Ready for what's next.

Technical Baseline Repair

When quick fixes and excuses are no longer enough

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Agenda

- A Note on Theory
- The Big Picture
- System Environment
- The Special Sauce
- The Approach
  - Initial Assessment
  - Solution Plan
  - Solution Implementation
- Did it work?

A Note on Theory

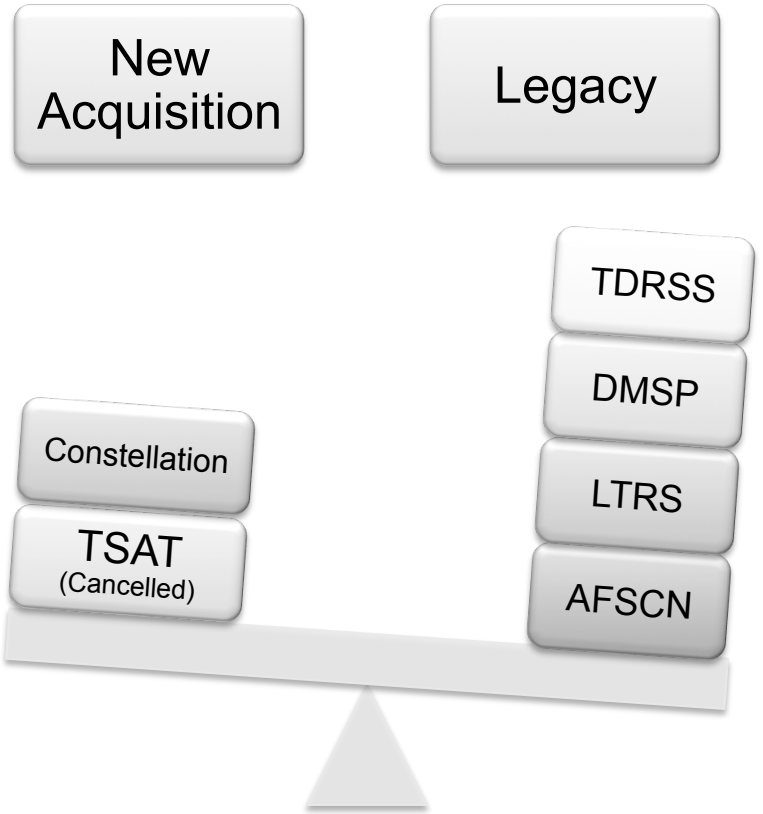
"In theory there is no difference between theory and practice. In practice there is."

- Yogi Berra

- The solutions presented in this briefing are not theoretical.
- This happened. This worked.

The Big Picture

- A trend toward upgrading and integration of Legacy systems vice the procurement of new systems appears to be emerging
- The addition of new capabilities on to an aging system is a significant Systems Engineering challenge
  - Not all programs have adequately met the challenge



TDRSS: Tracking and Data Relay Satellite System (NASA)
LTRS: Launch and Test Range System
DMSP: Defense Meteorological Satellite Program
TSAT: Transformational Satellite Communications System
AFSCN : Air Force Satellite Communication Network

If you build on a bad foundation, everything crumbles.

System Environment – Quick Facts

- Walking a Fine Line
  - "Names have been changed to protect the innocent."
- It is Big
  - Effectively two levels of Requirement Specifications: System and CI
  - 200+ System Level Requirements. 50+ CI Specifications with over 25,000 CI Level requirements
- It is Old
  - Some components decades old.
  - Sustainment contractor has transitioned multiple times
- It is Evolving
  - Multiple on-going and troubled major development projects
    - Major schedule slips and cost overruns
  - IST Test failures in one project the catalyst for this activity

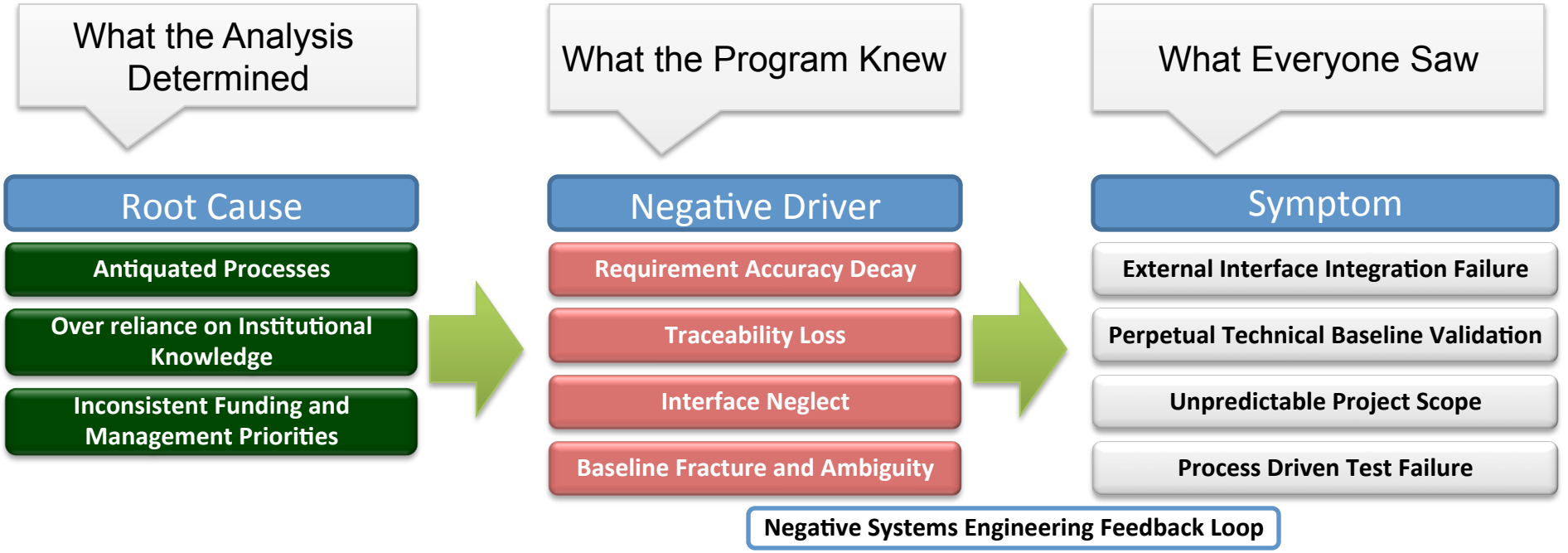
The Special Sauce – A Matter of Perspective

