Utah Transit Authority- Asset Condition and Monitoring Practices

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ABOUT UTA

- Public Transit District – six counties
- Population – approx. 2 million
- Linear Geographic Area - 130 miles by 20 miles
- Currently Employs - approx. 2000
- Operates over 700 Buses, 400 Vans, 146 LRVs, and 60 Commuter Rail Vehicles
- Carries 39,000,000 Passengers Per Year

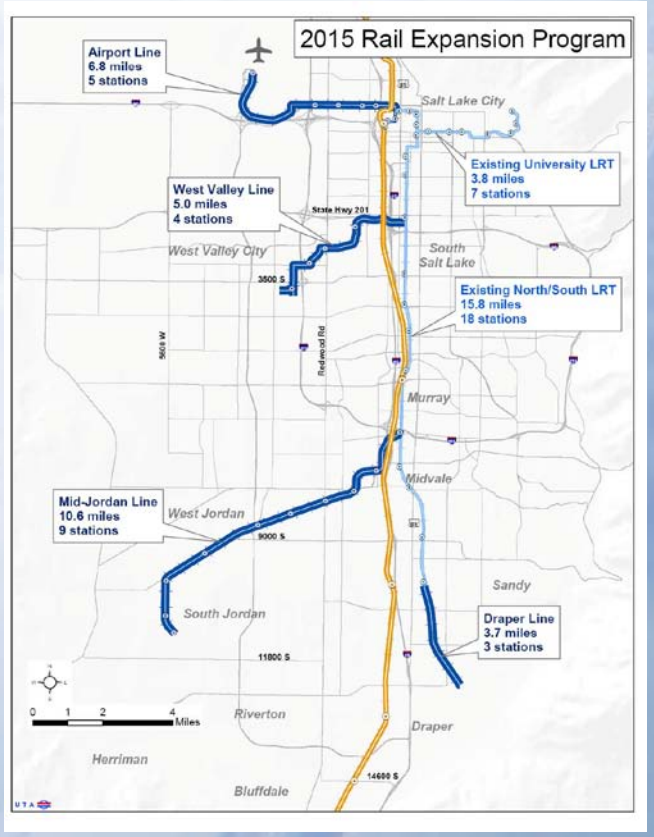
History of UTA

- 40 Years of UTA: Approaching 1 billion total passengers
- TRAX Light Rail has carried more than 115 million passengers
- 90% approval rating according to a recent Dan Jones public opinion poll
- 50 – 60% of downtown employees are taking transit to work
- All major projects have been brought in on time and below budget with no contractor claims

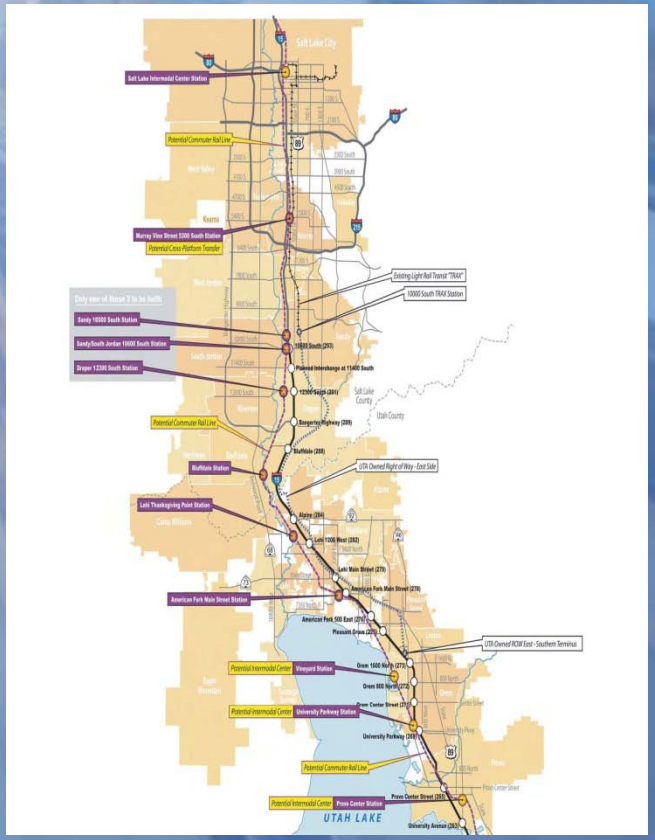

Weber County
Ogden
Great Salt Lake
Davis County
Salt Lake City
Salt Lake County
Utah County
Utah Lake
Provo
UTA
Service Area
* 1,400 square miles
* 75 cities
* 6 counties
* Population of 2.2 million
2040 Bus Network
2040 Rail Lines
UTA

