Current Asset Management Practices: A National and International Review

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Scope

- Literature research in SGR analysis and transit asset management
- Summary of SGR/Asset Management practices at sample agencies, including
  - Selected large and small agencies
  - Selected state DOT examples
  - Selected international examples

FTA SGR Existing Practice Review
Case Studies

- U.S. Transit Agencies
  - Chapel Hill
  - CTA
  - GRTC
  - St. Louis Metro
  - MTC
  - MARTA
- State DOT
  - Oregon
  - Virginia

FTA SGR Existing Practice Review
Case Studies

- International Agencies
  - London (England) Underground
  - Victoria (Australia) Department of Transport
  - Toronto (Canada) Transportation Commission

FTA SGR Existing Practice Review
Literature Review

- Limited but useful information available on SGR/Asset Management in the transit industry
- Most of the information in the literature discusses tools and approaches that some agencies use in the management of their assets

Summary of Existing Practices
Case Studies

Subject Areas (Considers all 11 agencies):

- Establishing Policy, Goals, and Objectives
- Performance Measures
- Asset Inventory
- Condition Assessment
- Maintenance Policies
- Information Systems
- Scenario Analysis

Summary of Existing Practices
Case Studies

- Establishing Policy, Goals, and Objectives
  - Generally agencies have a working definition of SGR and have identified achieving SGR as a goal
  - Two agencies have agency policy goals and objectives aligned with an asset management approach that identify achieving SGR as an objective, and provide a context for why this important

Summary of Existing Practices
Case Studies

- Performance Measures
  - Generally performance measures have been established for reporting, including average age of assets and mean time/distance between in-service failures
  - Three agencies have comprehensive set of performance measures established and reported regularly. Measures reported relate maintenance effectiveness to user impacts

Summary of Existing Practices
Case Studies

- Asset Inventory
  - Generally agencies have an asset inventory, with information stored at the vehicle level for buses and rail cars, and by track section. Data on structures and facilities is stored at varying levels of detail
  - Two agencies have an asset inventory (register) established for all assets, specifying data items for each asset and data collection protocols. Complex assets, such as rail vehicles, facilities, and structures are represented at the component and subcomponent level

Summary of Existing Practices
Case Studies

- Condition Assessment
  - Generally, agencies perform condition assessment on a regular basis for vehicles and track, and on a periodic basis for other assets. Defects are logged during inspections, but the agency lacks an overall condition measure
  - For three agencies, the condition assessment approach is well-established for all assets, and includes condition assessment measures as well as defect tracking

Summary of Existing Practices
Case Studies

- Maintenance Policies
  - Generally agencies have written policies established for asset rehabilitation and replacement for vehicles and track based on time and/or mileage intervals
  - Three agencies have developed a comprehensive policy intended to minimize life-cycle costs and maximize asset serviceability

Summary of Existing Practices
Case Studies

- Information Systems
  - Generally agencies have maintenance management systems established for vehicles and track
  - For two agencies, the maintenance management system is implemented for all asset inventory and maintenance. Track and other linear assets are represented geospatially

Summary of Existing Practices
Case Studies

- Scenario Analysis
  - Generally agencies perform unconstrained needs assessments periodically through projecting required rehabilitation and replacement work based on time or mileage-based intervals
  - For two agencies, scenario analysis is performed annually. The agencies have the ability to calculate unconstrained needs, as well as to project the distribution of work given likely funding, and estimate the impacts of any deferred maintenance

Summary of Existing Practices
Case Studies

Functional Areas (Considers six transit agencies):

- Inventory
- Inspection
- Identifying Deficiencies
- Decision Support
- Tracking work
- Monitoring and Reporting

Summary of Existing Practices
Case Studies

- Inventory
  - Chapel Hill – Uses TRANSMAN for bus inventory and manual means for other assets
  - CTA – Uses MAXIMUS MMIS for vehicles, Infor EAM for fixed guideway
  - GRTC - Uses RTA Fleet Management System for bus inventory, manual means for other assets
  - Metro St. Louis - Uses MAXIMUS MMIS for all vehicles and maintenance facility, other assets tracked separately
  - MARTA – Asset inventory stored in MAXMUS MMIS
  - MTC – Established RTCI for asset inventory

Summary of Existing Practices
Case Studies

- Inspection
  - Chapel Hill – Inspects buses every 6,000 mi (minimum), tracks inspections/deficiencies using TRANSMAN
  - CTA – Inspects vehicles daily, track and stations weekly, others periodically, stores inspection data in MMIS/EAM
  - GRTC - Inspects buses every 6,000 miles at a minimum, tracks inspections/deficiencies using RTA system
  - Metro St. Louis - Performs regular inspections of vehicles, maintenance facilities, storing data in MMIS
  - MARTA – Inspection data stored in MMIS, varies by asset
  - MTC – Varies by agency

Summary of Existing Practices
Case Studies

- Identifying Deficiencies
  - Chapel Hill – Manually by inspection
  - CTA – Manually by inspection
  - GRTC - Manually by inspection
  - Metro St. Louis - Manually by inspection
  - MARTA – Manually by inspection
  - MTC – RTCI predicts replacement/rehabilitation needs based on asset age

Summary of Existing Practices
Case Studies

- Decision Support
  - Chapel Hill – Needs projected external to TRANSMAN
  - CTA – Needs projected external to MMIS/EAM
  - GRTC - Needs projected external to RTA system
  - Metro St. Louis - Needs projected external to MMIS
  - MARTA – Needs projected external to MMIS
  - MTC – RTCI used to project future needs

