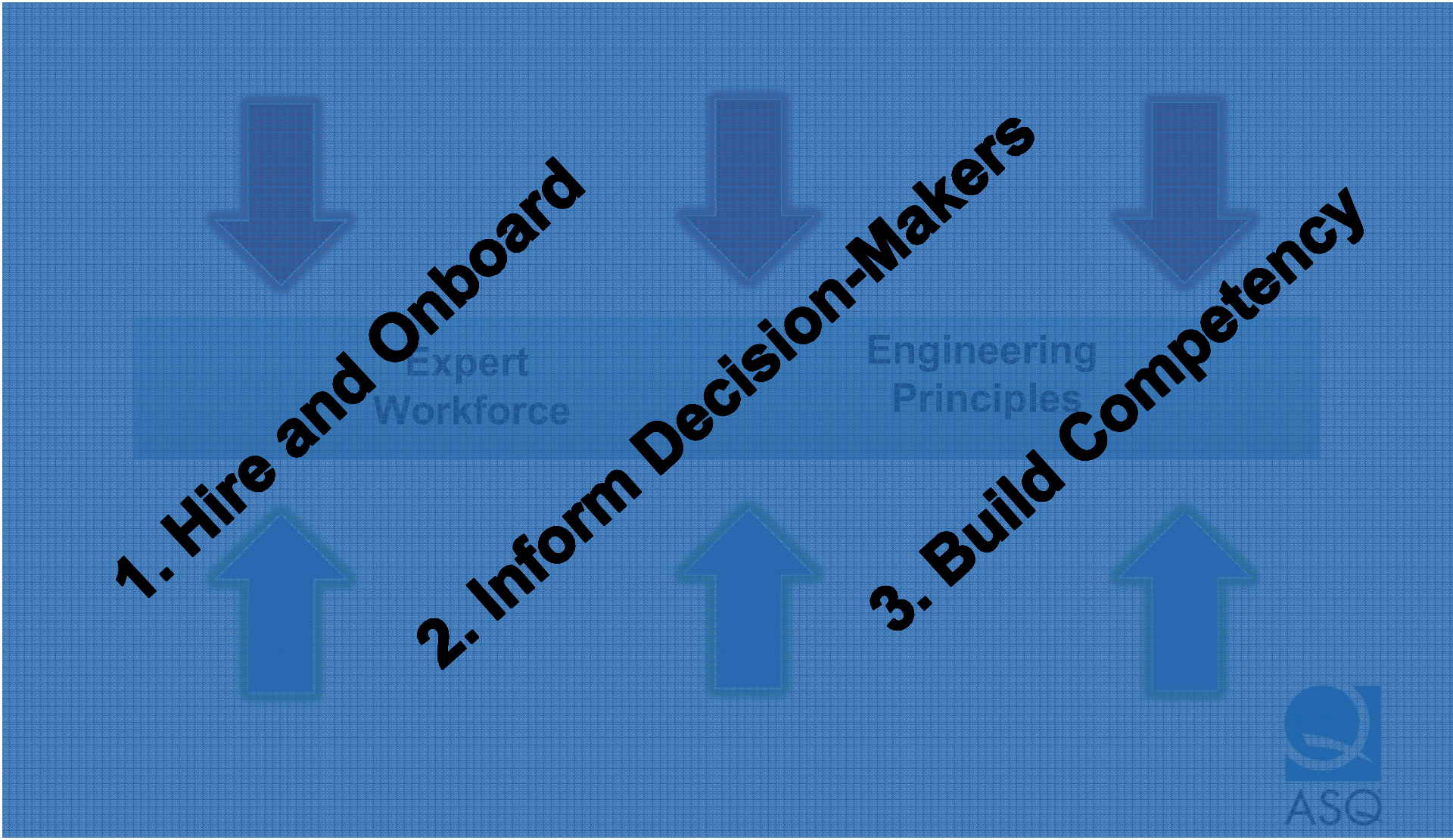
- Results: Developed zipper plans, work agreements, and monthly quality reports