Rail Expansion Projects

Four New Salt Lake County LRT Projects- Two lines beginning revenue service on August 7th, 2011



New Commuter Rail South Project- Anticipated opening in 2014



RAIL MILES SINCE 2000: 136

Year 2000-2008

North/South LRT-
15.8 miles

University/Med Ctr LRT
3.8 miles

Hub Extension LRT
1.0 miles

Commuter Rail North
45.0 miles

TOTAL: 65.6 miles

Year 2008-2015

West Valley LRT (2011)
5.1 miles

Mid-Jordan LRT (2011)
10.6 miles

Commuter Rail South (2014)
45.0 miles

Airport LRT (2014)
6.0 miles

Draper LRT (2014)
3.5 miles

TOTAL: 70.2 miles

Types of UTA Assets

- Bridges and Other Structures
- Light Rail Vehicles
- Commuter Rail Vehicles
- Rail Corridors/Platforms/Signals
- Traction Power/OCS Components
- Buses- BRT Guideway
- Maintenance Facilities
- Office Buildings
- IT Support (IPCS, JD Edwards, SPEAR)

State of Good Repair Ratings

Applied to all assets that are needed to allow for the system to operate as intended without restrictions.

- An asset management system that only tracks maintenance activities does not fill the complete need of true asset management.
- An effective system must provide information and data that adds value to the organization including cost projections of maintenance and replacement activities to keep the systems running without disruption to service.

UTA Methods For Monitoring and Rating

- Monitoring done through frequent and regular inspections
- Condition assessments are done in conjunction with regular maintenance activities
- Ratings based on UTA's SGR rating scale (1-10)
- Data is used to create UTA trend lines for how we operate
- As the trend models are refined, better cost projections and planned maintenance activities are achieved

Obstacles Involved To Achieve Consistent Condition Assessment

- Number of assets
  - Requires multiple resources to evaluate
- Entering inspection data
- Limited resources
- Retrieval of old reports
- Standardize risk assessments
- Subjective nature of assigning ratings
  - Amplified by multiple inspectors

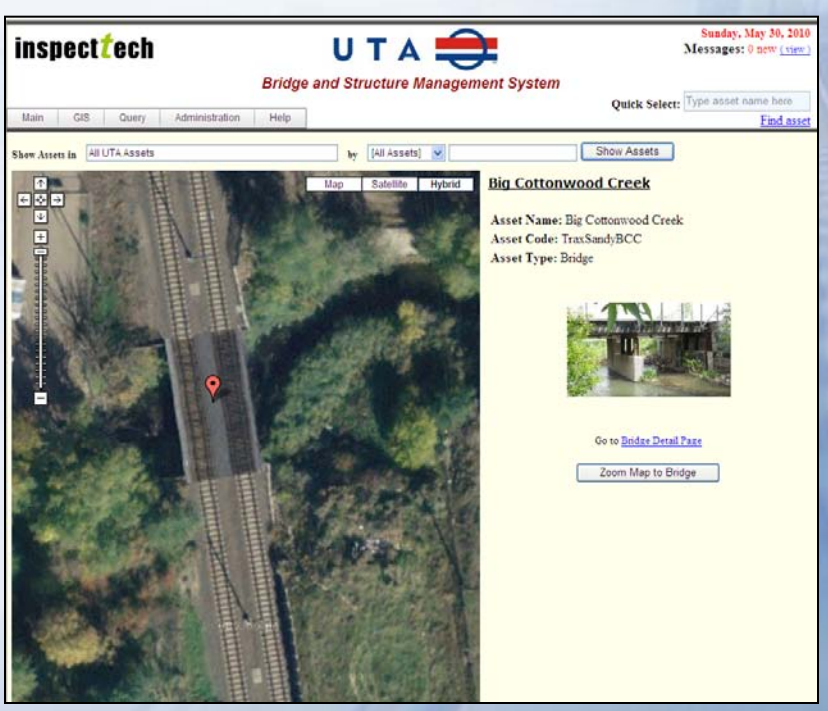
"An hour in the field is accompanied by two hours in the office"
- unknown

