Paperless Vehicle Inspection Reports (VIR)

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RGRTA

- 255 fixed route vehicles
- 60 paratransit vehicles
- 11 million miles of operation per year
- Annual ridership of 18 million customers

Topics covered

- Problems RGRTA tried to solve with paperless VIRs
- Problems with the paper VIR
- Electronic VIR design
- Problems implementing Electronic VIR
- Enabling infrastructure
- Benefits
- Unique Relationship with Vendor
- Lessons Learned

Problems to solve

- Streamline Maintenance Operations
  - Faster workflows, reduction of confusion during pullouts, increase on time performance
  - Know and track what is happening in the fleet, instantly
  - Reduction in rework caused by VIRs not routed properly.
- Improve Communication
  - Using existing infrastructure (radio, yard WiFi, cellular)
  - Instant connection to fixed end for problem resolution and VIR submission
  - Connecting maintenance team to drivers
- Aggregate Information
  - Seamlessly connect disparate information systems
    - Automatic fleet maintenance work orders
    - CAD/AVL, on board monitoring can create work orders
  - Drive economic decision making
- Drive Compliance
  - Ensure drivers are putting a safe product on the road
  - Avoid costly audits and fines
- Go Green
  - Eliminate paper and storage costs
  - Improve fleet performance, avoid change-offs

Current VIR Challenges

NYS Requirements

- Previous inspection review
- Corrective action review
- Signed pre- and post-trip inspection results
- Long-term storage of results

Weaknesses of a Paper Process

- Carbon-copy log kept on-board; replaced every 30 days
  - 1st carbon stays aboard
  - 2nd carbon → long-term storage
  - 3rd carbon → maintenance at end of day
- Compliance and Action dependent on driver discretion
- Reliant on hand-written notes
- VIR books are routinely damaged and destroyed by drivers and environmental factors (ie, rain, snow, water)

VEHICLE INSPECTION REPORT (VIR)

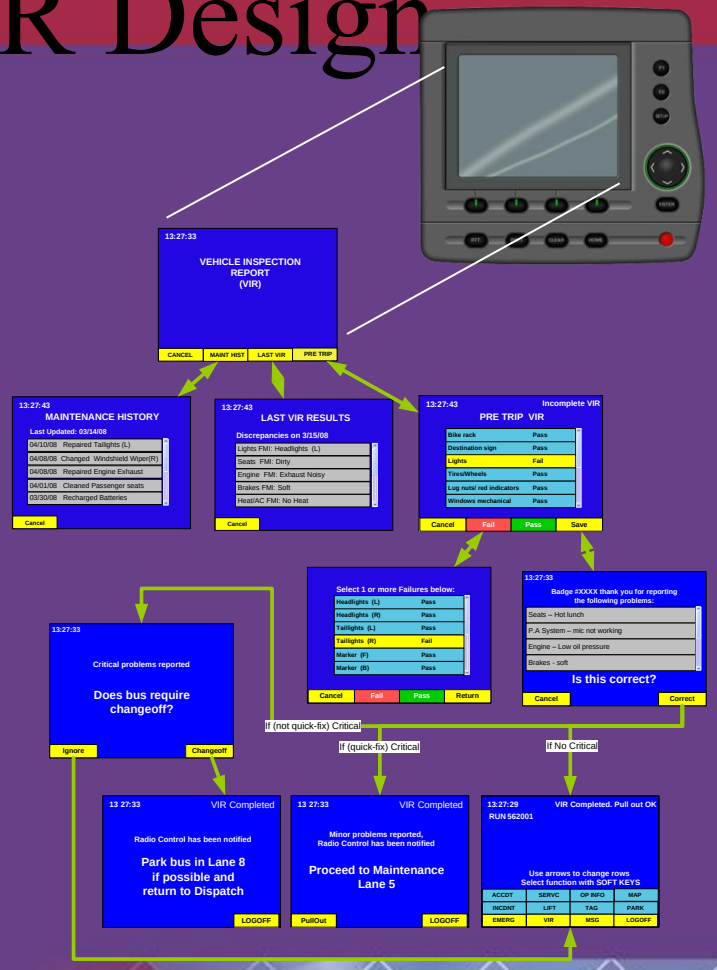
Bus #	Date	Driver's Signature/Badge #	Start Miles	Start Time	End Miles	End Time
		1.				
		2.				
		3.				

