VICERS PROJECT:
A Major Safety Initiative

Caravel
LEADING THE WAY IN PROJECTS

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Abstract

Caravel Group, was engaged by the Victorian Department of Infrastructure (DOI) and Connex, to project manage the installation of a Vigilance and Event Recorder Safety System (VICERS) on all suburban trains. Caravel was selected for their expertise and proven track record in the rail industry, having successfully delivered similar technical and safety orientated projects.

The installation of VICERS required train units to be taken from service and delivered to the installation site (Brighton Beach Siding) for fit-out, testing and return to service. This process although appearing straightforward, was immensely complex, presenting high levels of difficulty and numerous constraints. Taking units out of service for any period of time (no matter how short) is a considerable challenge in a culture driven by an 'on-time' running requirement.

With detailed analysis, planning, much strategising and negotiating, the Caravel Project Team successfully crafted and implemented a plan addressing the logistics of how to identify, select and transfer a train. Being heavily dependent on human intervention, the process required close oversight and micro-management to ensure that at any given point it didn't fail due to lack of visibility or priority. The Project was successfully able to ensure that trains moved in and out of the installation site in a timely and safe manner whilst simultaneously being able to boast an exceptional quality record.

Objective

The objectives are to install VICERS on trains within the agreed parameters, being:

- No more than 2 six car consists out of service at any given time.
- Units fitted with VICERS within a two day turn-around (subject to achieving the Fit for Install Certificate).
- Make efficient and effective use of 'Test Driver' Crew.
- VICERS installed at the Brighton Beach Siding.
- Trains tested and certified Fit for Service with VICERS isolated, prior to return into service.

Achievements

Notwithstanding all the constraints and dependencies the most significant achievements of the installation program were:

- Achieved industry best practice with respect to the number of trains out of service for project use (2 x 6 car consists) at any given time.
- Installation time reduced from 40 days per 6 car consist to two days per 6 car consist – a time reduction of 38 days per consist. In total 4 cabs per 6 car consist were fitted out with VICERS. A sum total of 260 cabs, which could have taken an extra 2,470 days!
- Production time reduced to an average of 1 day per 6 car consist (using the two road facility, provided) over 10 shifts per week (2x 8 hour shifts over 5 days per week). Facilities were established to cater for a 24/7 working environment, if so required, subject to EPA considerations.
- Installation activities operating within the prescribed two-train limit with only an occasional third train required. This essentially meant that no more than two trains were taken out of service, for the VICERS Project at any one time; this is significantly less than the original 5 trains forecasted by Train Operations during the initial planning phase.
- All trains pre-cabled, meaning that trains were pre-cabled at the new BBH Siding installation site in readiness for the actual VICERS Electronic Control Unit to be installed at BBH or elsewhere as needed (using a retrofit program).
- Level of defects identified post-fitment were absolutely minimal to the point that none were identified until after the midway point. This was testament to the strength of the quality management systems put in place and the people involved. The VICERS Project excelled in contrast with other projects that did not put such rigorous quality standards in place. Such stringent testing resulted in minimal impact on the day to day running of the network outside of the project, resulting in a new industry best practice performance being established by the VICERS Project for quality control.
- On-going installation process improvements continued with a mindset and culture established that 'every 15 minutes counts'.
- Faiveley Transport, the RTBU, EDI Rail and UMTL all share equal responsibility at every interface with the train, to ensure quality is achieved and maintained.
- A full work crew (complicated by the fact that the bulk of the crew had little or no prior railway experience), was up-skilled in the safe working requirements and obligations as directly related to work and workers in and around the rail corridor.

Overview

The VICERS Project was a challenging programme of works, in that it required Caravel as the Project Delivery Team, to facilitate the end to end program between a number of different key stakeholders, all of whom had their own expectations, requirements and business drivers.

To achieve installation of VICERS on trains, the Project was required to facilitate the identification, selection, transfer, installation and return of the train to service. This process from a planning perspective required:

- Identification of proposed units
- Generation of appropriate runs via Train Circulars
- Generation of driver rosters to correspond with the Circulars
- Documentation of agreed processes
- Publication of communication processes and protocols
- Publication of escalation plan

From an execution perspective, the following was required:

- Adherence to processes and protocols
- Escalation of issues including quality control and execution of all processes.
- Communication of execution
- Reporting.