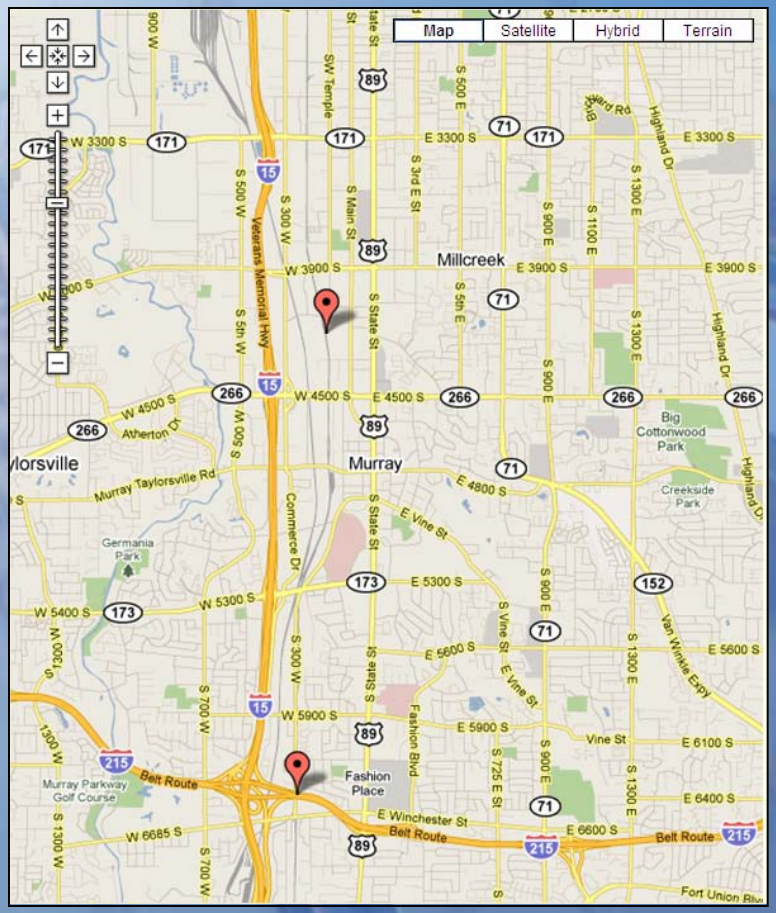
UTA has an active and efficient means of tracking our structures to meet the FRA requirements for yearly inspection. Our partner, ***InspectTech***, has provided UTA an effective means of gathering, evaluating and storing the data.

UTA Solution For Assessing Structures

- Benefits of current system are:
  - Real-time data uploads/information capturing
  - Access from any computer/tablet with internet connection
  - Yearly inspection tracking
  - Report generation
  - Cost projections
  - GIS interactive map
  - Inspection reports can be pre-populated with past data inputs.
  - Error checks in place to check for invalid values, lack of values, to ensure all data is included and accurate.

One Stop Location For All Data





ASSET MANAGEMENT, A RISK BASED APPROACH

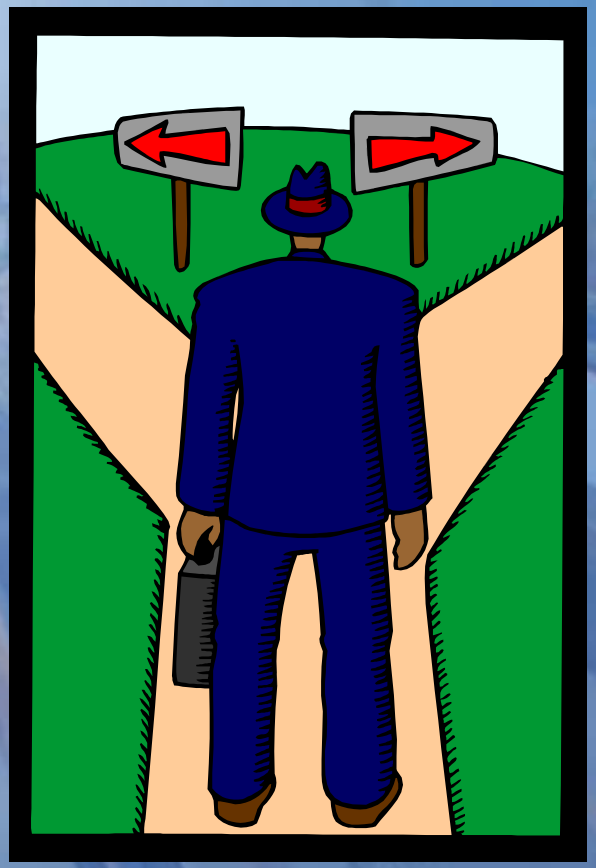
Relationship of Level of Risk versus Tolerance for Risk

