

**AMERICAN PUBLIC TRANSPORTATION ASSOCIATION**

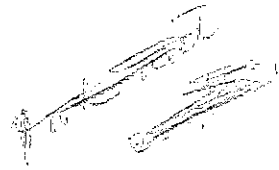
**PEER REVIEW**

**FOR**

**Caltrain**

**San Carlos, California**

**JULY 4, 2016**



**A Service of the American Public Transportation Association  
performed by the  
North American Transit Services Association  
a wholly owned subsidiary of APTA**

**FINAL REPORT**  
**OF THE**  
**NORTH AMERICAN TRANSIT SERVICES ASSOCIATION**  
**PEER REVIEW PANEL**  
**ON THE**  
**COMMUNICATIONS BASED OVERLAY SIGNAL**  
**SYSTEM (CBOSS) POSITIVE TRAIN CONTROL**  
**(PTC) PROJECT**

**PROVIDED AT**

**CALTRAIN**

**PANEL MEMBERS:**

**Jack Collins**  
**Keith Holt**  
**Michael Hursh**  
**Kay Neuenhofen**  
**Tim Shirk**  
**Greg Hull**

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Richard White, Interim President and CEO

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## INTRODUCTION

In April 2016, James Hartnett, Executive Director, Caltrain, contacted the American Public Transportation Association (APTA) to request a peer review of the agency's Communications Based Overlay Signal System (CBOSS) Positive Train Control (PTC) Project. APTA, through its wholly owned subsidiary the North American Transit Services Association (NATSA) and through discussions between NATSA and Caltrain staff, determined the review would be conducted May 31 – June 3, 2016. This final report was completed July 4, 2016.

A panel of industry and related industry peers was assembled and was comprised of individuals with experience in the implementation of PTC system technology and other complex signal system train control projects as well as experience in large technology and software-based projects. The onsite peer review panel consisted of the following individuals and the organizations from which they were selected:

**MR. MICHAEL HURSH**

General Manager  
AC Transit  
Oakland, CA

**MR. KEITH HOLT**

Deputy Chief Engineer, Communications & Signals  
AMTRAK  
Philadelphia, PA

**MR. TIMOTHY SHIRK**

Director of Communications and Signal Engineering  
SEPTA  
Philadelphia, PA

**MR. JACK COLLINS**

Chief Capital Officer (retired)  
Metrolinx/GO Transit  
Toronto, Canada

**MR. KAY NEUENHOFEN**

Software Engineer  
Davis, California

**MR. GREG HULL**

Peer Review Facilitator  
APTA, Washington, DC

The panel convened in San Carlos on Tuesday, May 31<sup>st</sup>. Panel coordination and logistical support was provided by NATSA Peer Review Facilitator, Greg Hull. Mr. Hull also coordinated panel member input in the drafting of this peer review report.

## BACKGROUND

The Communication Based Overlay Signal System (CBOSS) Positive Train Control (PTC) solution is an overlay component to the existing fixed wayside signal system and integrated into the existing CTC mainline tracks. The purpose of the system is to prevent train to train collisions, enforce civil speed, prevent intrusion into work zones, prevent train movement over misaligned switches, reduce gate down time, enforce adherence to the schedule and to accommodate capacity for future high speed rail. This state of the art system will improve safety for passengers, workers, the general public and highway traffic crossing the tracks.

## METHODOLOGY

The APTA Peer Review process is well established as a valuable resource to the public transit industry. Highly experienced and respected professionals voluntarily provide their time and support to address the review scope identified to assist the transit system and in turn assist the transit industry as a whole.

The panel conducted this peer review through documentation review, field observations, briefings, as well as listening sessions and interviews with Caltrain staff and contracted support.

## SCOPE OF THE REPORT

The purpose of the review was to have the panel assist Caltrain in reviewing the progress of the project and project team organization. The review focused on two particular areas:

### Programmatic:

- Performance of contractor relative to contract
- Engagement and oversight of contractor
- Engagement of Joint Powers Board (JPB) executive oversight and issue escalation/ process for decision making

### Technological:

- Interoperability design viability
- Effectiveness of design
- Technical team resources

## OBSERVATIONS AND RECOMMENDATIONS

### OPENING COMMENTS

The peer review panel found Caltrain's community outreach efforts on the project to be extensive and commendable. The PTC design is robust and appears to meet industry standards.