Summary of Existing Practices
Case Studies

Tracking Work

- Chapel Hill – Maintenance work tracked in TRANSMAN, capital projects tracked externally
- CTA – MMIS/EAM track maintenance work, capital projects tracked separately
- GRTC – Maintenance in RTA, capital projects externally
- Metro St. Louis - MMIS tracks maintenance work, capital projects tracked separately
- MARTA – MMIS tracks maintenance work, CIP tracks capital projects
- MTC – Varies by agency

Summary of Existing Practices
Case Studies

- Monitoring and Reporting
  - Chapel Hill – TRANSMAN used for maintenance reporting
  - CTA – Integrating monitoring/reporting system established
  - GRTC – RTA system used for maintenance reporting
  - Metro St. Louis - Overall performance reporting system established
  - MARTA – MMIS used for maintenance monitoring
  - MTC – Varies by agency

International Case Studies

- Agencies
  - London Underground
  - Victoria Department of Transport
  - Toronto Transit Commission

London Underground

- 11 rail lines in metropolitan London
- 243 miles of track
- 276 stations
- 4,070 rail cars
- 3M riders daily
- Operating since 1863

London Underground

- Privatized in 2003 and divided into three private sector infrastructure companies
- System maintenance (rolling stock, tracks, tunnels, signals) became responsibility of the three private companies (Infracos) for 30 years
- LU was responsible for operations and provided oversight
- In 2006, one of the Infracos went bankrupt and LU became responsible for their part of the contract

London Underground

- Developed an asset management regime for the Infracos including measures by asset type in
  - Ambience of trains and stations
  - Availability of the infrastructure, with reductions in availability due to maintenance measured in terms of lost customer hours
  - Capability of the infrastructure to provide service, measured in terms of passenger journey time
  - Fault rectification, measured based on response time established by type of defect

London Underground

- Adjusts monthly payments based on performance
- Asset Performance Review Maintenance (APRM) meetings every four weeks

London Underground

- Investment plan
  - Prepared annually
  - Assets categorized on an A-E scale based on residual life
  - LU models projected expenditures considering impacts of deferred maintenance on agency and user costs

London Underground
Noteworthy Features

- Development of a comprehensive asset register, including condition measures for all of its assets
- Implementation of the measure lost customer hours for supporting evaluation of maintenance effectiveness and linking maintenance to user costs
- Development of an annual asset management plan considering available funding and explicitly calculating agency and user costs of deferred maintenance

Victoria Department of Transport

- 5,000 miles of rail track in Victoria, Australia
  - Commuter rail, intercity rail, freight service
- 17 routes and 225 miles of rail track, plus 26 routes and 150 miles of trams in Melbourne alone
- 900 rail cars, 530 trams in Melbourne
- Annual ridership of 262 million passenger trips in Melbourne

Victoria Department of Transport

- Passenger transport system was broken into 5 fully independent franchises in 1999
- Each of the 5 franchises has responsibility for maintaining some part of the system within the framework of Victoria government's asset management policy
- Financial issues led to restructuring in 2004

Victoria Department of Transport

- Original arrangement emphasized a performance-based approach, with Victoria DOT to measure conditions every 3 years using a 0-100 scale
  - Approach was problematic – updates too infrequent, scale too complicated

Victoria Department of Transport

- Revised approach
  - Franchises establish an Asset Management Plan (AMP) for inspection, maintenance, quality assurance practices
  - KPIs established for monitoring condition: e.g., mean time/distance between failures, asset availability, number of defects, planned vs. actual work

Victoria Department of Transport
Notable Features

- Comprehensive asset management approach documented through government policy and franchise agreements
- Experience establishing condition measures for rail infrastructure and rolling stock
- Comprehensive, integrated web-based inventory of rail infrastructure

Toronto Transit Commission (TTC)

- Four rail lines of over 42 route miles and 69 stations
- Streetcar of over 189 miles
- 678 subway cars, 28 ICTS cars, 248 light rail vehicles and 1,37 buses
- 1.5 million revenue trips per day

Toronto Transit Commission (TTC)

- TTC reorganized as a result of the tragic Russell Hill accident and established a system where maintenance took precedence over system expansion
- As a policy, TTC maintains rail cars and LRVs based on manufacturer recommendations and experience
- Rail vehicles are assumed to last 30 years, with major overhauls approximately every five years
- Rail cars and LRVs are inspected monthly.

Toronto Transit Commission (TTC)

- TTC has a well-defined asset inventory with defined asset types and subtypes for each asset type and subtype
- Inspection cycles and asset lives are specified by asset type/subtype, and adjusted for environment.
- Nondestructive testing (NDT) to test for rail defects every 18 months

Toronto Transit Commission (TTC)

- Performs an annual condition assessment to support development of its 10-year capital program
- Conducts biannual audits of each of its departments, and periodically conducts peer reviews of its practices

Toronto Transit Commission
Notable Features

- Early leadership in, and continuing institutional focus on achieving and maintaining a SGR;
- Structured asset inventory incorporating asset types and subtypes; and
- Well-defined approach to inspection, maintenance, and information systems, particularly for subway track and structures.

Conclusions

- All the agencies studied have some form of asset management system but of different degrees of maturity
- Major opportunities for improvements to existing U.S. practice
  - Create an asset inventory for all assets, establish data collection protocols, and represent complex assets at the component and subcomponent level
  - Establish a condition assessment approach and measures for all assets, including defect tracking.

Conclusions

- Establish a comprehensive set of performance measures relating maintenance to user impacts and report these regularly
- -Define a comprehensive maintenance policy intended to minimize life-cycle costs and maximize asset serviceability
- -Implement a maintenance management system for all asset inventory
- Align agency policy goals and objectives with an asset management approach that identify achieving SGR as an objective

Questions