It is less expensive to keep a customer than to recruit a new one.

Asset Management is the key to identifying problems before they identify themselves by causing unplanned outages and failures.

Changing Mindset

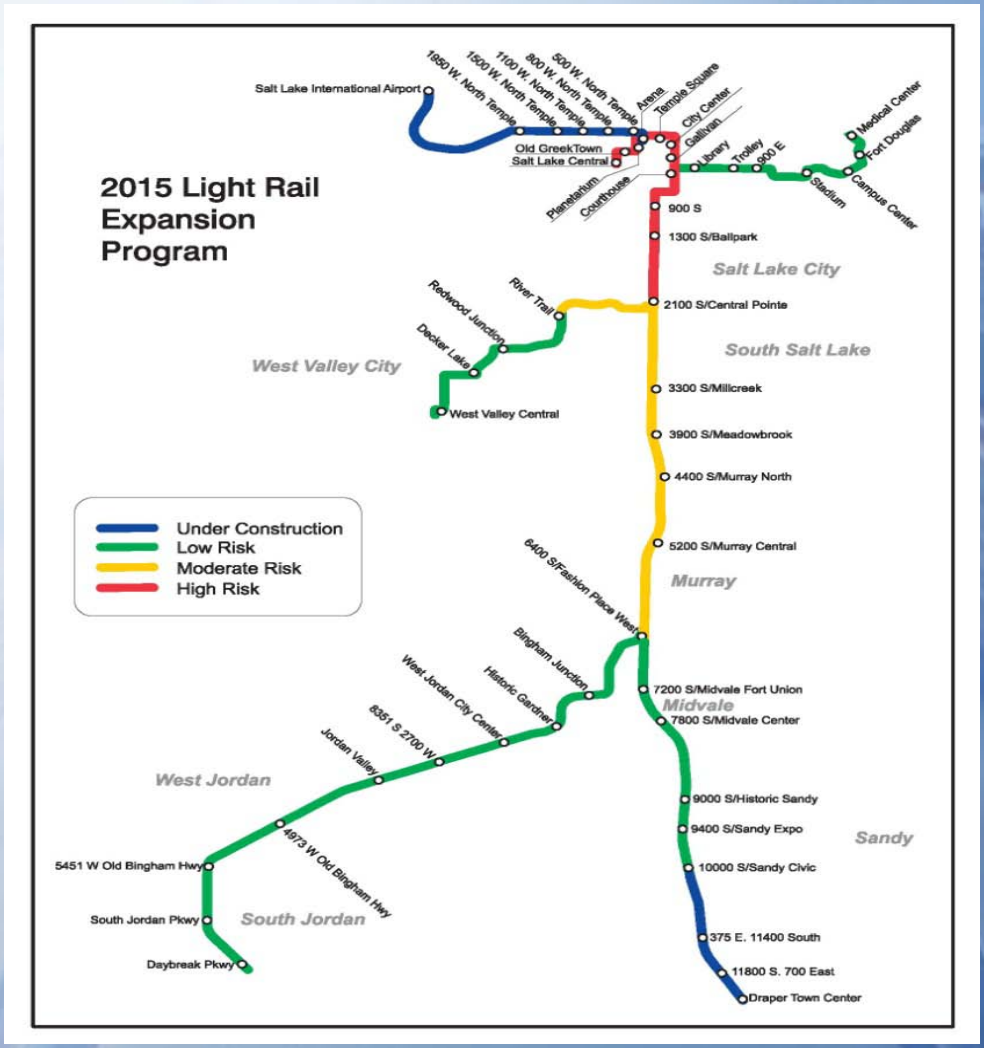
- Going from a construction and expansion mindset, to a maintain and maximize utilization mindset.
- Abandoning the “fix it when it breaks” approach.