However, in the view of the panel, the probability of meeting the October implementation schedule is doubtful. A definition of "*interoperability*" and how to test "*interoperability*" needs to be agreed upon by the parties. However, at this juncture, activation of PTC on Caltrain property should not be delayed and should be regarded as a priority.

Caltrain oversight and TASI engagement needs to be strengthened, and operational training needs to be expedited. Additionally, a long term operations and maintenance strategy need to be determined. In the view of the panel in order to effectively address these operations and maintenance issues the decision to re-bid or extend the TASI contract needs to be addressed as soon as possible.

### 1. PROGRAMMATIC: CONTRACTOR PERFORMANCE RELATIVE TO CONTRACT

In the view of the panel, friction between the owners' project team and PTG has impacted responsiveness and transparency by PTG in PTG communicating cost and schedule progress. PTG also regards the scope of the project to have changed due to changes by Class 1 railroads which then impacts the interoperability of CBOSS. Additionally, both the owner and contracted parties do not appear to be working on a commonly approved schedule, so it is unlikely that the PTG Revenue Service Demonstration (RSD) date of October 2016 will be achieved. The panel also believes that project performance has also been impacted, in part, by the lack of TASI engagement, which results in harm to the project.

### RECOMMENDATIONS

- Establish weekly stakeholder meetings to include Caltrain, the Program Manager, PTG and TASI
- Caltrain needs to come to terms (negotiate) with PTG to agree upon a realistic schedule for the implementation of PTC. The current moving schedule target must stop.
- Identify what specifics and to what degree PTC-related changes brought about by Class 1 railroads have impacted the scope of this project
- Caltrain needs to direct PTG to commence information/ knowledge transfer with TASI

2. PROGRAMMATIC: ENGAGEMENT AND OVERSIGHT OF THE CONTRACTOR

The oversight of PTG has included Caltrain and its program management consultants. In the view of the panel, in the absence of a strong technical team within Caltrain, Caltrain management has delegated decision making on the PTG contract to its program management consultant. PTG does not regard the program management consultant as the owner and this has consequently led to unresolved technical and contractual issues. Despite the recent partnering session, there continues to be a lack of commitment to resolving contractual issues such as scheduling and cost. The question remains as to where the cure or resolution presently stands.

**RECOMMENDATIONS**

- Caltrain needs to directly hire a project manager with requisite technical experience and provide that person with the authority to manage the interests of Caltrain
- Immediately engage TASI for revenue startup and handover with a focus on training and knowledge transfer
- Take action now to place CBOSS equipped Caltrain trains on Caltrain track into revenue service as soon as possible
- Engage with PTG to establish a clear and real plan for implementation of PTC interoperability (ability to synchronize safe train movement with all relevant parties)
- Determine common ground for resolving current outstanding contractual issues

3. PROGRAMMATIC: ENGAGEMENT JPB EXECUTIVE OVERSIGHT AND ISSUE/ESCALATION DECISION MAKING PROCESS

Notwithstanding Caltrain's role on behalf of JPB, it is not clear to the panel whether JPB itself has played a role in the day to day project oversight. The initial partnering session established an issue escalation process, however, this process appears to have broken down. As previously noted, despite the recent partnering session, there continues to be a lack of commitment to resolving contractual issues such as scheduling and cost.

The panel notes that the PTC CBOSS project is just one of several complex infrastructure projects that will require Caltrain to take a serious look at in-house technical management resources.

**RECOMMENDATION**

- Caltrain and PTG CEO's should continue their weekly phone call to discuss project status and issues

4. TECHNOLOGICAL: INTEROPERABILITY DESIGN VIABILITY

It appears that the current status of software does not support interoperability with tenant and host railroads and that configuration management of the versions of system software control is lacking. It does not appear that interoperability will be included with the October 2016 revenue service demonstration.