- A cost effective repair to systemic system engineering failures requires a unique perspective
  - A one size fits all, fix everything approach may not be fiscally realistic

- Try to think like a medical doctor - Treat the System's System Engineering environment as an evolving, inter-connected, system of systems
  - The symptoms are not the problem, they are manifestations of the problem
  - Ensure core Systems Engineering processes are healthy
  - Target resources to the address the root causes of Systems Engineering dysfunction
  - After the targeted fix, permit the natural iterations of good systems engineering processes to heal other Systems Engineering components

Initial Assessment

- The initial assessment included interviews with government and developer stakeholders



Initial Assessment - Symptoms

External Interface Integration Failures	Undifferentiated Operational/Developmental/Future requirements drive multiple integration failures.
Perpetual Technical Baseline Validation	Un-scoped baseline validation activity for major development project drove major cost and schedule slips. Low confidence in Technical Baseline drives re-occurring requirement validation "tax" on new projects.
Unpredictable Project scope	Lack of robust requirement management processes drives increased cost estimation uncertainty. Ability to efficiently cost proposed projects lost.
Process Driven Test Failures	Major development project requires unplanned iterative testing to compensate for test failures. Drives multiple negative award fee comments.
Negative Systems Engineering Feedback Loop	Perceived inability for contractor to repair Systems Engineering process drives perfect storm of increased Government oversight and funding reductions. Positive SE processes (ERB, Requirement Analysis, Architecture) grouped with the bad. All lose Government support. Technical Baseline degradation is accelerated.

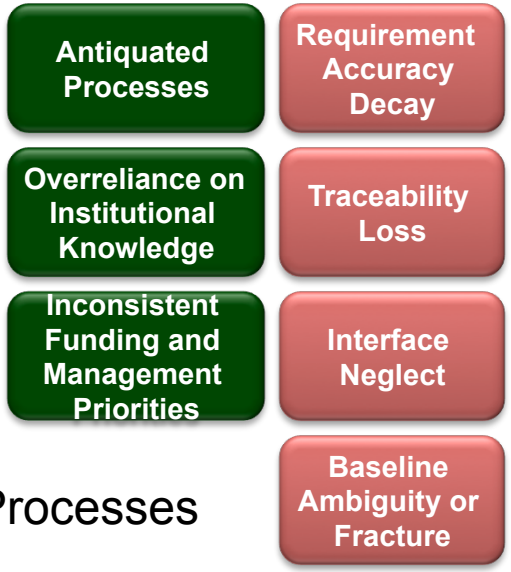
Initial Assessment – Drivers

Requirement Accuracy Decay	Low community confidence in requirement accuracy. Accepted cultural avoidance of updating specifications.
Traceability Loss	Low community confidence in documented traces. Most traces absent or inaccurate. Many traced to non-baselined TRDs.
Interface Neglect	Interface specifications contained undifferentiated mix of operational (i.e. “as-is”), developmental (under contract) and future requirements.
Baseline Ambiguity or Fracture	No Government - contractor consensus on baselined equipment or specifications. Insufficient ad hoc approach to managing splintering technical baseline drives confusion and overall lack of confidence.