Risk Based Management

Important to identify assets and their components that are most critical in the high risk areas. The risk of these component failures is combined with the condition rating to develop an overall risk score.

Areas of Risk for UTA LRT



Asset Risk Score

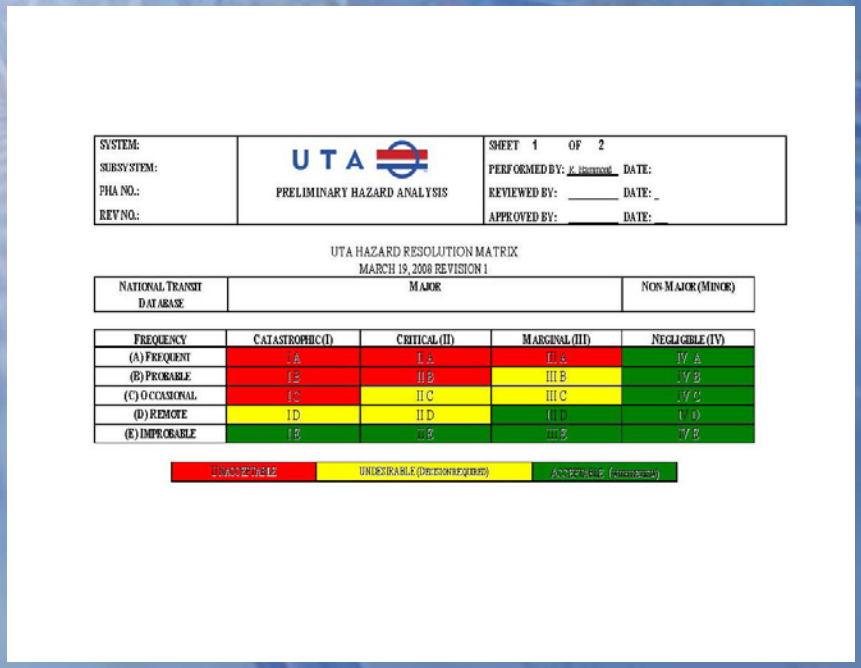
Formula Based

- **Risk Factor = Probability of Occurrence x Impact of Occurrence**
  - Value of 1 gets highest risk factor.
  - Value of 50 gets lowest risk factor.
- Probability
  - SGR rating value
- Impact Scale 1-5
  - 5- Low- Does not support delivery of service
  - 4- Minor- Supports assets delivering periodic service
  - 3- Average- Supports assets delivering a daily service.
  - 2- Moderate- Directly delivers periodic service.
  - 1- High- Directly impacts daily service

- Items with low scores force increased frequency of evaluation
- Failure of components in high risk area forces immediate inspection of all similar components
- If any accelerated aging is identified, all components of same type are replaced
- Trend lines for systems and components can be developed and shared

Risk Approach

- Red Area
  - Area where risk is considered high.
  - Failures/delays in this area impact all lines.
  - Cannot recover from failure using other transit modes.
- Component replacement policy is increased.
  - If component shows high probability of failure; risk approach would dictate that all components in area would be replaced.
  - Inspection frequency will increase in relation to other areas.



SYSTEM:	UTA	SHEET 1 OF 2
SUBSYSTEM:	PRELIMINARY HAZARD ANALYSIS	PERFORMED BY: K. Hammond DATE:
PHA NO.:		REVIEWED BY: _____ DATE: _
REV NO.:		APPROVED BY: _____ DATE: __

UTA HAZARD RESOLUTION MATRIX
MARCH 19, 2008 REVISION 1

NATIONAL TRANSIT DATABASE	MAJOR			NON-MAJOR (MINOR)
FREQUENCY	CATASTROPHIC (I)	CRITICAL (II)	MARGINAL (III)	NEGLIGIBLE (IV)
(A) FREQUENT	I A	II A	III A	IV A
(B) PROBABLE	I B	II B	III B	IV B
(C) OCCASIONAL	I C	II C	III C	IV C
(D) REMOTE	I D	II D	III D	IV D
(E) IMPROBABLE	I E	II E	III E	IV E