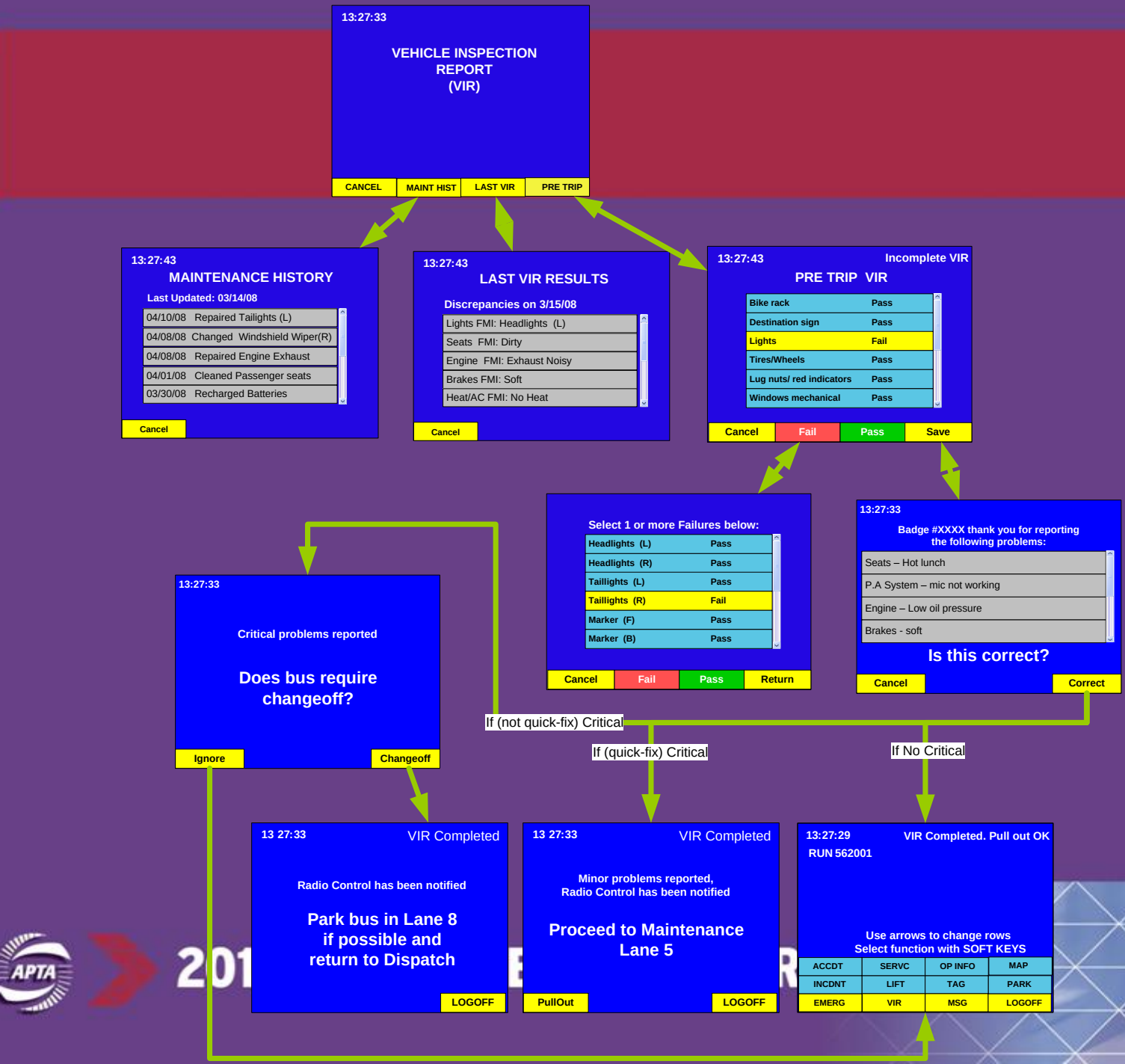
✓ = Satisfactory x = Unsatisfactory

1	2	3	Inspection Item	1	2	3	Inspection Item	1	2	3	Inspection Item
			1. Bike Rack				17. Air Pressure				33. Windows-Clean
			2. Destination Sign				18. Kneeler				34. Exterior-Clean
			3. Lights				19. Wheelchair Lifts/Ramps				35. Seats-Clean
			4. Tires/Wheels				20. HVAC				36. Seats Damaged/Worn
			5. Windows-Mechanical				21. Electrical				37. Floors (Spills, Dirt, Etc.)
			6. Fluid Leaks				22. Engine				38. Graffiti
			7. Body-Exterior				23. Brakes				39. Walls-Clean
			8. Mirrors				24. Steering				40. Biohazards-Clean Up
			9. Seating-Mechanical				25. Suspension				41. Driver Compartment-Clean
			10. Wheelchair Tie Downs				26. Transmission				42. Other
			11. Body-Interior				27. Speedometer				43.
			12. P.A. System				28. Fire Ext. Pinned/Secured				44.
			13. Radio				29. Reviewed Previous Day's VIR				45.
			14. Farebox				30. Lug Nuts/Red Indicators				46.
			15. Horn				31. First Aid Kit				47.
			16. Wipers/Washer				32. Triangle Reflector				48.

Electronic VIR Design

- Driver ID, Block, and ODO data automatically verified
- Screens for
  - Viewing previous inspection
  - Viewing corrective actions
  - Entering Inspection results
- Pass/Fail of inspection items, with failure mode list for discrepancies
- Suggested action based on criticality
- Service Request automatically generated in Maintenance
- Notification to Radio Control of inspection non-performance
- Leverage existing infrastructures: WLAN, RF, CAD/AVL System




13:27:33
VEHICLE INSPECTION REPORT (VIR)
CANCEL
MAINT HIST
LAST VIR
PRE TRIP
13:27:43
MAINTENANCE HISTORY
Last Updated: 03/14/08
04/10/08 Repaired Tailights (L)
04/08/08 Changed Windshield Wiper(R)
04/08/08 Repaired Engine Exhaust
04/01/08 Cleaned Passenger seats
03/30/08 Recharged Batteries
Cancel
13:27:43
LAST VIR RESULTS
Discrepancies on 3/15/08
Lights FMI: Headlights (L)
Seats FMI: Dirty
Engine FMI: Exhaust Noisy
Brakes FMI: Soft
Heat/AC FMI: No Heat
Cancel
13:27:43
Incomplete VIR
PRE TRIP VIR
Bike rack Pass
Destination sign Pass
