

**NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF RAILROAD, PIPELINE & HAZMAT INVESTIGATIONS
WASHINGTON, D.C. 20594**

HUMAN PERFORMANCE AND OPERATIONS GROUP FACTUAL REPORT

A. ACCIDENT

Type: Passenger train collision with on-track equipment
Date and Time: March 10, 2022, about 10:33 a.m.
Location: San Bruno, California, MP 11.6 on main track No. 2
Carrier: Caltrain
Train: Caltrain southbound train No. SB 506
NTSB Accident # RRD-22-LMR-007

B. HUMAN PERFORMANCE GROUP

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C. SUMMARY OF THE ACCIDENT

A detailed summary is included in the IIC’s Report found in the NTSB docket.

D. DETAILS OF THE INVESTIGATION

1. Behavioral Factors

a. Sleep/Wake/Work History

The month before the accident (February 10 – March 10, 2022) the RWIC had worked 21 days. His normal days off were Saturday and Sunday, however he had voluntarily worked those two days during the week leading up to the accident. His last day off was Wednesday March 2. During his off-duty time he typically ate dinner, watched TV, and then went to bed. He did not take naps during his time off. He indicated that he required 5 to 6 hours of sleep per night to feel rested. He stated that he felt “normal” when he went on duty the day of the accident.

The RWIC’s detailed work and sleep history for several days leading up the accident is included in Table 1.

Table 1. The RWIC’s work and sleep history

DAY	TIME ON DUTY	TOTAL TIME ON DUTY (HOURS)	TOTAL TIME OFF DUTY (HOURS)	SLEEP TIMES
Saturday March 5	5:00 a.m.	14.0	10	8:30 p.m. - 4:00 a.m.
Sunday March 6	5:00 a.m.	14.0	10	9:15 p.m. - 4:00 a.m.
Monday March 7	6:00 a.m.	11.0	13.0	7:00 p.m. - 4:00 a.m.
Tuesday March 8	6:00 a.m.	11.5	12.5	8:00 p.m. - 4:00 a.m.
Wednesday March 9	5:30 a.m.	13.5	10.5	8:30 p.m. - 4:00 a.m.
Thursday March 10	6:00 a.m.	5.5 hours prior to collision	n/a	n/a

2. Task Factors

a. The RWIC’s meeting with the Balfour Beatty foreman

On the day of the accident around 7:00 a.m., the RWIC had an initial, informal briefing with the foreman with Balfour Beatty at the Visitation yard.¹ The RWIC and the foreman had

¹ On this day the foreman was also worked as an equipment operator.

worked together the previous day, and the RWIC was pleased with how the job was completed. The other workers, including the subgroup coordinator, were also present. The foreman told the RWIC his intent to get the work started a little earlier than the day before. The foreman also discussed the procedure he had planned for that day's job, particularly the plans to load the equipment onto the tracks at Center Street, then load and install the poles.² The RWIC and foreman both agreed to the plan. The foreman told investigators that after that meeting, all the workers were aware of what their plan was for that day. These plans did not change before the accident.

A formal job briefing, led by the subgroup coordinator, occurred with all the workers later that morning at Center Street before the work began, though the RWIC did not attend. The foreman told investigators that the briefing was essentially a repeat of the work that was performed the previous day.

The RWIC also held a briefing with the train dispatcher before the equipment was put on the tracks.

b. Previous experience with the train dispatcher

The RWIC and the dispatcher had worked together on many occasions over the last several years. The dispatcher told investigators that the RWIC had been a very professional worker, and that he had never had a problem with RWIC when track and time were in effect.

On the day of the accident the dispatcher was cognizant that the RWIC hadn't been in the area where the work was being done for a while. He told investigators, "I could tell that he was trying to wrap his head around what exactly was going on there, who he was working with and what he needed to do...I felt like he was a little stressed because he was running a crew that he was unfamiliar with." He added that he did not believe the RWIC was making any wrong decisions.

c. Previous experience with the subgroup coordinator

The RWIC and the subgroup coordinator had previously worked together briefly (just a few days) on another project in South San Francisco. The RWIC described him as having a lot of energy, nervous, and wanted to do well. The RWIC felt comfortable working with him, but had

² In short, the plan was to load the equipment on the track 2 at Center Street, hi-rail to the San Bruno yard on Track and Time where they would load the poles and equipment. Then they would continue to hi-rail north past Scott Street (and into their Form B) to about MP 8.6. At that location the Track and Time on track 2 between Center Street and Scott Street could be released by the RWIC. The crew would then begin setting the poles as they had done the previous day.

some concerns and wanted to make sure the subgroup coordinator understood the operations, including the equipment being used and people he was watching that day.

The RWIC also stated if a Form B were in effect, the subgroup coordinator would “be my eyes, my ears. He would be the watchman of the group. Whoever is performing duties on the track or whatever they’re doing, he’ll be specifically with them and reporting to me.”

The RWIC told investigators that on the day of the accident he had received all the necessary information during his phone calls with the subgroup coordinator. The radio communications between the RWIC and the subgroup coordinator was sometimes inaudible, which resulted in the RWIC repeating himself or using the phone to communicate to make sure that people and equipment were clear of the tracks. .

d. RWIC’s concerns working a new job

Including the day of the accident, the RWIC had worked this job twice. He worked with the same gang the day before the accident, but never before that. The day before the accident he was initially assigned to a different work site, but was redirected that morning to fill in for an employee on leave who was assigned to this job. He told investigators that the day before he did not feel rushed to work this job, but had concerns that he would be working a new task with a crew he did not know and being unaware of the specific type of equipment being used at the site. He told investigators,

I feel personally now I’m being thrown into something that I’m really not ready for. I can handle it, but am I really ready for that change right now? I’ve been off for the last 10 months and I just came back a month ago, February 1. Am I ready for that type of, I’ll say, excitement?...It was shell shock. It was a change. I’m not going to say I wasn’t ready because I’m trained on the property...So it was a shock to my system, I’ll say.