UNACCEPTABLE | UNDESIRABLE (DECISION REQUIRED) | ACCEPTABLE (WITH REVIEW)

LR System's Main Risks

- Vehicles
  - Age of Vehicles
  - Four different types in use, running mixed consists
  - Inconsistent record of maintenance activities
  - Due to system demands, may not have had complete overhaul at appropriate time
  - Complete investigation of why current failures are occurring
- OCS wire coming down
- Signal failure forcing manual train movement control
- LRV versus automobile interaction in high volume downtown area

OCS Failure Examples

Risk

- OCS comes down
  - Good access increases response/repair time
  - Public safety hazard
  - Paralyzes the system
- Catenary Wear
- Damaged Pole
  - Potentially paralyzes system because majority of UTA poles are running between the tracks.

Response time frame

- 4-10 hours to fix
  - Bus bridge becomes impossible due to restricted resources and increased traffic.
- Catenary wear can be fixed overnight for small sections. Minimal disruptions.
  - Larger areas are contracted out and replaced over long weekends helping to minimize effect.
- 4-8 hours to replace damaged pole.

Vehicle Failure Examples

Risk

- Derail
- Hooking pantograph
- Single car failure in a consist
- TPSS failure

Response time frame

- 2-4 hours to re-rail car in downtown
  - 4-8 outside embedded track area
- 1-2 hours.
  - Pantograph needs to be tied down. MOW needs to be dispatched
- 15 minutes- 3 hours.
  - Depends on if it is a braking issue and if brakes can be electrically or manually released.
  - SD100 brakes have to be manually pumped off. Min 5-10 minutes a truck.
  - SD160, UTDC, S70 models can electrically cut the brakes out. Sometimes they may have to be pumped off.
- Cars can generally be towed to next station, passengers moved out of disabled car, and train proceeds to end of line where car can be cut. **Close proximity to stations, the end of line, and the slower speed makes towing easier and potentially less destructive to vehicles and track if brakes are locked up.**

West Valley Tie-In to Downtown I-Hub

Half Grande Interlocking

Risk Based Management Practical Example

- Each potential deficiency is identified
- Cost data entered with Consequence of Failure and Likelihood of Failure
  - Cost must include a value for customer disruption, much like is done in the highway system where delay cost per vehicle is included in contracts and incentives
- As more information is collected the trend lines are refined for our system and components
- Useful components or systems that are removed in high risk area may be used in less critical areas

Risk Example #1

- North/South Line I-215 Bridge:
  - Consequence of Failure: High
    - Loss of Life/Injury: High (potential train loss)
    - Functionality: High (Loss of Sandy, Mid-Jordan, and Draper lines).
    - Replacement Cost: High
  - Likelihood of Failure given Condition: Extremely Low
    - Bridge inspected once a year. UDOT inspects from substructure up to the membrane on the decking.
    - UTA inspects from membrane to top of rail.
  - **Overall Risk Score:**

Risk Example #2

- West Valley Line Box Culvert #2701:
  - Consequence of Failure: Marginal
    - Loss of Life/Injury: Low
    - Functionality: Marginal (Loss of last station on West Valley Line – Bus Bridge).
    - Replacement Cost: Marginal
  - Likelihood of Failure given Condition: Low
  - Overall Risk Score: Low