**RECOMMENDATIONS**

- A priority needs to be given to implement PTC operation on Caltrain property
- There needs to be agreement on a clear definition of interoperability as it pertains to tenant and host railroads along with a test plan and schedule
- Establish configuration management of system software version controls

5. TECHNOLOGICAL: EFFECTIVENESS OF DESIGN

The logic for the fiber optics design and distribution was well planned and can be leveraged for future revenue. The control center design incorporates state of the art technology, and is well laid out and labeled. The On Board Computer (OBC) has approximately 10,000 lines of code which is considered a small system that promotes maintainability and robustness. However, in reviewing the open software defects list, it appears that at least one of the defects is said to crash the OBC. As noted by the current defect list, there are multiple communication network issues that remain to be resolved.

The panel notes that the security layer of the software is an older application that is vulnerable to cryptographic intrusion.

**RECOMMENDATIONS**

- The panel encourages that the back-up Central Control facility PTC network be physically isolated from external open networks (physically disconnect VPN connections)
- Review current security layers of the software and research whether security can be hardened without incurring unintended consequences. Continue efforts to deploy planned key exchange server.
- Review the vehicle equipment installations and systems design. Include TASI in this review.
- Consider the establishment of a configuration management function within Caltrain to ensure that modifications to PTC systems are controlled



6. TECHNOLOGICAL: EFFECTIVENESS OF DESIGN

In the view of the panel, animosities between the prime contractor and project management oversight present an impediment to resolving outstanding technical issues. PTG appears to have appropriate technical resources to complete CBOSS requirements for Caltrain running on Caltrain tracks. It is apparent that TASI resources have not been fully engaged during the course of the project.,

**RECOMMENDATIONS**

- The panel encourages Caltrain to bring PTG and the project management team together to resolve interface issues in order to be more effective in resolving outstanding technical issues
- TASI can provide additional resources to strengthen current implementation and future maintenance of the system

OTHER OBSERVATIONS AND RECOMMENDATIONS

The panel encourages that technical and commercial issues be separated and allow technical issue resolution to drive the schedule. It does not appear that training has progressed to the degree needed to meet the October deadline. It also needs to be realized that seasonal events will limit the availability of operations personnel for training. If not currently developed, establish a master test plan that is coherent, regularly updated, and is communicated to all relevant parties. Also ensure that on-going responsibilities for the rules, rulebook and bulletins are clarified and understood by all relevant parties.

## CONCLUDING REMARKS

The findings and recommendations of this review are intended to assist Caltrain in implementing strategies that will assist the organization and its partners to successfully implement the CBOSS PTC project.

The panel sincerely appreciates the support and assistance extended throughout the entire peer review process by all Caltrain personnel as well as their contracted support. The panel stands available to assist with any clarification or subsequent support that may be needed.

# Appendix

APPENDIX A



BOARD OF DIRECTORS 2016

PERRY WOODWARD, CHAIR  
JOSE CISNEROS, VICE CHAIR  
MALIA COHEN  
JEFF GEE  
ROSE GUILBAULT  
RAUL PERALEZ  
JOEL RAMOS  
ADRIENNE TISSIER  
KEN YEAGER

JIM HARTNETT  
EXECUTIVE DIRECTOR

April 5, 2016

Mr. Richard White  
American Public Transportation Association  
1300 I Street, NW, Suite 1200 East  
Washington, DC 20005

RE: REQUEST FOR APTA PEER REVIEW – CBOSS PTC PROJECT

Dear Mr. White:

This letter will serve as our formal request for APTA to assist Caltrain with a Peer Review of our CBOSS PTC.

Attached is a briefing document that includes background on the agency, the CBOSS PTC project purpose and goals, problem statement, and requested APTA Peer Review team scope of work. This document also includes the Caltrain point of contact for coordination of the Peer Review Process and the requested schedule for Peer Review activities to begin. Also enclosed is the required executed indemnification form.

The agency is processing the APTA \$9,000.00 fee and will mail this check under separate cover to your attention. This letter will also confirm our commitment to reimburse appropriate Peer Review expenses including coach class air travel, and hotel and meal expenses. Caltrain typically reimburses meal expenses on a per diem rate under the GSA schedule for the San Francisco region. Prior to booking hotels for the Peer Review Team we would ask that these reservations be coordinated with our staff.

Please do not hesitate to contact me at 650 508-6221 if you have any questions or concerns with our request. We appreciate APTA's assistance with this important agency initiative.

Sincerely,

A handwritten signature in black ink, appearing to read "Jim Hartnett", is written over a printed name and title.