Initial Assessment – Root Causes

Antiquated Processes	**Two level requirement hierarchy never evolved to align with current system's complexity. Archaic and unsustainable Trace management process. No process to maintain multiple baselines.**
Overreliance on Institutional Knowledge	**"Real" requirements known by a select few. Some were not on the baseline. Key personnel became well intentioned choke points. An enabler for requirement decay.**
Inconsistent Funding and Management Priorities	**Insufficient resources can drive insufficient products. Over a long timeline, iterative products suffer on past inaccuracies or omissions. Imbalanced Project vs. System Engineering.**

Solution Plan



- Modernize Requirement Management System
  - Addresses process aspect of Traceability Loss
- Build Segment Specifications
  - Third Tier to Spec Hierarchy addresses Antiquated Processes
  - New Accurate Requirement Set
    - Jumpstarts Requirement Accuracy Decay Solution
    - Mitigates Institutional Knowledge challenge
    - Facilitates identification of As-is, Developmental, and Future baseline
    - Mitigates Baseline Fracture or Ambiguity
  - Jumpstarts content aspect of Traceability Loss
- Identify and Publicize Impacts to short term funding decisions
  - Addresses Inconsistent funding /priority challenge

Solution Implementation – Lessons Learned

Remember the Goal

- The goal is to fix a systemic problem, not produce a product. There is a difference.

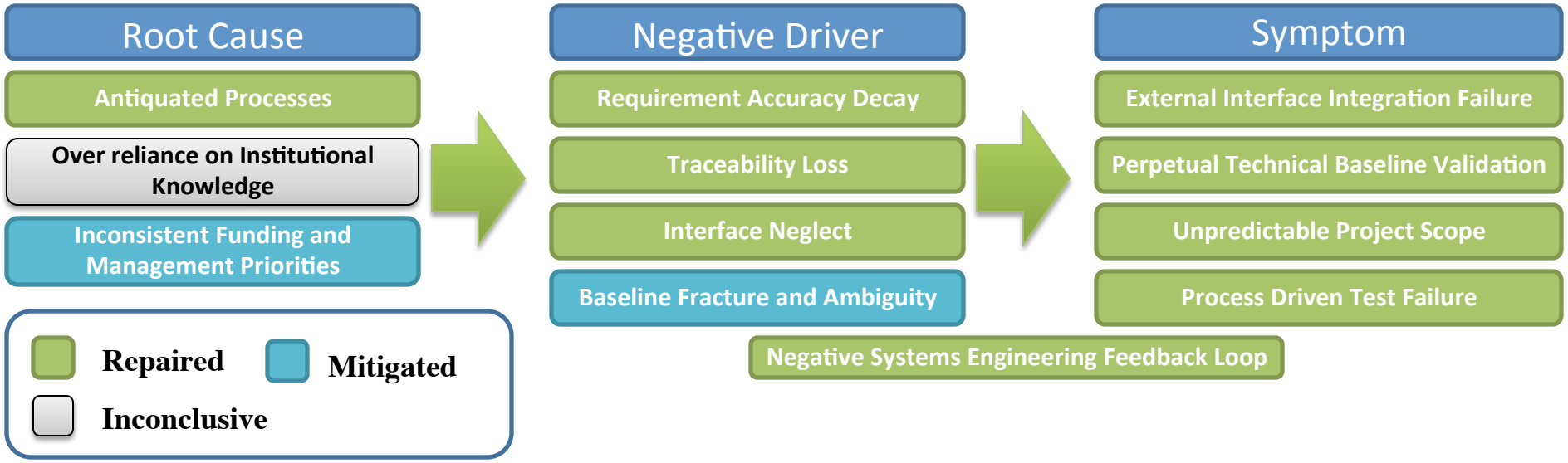
Adapt to Reality

- Assess the health of the Systems Engineering products and processes
- Identify, then fix or mitigate challenges. (Note: Ignore was not an option.)

Do not ignore the stakeholder environment

- Deal with the skeletons. Talk to your audience (talking ≠ email).
- Coordinate and publish a robust and modular solution plan. Follow it.
- Design products to expeditiously both convince and inform. Pithy and clear is good.

Did it Work?



- New Segment Specifications, when combined with good systems engineering processes healed majority of challenges
- Funding and Management priorities now balanced
- Products structured to document baseline fracture
- Foundation present to relieve institutional knowledge reliance

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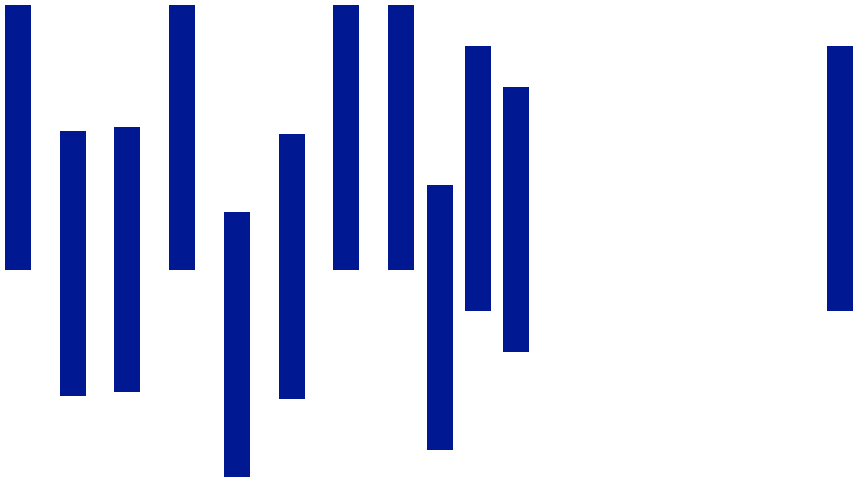
delivering results that endure



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