To support this the project developed a detailed Train Logistics Management Plan (TLMP) which served as the overarching blueprint for projects train movements.

Seen One Train, Seen Them All?

There are a number of different train types operating in the network. In the case of the Comeng fleet there are 7 variants, which were, for a period of time, separated into North and South fleet groupings, where they underwent significantly different modifications. Thereafter the trains would attract different defects over their 25-30 year life time and be returned to service in slightly different configurations.

In effect very few trains were actually alike in every respect. This presented significant challenges to the project, as the installation programme sought to maximise efficiencies by creating a production line–like facility.

NB: Images below are of various cabs including Comeng varients.

Logistical Constraints

A key requirement of the Train Logistics Management Plan (TLMP) was to address logistical constraints. The number one constraint placed on the project was the maximum quota of two six-car consists allocated (to the project) at any one point. There were a number of other known constraints in capturing and transferring trains across the network that the project needed to be cognizant of, and plan for, which included:

- Unit allocation constraints pertaining to 'North' and 'South' unit management requirements. This was a temporary constraint that was only due to affect the commencement of the program and would soon after be removed.
- Train access conflict with other projects (conflicting scheduling and procurement). Advance scheduling, and constant liaison with Passenger Fleet Maintenance and Network Operations was essential to mitigate against this potential issue.
- Driver availability to meet the project circulars. To address this constraint a specific 'Test Driver' Crew was identified and allocated to the project. However limitation of driver resources per this roster also created potential issues with restrictions to train movements due to reliance on qualified crew.
- Preparation of Circulars (potentially a daily requirement) to ensure units requiring VICERS installation were delivered as required. This constraint was resource-dependent and, so long as advanced planning and dedicated resources existed, it was manageable.
- Train maintenance requirements restricting allocation of required unit for installation. To address this constraint, requirements couldn't be made for a specific consist but rather for any one of a number of consists. During the tail end of installation, negotiation and advanced planning became critical.
- Network related activities that affected the route (planned and unplanned) including track occupations (as identified and documented by the Timetables group). Awareness of planned activities and on-going communication with Network Operations was essential in managing this constraint.
- Fixed production capacity due to project commissioning program (limited or no 'catch up' opportunities).
- Tail-end of the installation program, whereby residual units are difficult to locate and difficult to deliver, affecting timely access to the remaining units for fit out. Planning and train configuration management was essential to ensure that trains requiring installation of VICERS were tagged early and kept 'in sight' to ensure that they were not lost in the system and/or withdrawn for other purposes.
- Train 'condition' on arrival at installation site. The possibility exists that there will be end-of run faults. Depending on the FMP fault classification (Fault Management Protocol) the train may need to be returned and replaced.
- A nominal precedent exists which provides for Drivers to undertake full 'fit for service' testing post modifications and upgrades. This posed a constraint on the project which needed to be addressed based on scientific grounds to ensure that only tests necessary from a safety perspective and beneficial to supporting the testing process were included. To this end, extensive consultation occurred with the RTBU.
- Train logistical constraints relating to occupation requirements for Spencer St and the Fairfax upgrade. Theses occupations ran for a period of 19 months and resulted in track closures from 2100 to 0415 each day. To address this constraint the project needed to ensure that units 'tagged' for VICERS install were moved through this section prior to 2100 or alternatively traversed across other areas of the network which were not occupied.
- Driver rostering constraints presented with respect to the raised road modification at BBH Siding. The raised road, meant that drivers required 'new road knowledge', and as such, training (orientation) to this end was delivered.
- Driver resources are scarce and presented a rostering issue where transfers needed to occur at periods of low resourcing (i.e. late into the evening and early morning). This constraint was addressed through ongoing consultation with the RTBU to ensure passive resistance could be averted.
- Special event requirements affecting resource availability (drivers and trains).
- Automatic Spring Park Brake (ASPB) project impacts and mitigation effects.