All customers on management zipper plans

~60% of FY13 quality engineer support documented in work agreements

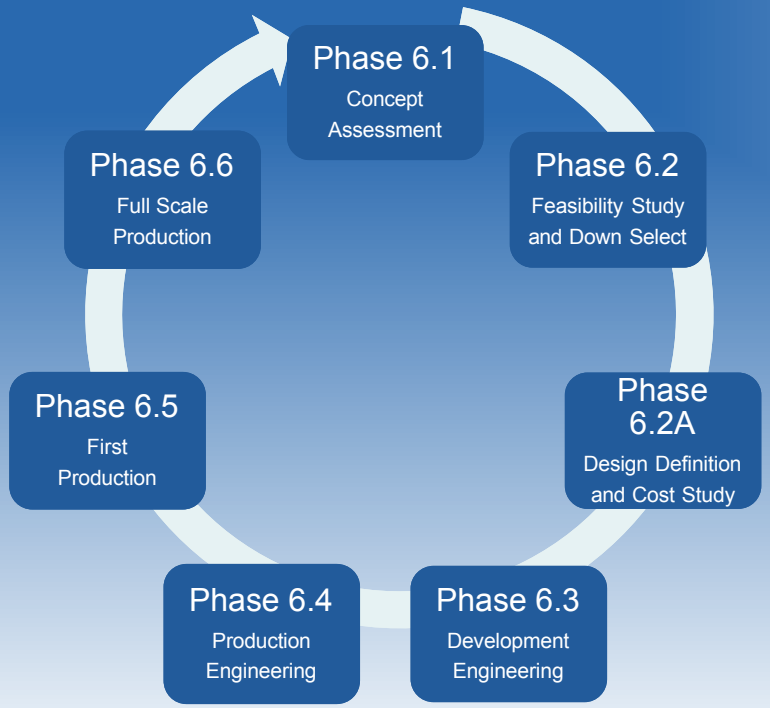
Major weapon programs receive monthly state of quality reports

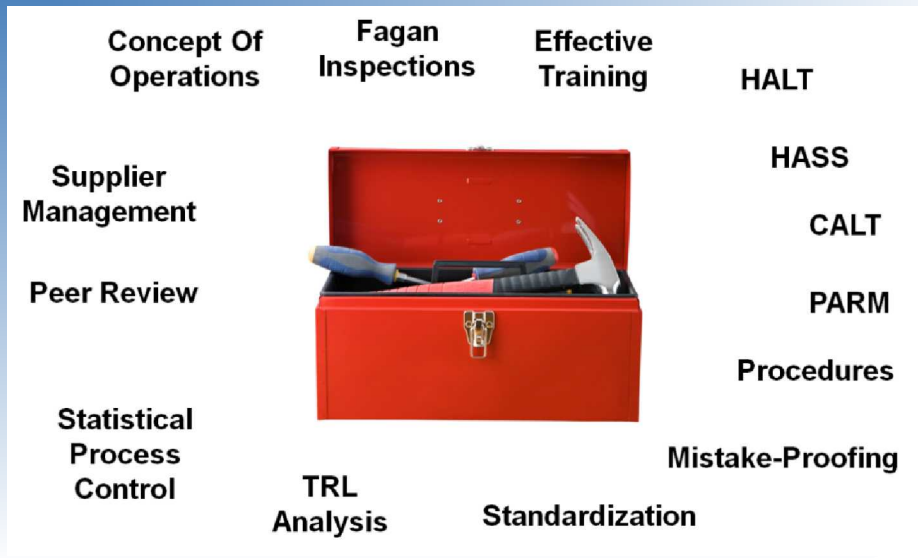
A Strategy for the Quality Organization



3. Objective: Build Competency

- Goal: Provide training on engineering processes and preventive quality techniques

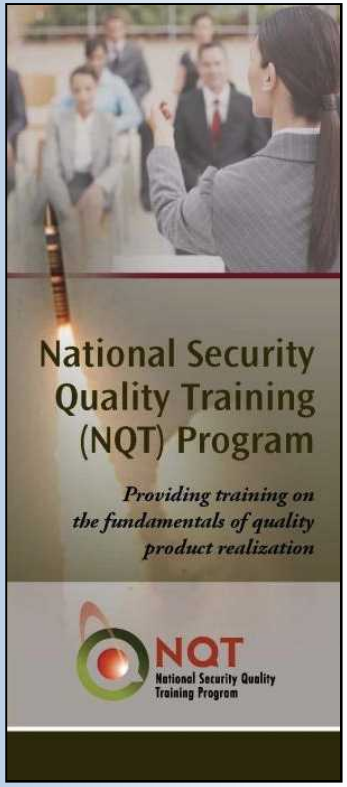




Graphic from M. Daily "1700 Defect Prevention Strategy Discussion, Jan 2012"

3. “Build Competency” Results

- Goal: Provide training on engineering processes and preventive quality techniques
- Result: Developed and deployed a corporate-wide “quality” training program



In FY12, ~700 attendees with 80% from outside the quality organization

Summary

- In high-consequence engineering organizations, quality assurance may be heavily dependent on staff competency,
- Competency-dependent quality assurance models are at risk when the environment changes,

Summary

- Risks in a competency-dependent culture can be mitigated through changes to hiring, training, and customer engagement approaches,

- Quality engineering organizations can mitigate corporate-level risks by driving changes that benefit all departments.

End