Risk Example #3

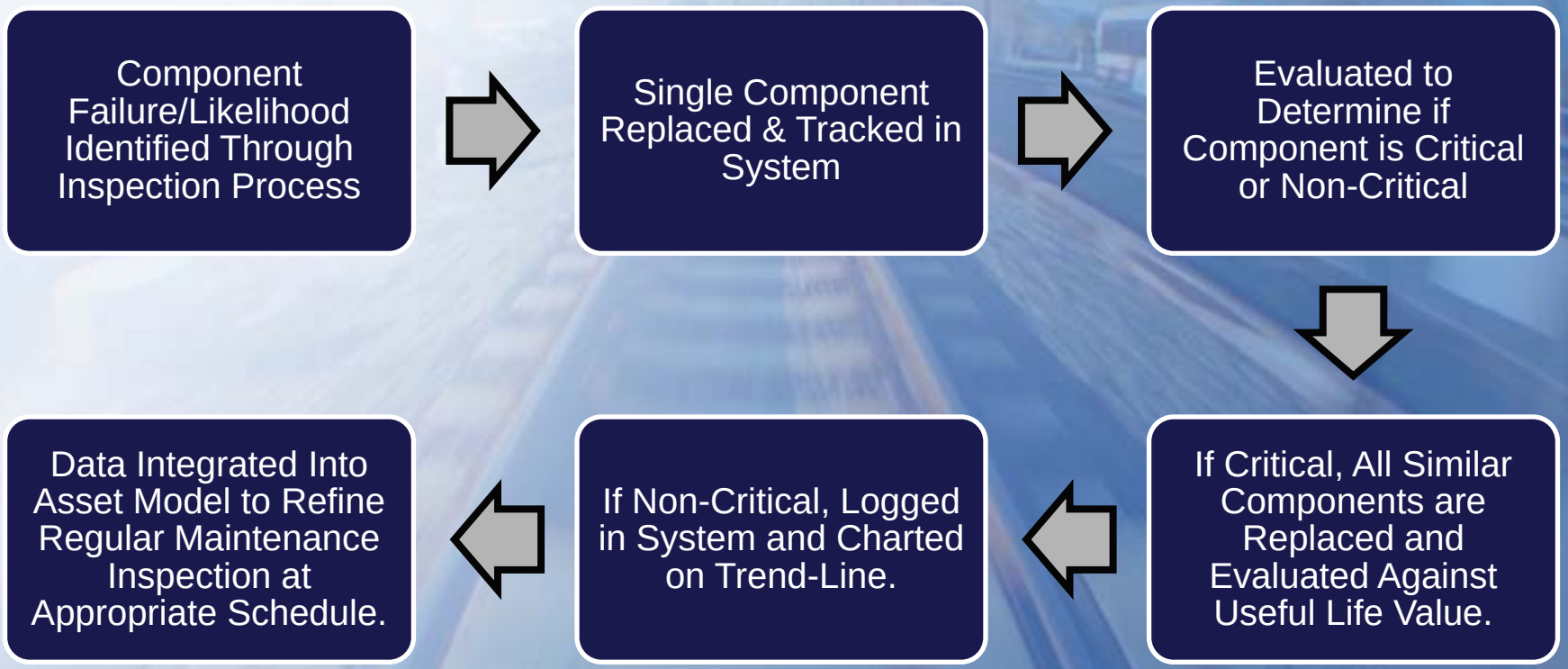
- SD100 Vehicle Failure at Half Grande Interlocking
  - Consequence of Failure: High (at this location)
    - Loss of Life/Injury: Low
    - Functionality: High (Could obstruct movements on Sandy, University, West Valley and Mid Jordan Lines).
    - Replacement Cost: Low-Moderate (Could be brakes, could be propulsion system, could be a number of things)
  - Likelihood of Failure Given Condition: Moderate
    - SD100s are the oldest cars in the fleet.
    - Brakes must be manually pumped off instead of electrically cut out increasing down time.
    - Likelihood of car being dragged to end of line is increased due to location.
  - Overall Risk Score: Moderate / High

Current Mitigation Practices

- Evaluate potential system improvements in high risk area
- If system improvements can reduce risk or reduce time of disruption then they are moved to a budget wish list for improvements. System improvements in a high risk area may be:
  - Addition of crossover switches to minimize length of by-pass area
  - Add sidings to store disabled vehicles until vehicle can be moved to maintenance facility during off hours
  - Construct downtown circulator loop providing option for dual direction running and by-pass of disabled areas or vehicles

- Planned outages are better received by our customers
- Unplanned outages potentially introduce unrecoverable delays for an extended period of time
- Cost of failures generally are significantly greater than replacement prior to failure
- Loss of passengers makes system less efficient

Philosophy on Component Replacement in Critical Areas



Conclusion

In the opinion of UTA; risk management, when combined with regular SGR activities, provides a cost effective means of maintaining the highest reliability of service while minimizing costly failures in the system.

QUESTIONS