Key Criteria for Train Movements

To ensure train movements occurred and installation was achievable a number of factors needed to come together. The TLMP sought to address these by specifying the key criteria for train movements. In light of the aforementioned constraints, the criteria required that:

- Units needed to be delivered as per the circulars.
- Drivers needed to be rostered to move units as per the circulars.
- Drivers needed to be trained and certified competent to operate trains to the installation site. Training related to raised road operations and other site specific protocols for moving trains in and out of the Brighton Beach Siding.
- Installation needed to occur as per the defined timeframes allowing units to be turned around without delay.
- Units needed to be available from any depot at any given time (i.e. no restrictions to where units can be obtained from.)
- Units needed to arrive in 'fit for installation' condition meaning there are no FMP codes (maintenance underway/outstanding) with the exception of minor faults which have a 35 day run period (end of run faults).
- Units to be returned in 'fit for service' condition excepting existing end of run faults.

Capping On-Time Running (OTR) at the Network Average

Due to the removal of units out from service for the purposes of VICERS installation, the project placed a constraint on Connex' capacity to meet its 'On Time Running' deliverable. At the time of the programme commencing, OTR was approximately 93-94%. This was likely to drop due to the requirement for trains to be allocated to the project rather than being 'in-service'. It was expected in light of the above that the project would only be able to deliver trains at a rate no better than the network OTR. For planning purposes a rate of 90% was allowed for.

How OTR Manifests as an Operational Delivery Risk

A key train delivery risk that posed a constant threat for the project was the OTR requirement. OTR creates constraints on unit availability for installation purposes (i.e. all units required to supplement the fleet to meet OTR).

Although technically, this OTR constraint was negated by the project obtaining a waiver from the DOI enabling the Project to have access to 2 six-car consists for installation purposes and removing any penalties that this set utilization approach could incur for Connex. However, even with the waiver in place the project faced constraints from a behavioural (culture and mentality) perspective, whereby instinct would lead to trains being held back rather than handed over for installation purposes. This issue was treated through ongoing communication, promoting the agreements and project objectives and safety benefits.

Risk Management of Train Logistics

To address the risks associated with the logistical planning and management of train movements for installation purposes, the project developed a Train Logistics Risk Management Plan. This plan was a subsection of the TLMP and sought to address the planning of unit exchanges and the implementation risks associated with the TLMP.

Maximising the Transfer Window

To reduce the impact of resources and demands of the project on the business, transfer windows for train movements were set at specific times (outside of peak and other high traffic times). This was done with an expectation that the organization's ability to deliver trains would stay in the target range of greater than 90%.

Train Availability and Delivery Considerations

The project predicated unit availability on the assumption that factors such as special events, occupations and driver roster requirements were fully considered in the TLMP in order to meet the installation phase schedule of the project.

As such, the project also recognized that unit availability and delivery considerations needed to factor in a requirement for Fleet Control in conjunction with UMTL to take steps to ensure that sets which arrived at BBH Siding did not:

- Already have VICERS fitted; or
- Have maintenance faults which would prevent the successful installation of VICERS.

Creating a Window for Production 'Catch-Up'

Given the number of considerations and constraints imposed on the project, it was prudent to ensure that some flexibility in the installation schedule was afforded. As such a buffer was built into the programme and the TMLP which allowed catch-up to occur during restricted timetable operations (such as Christmas).

This buffer technically offered the supplier an opportunity to recoup lost time resulting from fleet unavailability during the scheduled program. Although the cost of resourcing during such period did present a moderating factor.

Managing Expectations

Essentially, a provision has existed on other fleet upgrade/ modification projects whereby drivers are involved in conducting pre-commissioning checks on units prior to their return to service.

However the VICERS project was a unique project in the sense that although units were being fitted with VICERS, the system would remain isolated post installation and would not be commissioned until other related and interdependent work streams were completed. As such the matter of testing in general was addressed through the Master Test Strategy Plan and the resulting subordinate plans created in accordance with this master plan.

The project proposed that a continuum of tests based on scientific and engineering principles be employed, which would far better address the need and safety concerns than those demanded or previously utilized.

Testing was addressed with the driver representatives working party. Separate agreements were obtained with regard to the extent of the pre-commissioning checks and, specifically, the time at which such checks would be conducted.