Lights Fail
Tires/Wheels Pass
Lug nuts/ red indicators Pass
Windows mechanical Pass
Cancel
Fail
Pass
Save
Select 1 or more Failures below:
Headlights (L) Pass
Headlights (R) Pass
Taillights (L) Pass
Taillights (R) Fail
Marker (F) Pass
Marker (B) Pass
Cancel
Fail
Pass
Return
13:27:33
Badge #XXXX thank you for reporting the following problems:
Seats – Hot lunch
P.A System – mic not working
Engine – Low oil pressure
Brakes - soft
Is this correct?
Cancel
Correct
13:27:33
Critical problems reported
Does bus require changeoff?
Ignore
Changeoff
If (not quick-fix) Critical
If (quick-fix) Critical
If No Critical
13 27:33
VIR Completed
Radio Control has been notified
Park bus in Lane 8 if possible and return to Dispatch
LOGOFF
13 27:33
VIR Completed
Minor problems reported, Radio Control has been notified
Proceed to Maintenance Lane 5
PullOut
LOGOFF
13:27:29
VIR Completed. Pull out OK
RUN 562001
Use arrows to change rows
Select function with SOFT KEYS
ACCDT SERVC OP INFO MAP
INCDNT LIFT TAG PARK
EMERG VIR MSG LOGOFF

Implementation problems

- Union negotiations
- Integrating with our Enterprise Asset Management system (AssetWorks)

Enabling Infrastructure

- On-board display and computer
  - Drivers' VIR GUI
  - Vehicle health monitoring
- Multi-mode communications
  - Short-range service used as primary backbone; used to transmit bandwidth-intensive data while bus is in-yard
  - Long-range service used to transmit critical alerts only
- Data interfaces from CAD/AVL
  - with Operations Management system for Driver SSO
  - with Maintenance Management system for history and service requests
- Vehicle Health Monitoring
  - Automatically creates VIR entries for vehicle alarms
- Maintenance Management system
  - AssestWorks

Unique relationship

- Hired ACS to help design the product
  - RGRTA did a bulk of the legwork
  - Also hired RIT to help
- ACS put up some of the R&D money
- Royalty sharing program with ACS

Lessons Learned

- Design for usability, but consider training
- Plan for failures, have a backup
- Revisit policies, create auditing mechanism