Jim Hartnett  
Executive Director

Attachment

PENINSULA CORRIDOR JOINT POWERS BOARD  
1250 San Carlos Ave. – P.O. Box 3006  
San Carlos, CA 94070-1306 650.508.6269

**Agenda for CBOSS PTC APTA Peer Review  
May 31 - June 3, 2016  
Meetings Held in 4<sup>th</sup> Floor Dining Room  
1250 San Carlos Ave, San Carlos CA**

**May 31<sup>st</sup>:**

6:00 pm Dinner at Positano - 617 Laurel Street, San Carlos --  
APTA Team, Jim Hartnett, Michelle Bouchard & Gigi Harrington

**June 1<sup>st</sup>:**

8:15 am Kick off Confirm Objectives/Outcomes  
APTA team, Jim Hartnett, Michelle Bouchard, Gigi Harrington & Sal Gilardi

9:00am-10 am Caltrain funding, governance and service overview-present and future (PCEP)  
Michelle Bouchard, Gigi Harrington, Danielle Stewart, Seamus Murphy

10:00am - 12:00pm History of the Program – Karen Antion, Dave Elliot, Michelle Bouchard & Sal Gilardi  
including Luis Zurinaga (SFCTA) and Jim Lawson (VTA)

12:00pm - 1:00pm Working Lunch with PTG Team. What is working and what is not?

1:15pm - 2:30pm CBOSS technology overview Karen Antion, Dave Elliot, Michelle Bouchard & Sal Gilardi  
including Luis Zurinaga (SFCTA) and Jim Lawson (VTA)

2:45PM - 3:45pm Integration and Interoperability – Karen Antion, Dave Elliot, Michelle Bouchard & Sal  
Gilardi including Luis Zurinaga (SFCTA) and Jim Lawson (VTA)

4:00pm – 5:00pm Stakeholder Viewpoints – Seamus Murphy, Casey Fromson, Michelle Bouchard &  
Sal Gilardi

**June 2<sup>nd</sup>:**

8:15am - 9:30am Follow-up from previous day, missing pieces –  
Gigi Harrington, Michelle Bouchard, Karen Antion, Dave Elliot & Sal Gilardi

9:30am - 11:30am Tour BCCF and Hi-Rail and discussion of Safety Certification and Safety for the Project

12:00pm - 1:30pm Contractor Management  
Gigi Harrington & Michelle Bouchard

2:00pm – 5:00pm Peer Review Working Meeting

**June 3<sup>rd</sup>:**

8:15am - 10:30am Project Closeout  
Jim Hartnett, Michelle Bouchard, Gigi Harrington, Sal Gilardi, Karen Antion & Dave Elliot

## DOCUMENT LIST

1. Caltrain Positive Train Control Project- APTA Peer Review (general summary of milestones and related networks)
2. “What Is Working and What Is Not” (summary produced by Parsons Transportation Group)
3. JPB CBOSS Project Organization Structure (6/1/16)
4. Interoperability Coordination Efforts (timeline)
5. Caltrain PTC Project Training Schedule (updated May 2, 2016)
6. Table 2-1 Hazard Log Status Levels/ Table 2-4 Hazard Risk Index
7. CBOSS PTC Integration and Interoperability (presentation: June 1, 2016)
8. Advanced Signal System (CBOSS PTC) System Overview (presentation: June 1, 2016)
9. Caltrain Overview- APTA Peer Review of CBOSS PTC (presentation: May, 2016)
10. Caltrain PTC Implementation Plan (PTCIP) (September 24, 2014)
11. JPB Board Presentations (2011-2016)
12. CBOSS Weekly Executive Dashboards (2016)
13. Caltrain Monthly CBOSS PTC Progress Reports (2015-2016)
14. CBOSS PTC Project Plan to Completion Partnering Session (Rev Approach, 11-4-15)
15. Caltrain CBOSS PTC Project Partnering Session (April 29, 2015)
16. JPB/ PTG/ GE Partnering Meeting (August 31, 2015)
17. Breach of Contract/ Demand to Cure Correspondence: JPB to PTG/ PTG to JPB (2016)
18. U.S. Government Accountability Office Report: Positive Train Control / GAO-15-739 (September, 2015)