Instead, a sequence of driver preparation activities associated with the installation works was developed and carried out prior to units fitted with VICERS being returned to service.

When Selection Matters

Fleet Maintenance and Fleet Control were required to undertake a pre-selection check on units to ensure that those selected for transfer to the VICERS project met the criteria set by the project. The criteria essentially required that the unit was checked for:

- Status (i.e. ensure it hadn't already been fitted with VICERS)

  and

- Defects

Establishing a Transfer Protocol

The transfer protocol established made certain that a transfer window was utilized and that checks occurred pre and post installation to ensure that only the units suitable for install and safe to return back into service were transferred.

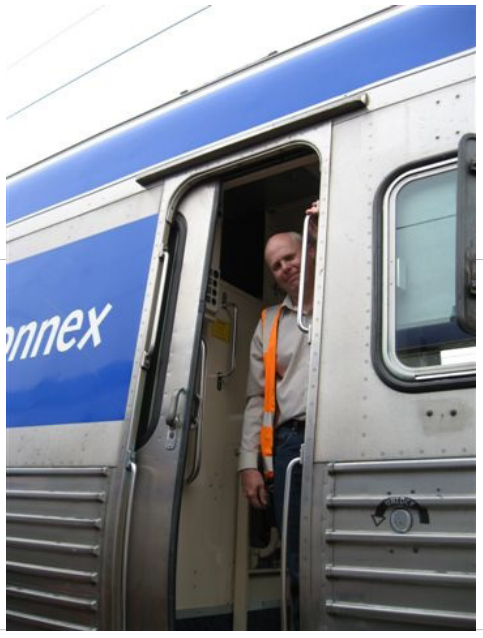
Handover from Supplier

The Supplier and UMTL conducted a Handover Check of the train post the supplier static and pseudo dynamic testing of the unit. The Handover Check was documented by the Supplier and signed off by both parties. UMTL ultimately had the responsibility for ensuring that the check was consistent with any other handover checks and met internal standards, quality and safety requirements.

Fit for Installation Check

Once a unit was delivered to BBH Siding for installation it was required to undergo a 'fit for installation check' (undertaken at BBH Siding by UMTL). The Fit for Installation check certifies that a unit is free of defects that could impact installation of the VICERS system. UMTL conducted the fit for installation check, and if the unit did not pass the test the train would not be accepted by the supplier. Installation commenced once the Fit for Installation Certificate was issued.

If a unit is found to be defective and/or have a defective sub system which infers that the installation could not successfully occur the unit was logged as defective. A defect notice was issued by UMTL and the VICERS Project Manager Operations advised of the defect. An escalation process was established to ensure that the unit could be returned to a Maintenance Depot and a replacement unit transferred at the next available window.



Fit for Return to Service

Following the handover of the train from the Supplier to UMTL, the trains must be checked and certified defect free (or acceptable 35 day run defects as per original clearance) such that the train can successfully perform a test run.

UMTL conducted the Fit for Return to Service check and the train would not be accepted by the driver if it does not pass the Fit for Return to Service check.

Fit for Service Certificate

Units were not released from the install site until a 'Fit for Service, certificate was issued in respect to the VICERS installation works.

Once the certificate was issued from the installation site and the units that were being fitted with VICERS release operations, another unit would be released to the project and transferred to the installation site.

Test Driver Training

Due to the technical nature of the transfer process and the procedural steps which needed to be adhered to ensure the process did not break down, only a select number of drivers were utilized by the project. The group were known as 'Test Drivers'.

Test drivers were drivers on a separate roster specifically for project and other special duties. These drivers were required to be trained on requirement associated with the VICERS project such as:

- New road knowledge (for raised roads into BBH Siding).
- Transfer Protocol (liaison with TCAO, Signaller, Fleet Control, UMTL etc).
- Driver Preparation requirements (VICERS isolated).
- Driver required to know how to check manual points (and change to the right position if required) on arrival and departure at BBH Siding. This needed to be carried out by a Level 3 Certified Safe Worker.
- Aware of Site Procedures including liaison with Site Supervisor, Level 3 Certified Safe Workers, Supplier Installation Crew and UMTL.

