A Systems Engineering Approach to Risk-based Asset Management

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OVERVIEW

A system engineering approach to asset management can improve the management of risk.

Managing asset failure and their consequences is a critical function of an asset management system.

A risk-based approach to asset management does not mean taking on more risk, rather it manages risk to optimize cost and performance.
Many factors are forcing transit agencies to rethink how they manage their assets.

Global Trends
- Rapid Urbanization
- Higher expectations
- Changing Technologies
- Climate change
- International Standards

New Federal Requirements
- State of Good Repair and performance measures
- Minimum safety performance standards and new safety oversight scheme
- Requires Asset Management Plans and performance targets
- Requires Safety Plans with targets and risk strategies

Agency Challenges
- Growing Demands
- Accelerating Rate of Change
- Chronic Underfunding
A system engineering approach to asset management will result in improvements to the management of asset risk.
Our approach to the Asset Management Program at NYCT

Systems Engineering
- Review of Requirements (ISO Architecture)
- System Design
- Design Review
- System Implementation
- Acceptance Test Matrix

Enterprise Information Architecture

Program Management

Change Management

International Standards

MSP

Prosci

ISO

BSI

New York City Transit

ATKINS

June 4, 2013
Our mandate is to improve our “management system” to support evidence based decision-making over the lifecycle of our assets

Executive Mandate

Establish an effective management system that supports informed decision making

Demonstrate to customers, funders and other stakeholders that the right things are being done with the budget and that the assets are being managed responsibly
Our Concept of Operations captures our vision for an asset management system that derives optimum value from our assets over their lifecycle.
Decision criteria can be used to align the 3-levels of planning, which in turn inform detailed delivery planning for projects, maintenance and operations.

- **Business Planning**: Medium term planning to achieve organizational goals and objectives.
- **Network Planning**: Optimized plans to achieve the required system performance.
- **Asset Class Planning**: Optimized plans for an asset class to achieve the required asset performance.

### Levels

- **Funding Levels**
- **Customer Service Guidelines**

### Planning

- **Investment Planning**
- **Delivery Planning**
- **Maintenance Planning**
- **Operations Planning**

**MTA**

**NYCT**

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High-level business requirements were defined to deliver the NYCT mission.

The requirements support an evidence-based planning and decision-making system that support a balanced approach to performance, cost and risk to transit outcomes.
Our proposed asset hierarchy defines basic location, equipment and event data required for vehicles, facilities, guideways and systems.
Hierarchical, logical, spatial and temporal models of asset information are needed to support life-cycle maintenance, management and analytics.
The asset hierarchy is designed to support the management of risks resulting from asset failure.

The proposed hierarchy will help NYCT move to a reliability-centered approach to maintenance

Reliability-Centered Maintenance (RCM) is a process used to determine what must be done to ensure that any physical asset continues to do what its users want it to do in its operating context:

- What are its functions?
- In what ways can it fail?
- What causes it to fail?
- What happens when it fails?
- Does it matter if it fails?

- Can anything be done to predict or prevent the failure?
- What if we cannot predict or prevent the failure?

NYCT Asset Management System supports evidence-based planning and decision-making that recognizes financial and other constraints.
Managing Successful Programmes© follows a system engineering approach for the realization of benefits of a change program.

**Corporate Objectives**
- Improved decision making
  - Forms mandate

**Program Vision**
- Developed into
  - Program Blueprint
  - Defines the

**Project Outputs**
- An Asset Management IT system

**Capabilities**
- Create

**Outcomes**
- A single, shared view of the condition of our assets across NYCT

**Benefits**
- Realizes
- Reduce maintenance hours by X%

**Corporate Objectives achieved**
- Delivers
When we talk about managing assets, for the most part we are really talking about managing asset risk

- ISO 55001 and PAS-55 advocate risk based asset management as a key success factor for asset-intensive systems.

- A risk based approach does not mean taking on more risks, but using an assessment of risks to balance cost, performance, safety, customer service, and social responsibilities.

- Developing our knowledge around asset failure modes and the potential business consequences is key to the performance-cost-risk trade-off at the heart of good asset management.

Reference: Discussions with Mass Transit Railway (MTR) on Risk-based Asset Management

June 4, 2013
Thank you – any questions?

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