Monitoring and Reporting

Due to the complex nature of this project the monitoring and reporting associated with the programme were of critical importance.

Daily reporting was essential and needed to be completed and the Project Manager Operations (VICERS Project) kept informed of the progress of the transfers, and the unit numbers of trains fitted with VICERS (as per the train modification record).

A core report used to identify and allocate units for VICERS installation was the Daily Order Sheet, which was supplemented with a VICERS Train Modification Record. These two documents formed the configuration baseline record.

The Project was responsible for maintaining a central VICERS modification register (ID by unit number).

Any deviations from the agreed protocols and circulars needed to be notified to the VICERS Project as soon as practicable (i.e. prior to a decision being made or action taken).

Driver Preparation of Units

Prior to returning a train to service, the Test Driver was required to undertake the usual Driver Preparation (Driver prep) of the train. The VICERS unit was left isolated in the unit and a full prep would occur. If the train failed the prep for any reason other than VICERS, the usual process for failed units would be adhered to. If a VICERS related fault was detected the train would be returned to UMTL and the Supplier for retesting and action as required.

Establishing a Driver Protocol

The Drivers were required to follow specific train delivery protocol to ensure that the logistical transfer process did not break down at any point. As trains were required to be checked pre and post the installation, with the potential that a unit could be rejected at any point in the process, it was essential for a driver to remain with the train throughout the testing process.

A number of different operational areas were engaged to facilitate this process and ensure that communication did not break down.

Conducting Static & Dynamic Testing

Once VICERS was installed on the unit the Supplier was required to undertake static testing. Testing was completed at the BBH Siding per the testing plans and checklists prepared by the Supplier in consultation with UMTL and the VICERS Project.

Of particular interest was the fact that the project addressed a long standing precedent in which the "rule" was that if the train's brakes were modified in any way at all then a full curve brake test would be performed. Such a test required a major set-up exercise, took considerable time to perform and consumed significant driver and technical resources.

The project performed a full safety risk assessment to determine what was required using logic, science and engineering discipline. Further, noting the potential industrial sensitivity of the matter independent brake experts and a facilitator were used to ensure we arrived at the right result without bias from the project. This resulted in a major win in which special A and B type limited dynamic testing was required beyond the Static tests. With defective trains either being returned to BBH if a VICERS faults was detected, or to Westall if other train defects were identified outside of the project work.

Dynamic testing was undertaken by test drivers in accordance with agreed test scripts in controlled environments with all the relevant approvals sought.

Operational Site Safety for Installation

Accordingly, in addition to the Safety Risk Assessment meetings and the OH&S and Union Consultation series of meetings conducted as part of the BBH Upgrade, there was another parallel series of meetings involving the Network Safety and OH&S representatives from Connex, UMTL, Electrical Control (Electrol), the Supplier, and Mainco, in order to develop a synchronized set of Safe Working Method Statements (SMWS) and Safe Working Instructions (SWIs). From the Supplier's perspective, the overarching document resided with Connex, but a large number of other factors, e.g. Network safety, electrical, signalling, fleet management, etc had to be considered to manage the following scenarios:

For Connex:

- Level 3 Safe-working Co-ordinator unlocking the site and departing or arriving train.

For UMTL:

- Fit for Installation Check 4a
- Fit for Service Check 4b

For Supplier:

- Preparation of Site for Train Delivery
- Work on Train with Overhead Power De-energised
- Work on Train with Overhead Power Energised
- Fit for Installation
- Test VICERS Installation
- Site Evacuation
- Service & Repair Procedure

Final Word

Installation of VICERS on units required significant planning and consultation with the various maintenance and operations groups in Connex as well as the Supplier, external Maintenance Groups and the Department of Infrastructure.

The process was resource intensive and required extensive support along the way to ensure that breakdowns at any one point did not inadvertently bring the programme to a stand-still. Due to the complex nature of the organisation and train operations at large, the planning process required in-depth understanding of the rail system, network operations, fleet maintenance and crew.

An effort as large and complicated as this project could not be achieved without a sound understanding of the day to day running of a rail organisation, the constraints, conflicting priorities and the unforgiving operational demands of the general public.