The RWIC also told investigators that he felt more comfortable the second day on the job than the first. He had anticipated that the overall tasks between the two days would be similar. He noted that on the day of the accident one significant change was the point of entry of the equipment onto the tracks (i.e., equipment entering Center Street rather than Linden Street). He also noted that trains passing through the work zone would be crossing over at a different location (closer to where the crew was working) than the day before, for reasons he did not know.

e. Trainees

Two new employees were assigned to the crew. One was “shadowing” the RWIC, and the other was with subgroup coordinator. They were given relatively small tasks to perform, including putting up the flags for protection, but mostly were there to observe and learn from the experienced employees.

f. The RWIC’s decision of where to position himself at the work site

At the time of the accident, the RWIC was stationed a few miles north of that accident site. He told investigators that generally he places himself in the area where the most significant work is being performed. However, he also needed to be in an area where he can communicate by radio with all train crews that are approaching the work zone. Based on his previous experience in that area, he had known that the radio communication with other trains was often poor in the area where the equipment was being placed on the track. He further stated that even if radio reception was good where the equipment was being loaded, he still would have staged himself where he was for various reasons.

g. Communication with trains approaching the work zone

When a Form B or track and time is in effect, the RWIC must communicate and give authority with the train crew in order for the train to traverse the work zone.³ They normally talk once on the radio and the conversations last about one minute. However, on one occasion before the accident, the RWIC had communicate twice with a train crew. The two communications with that train occurred at 9:50 a.m. and 9:55 a.m., the latter being the RWIC’s last communication with a train before releasing track 2 at 9:58 a.m.

h. RWIC’s knowledge of the crew’s location on the tracks

The RWIC told investigators that 9:58 a.m., when he released track and time of track 2, he did not know the position of the work crew. He stated that “they’re probably on the move from Center Street down to my location on track 2 with the equipment...I have no idea (of their exact location).”

From 9:54 a.m. to 9:58 a.m., the RWIC recalled the sequence of events as follows:

“We (the subgroup coordinator and the RWIC) are back and forth in conversation. I gave him permission to get on track 2. He got on track 2. We have track 1 for additional protection. I released track 1, I’m thinking – when he told me that they were in the clear,

³ Other operators, including machine operators and hi-rail vehicles, must also receive authority before entering the work zone limits.

I release track 1, and then I probably called right back and released track 2. In the meantime, probably on and off with dispatch, because the line was probably busy, is crazy, and I'm trying to release [track] 2 at that time. I'm thinking that me and [the subgroup coordinator] talked and he's probably now got orders to proceed north to where I'm at. While he's proceeding north, I'm trying to get the track and time released so that we can get that other track open so that we could have our track open to have train movement... I know after I release track 1, I had to release a piece on [track] 2. And maybe clog in my mind, I don't know what went on there, but I remember I know I got to release [track] 1... Because we have to have our traffic on [track] 1. We have to have open track...I thought a conversation with the dispatch that I had to release one of my times on [track] 2.”

i. Workload

The RWIC told investigators that overall, the work he was responsible for was manageable. He also said that it could get “overwhelming, because first thing, you got a train calling... You want to get that train through, but you also want to make sure that your people are in the clear and equipment... Yes, it's overwhelming. And talking to a train, that's a lot going on. And I'm talking to each train each way... We're talking about two trains going through and you're clearing five, six people, whatever it is in your limits, every time. Every time.”

On the day of the accident, he noted that the overall workload was similar to the previous day and was manageable because the trains were on schedule and there were no additional trains. He only had one workgroup, which had three pieces of equipment.

The RWIC stated that between 9:30 a.m. and 10:00 a.m. the workload increased. At that time, contractors were ready to go to get on the track and to their worksite, and the RWIC was communicating by radio to the subgroup coordinator and with the dispatcher trying to establish track protection (track and time). He told investigators that period is “a hectic time.”

The RWIC told investigators the following about the activity level between 9:50 a.m. and 9:58 a.m.:

That's a lot, a lot. I'm not used to running this, so that's a lot for me...everything happens at the 9:30 hour when they're allowed to get the track and time. So, a lot is going on during that time. But again, not new to me, but it's new to me because I'm not used to being in this circle with this project.

The RWIC's communication with the train crews, the subgroup coordinator, and the train dispatcher and other events are included in Table 2.

Table 2. Timeline of Radio and Cellphone Communications and other Events

<u>Time</u>	<u>Communications & Events</u>
3:00	Employees completed mechanical inspection of Train 506 equipment
3:45	Engineer on duty.
4:54	Conductor and Assistant conductor on duty.
6:30	Subgroup Coordinator (SC) began work by conducting vehicle "walk around" inspections and calling RWIC to plan first part of day.
6:33	RWIC called SC on cell phone to plan the job briefing meet time/location
7:33	Employees completed Class I Air Brake Test on Train 506 Consist
	Construction work Group members travel separately to visitation yard.
8:00	RWIC, SC, Foreman and all work group members participate in job briefing at Visitation Yard
	RWIC traveled to a location near the Form B
	SC, Foreman, and Work Group traveled to Center Street.
9:01	SC Called RWIC on cell phone.
9:03	RWIC called dispatcher, no connection
9:09	Dispatcher called RWIC - Job Briefing.
9:10	RWIC gave Form B Track Bulletin to Train 109
9:20	RWIC gave Form B Track Bulletin to Train 305
9:16	SC called RWIC on phone
9:24	RWIC gave Form B Track Bulletin to Train 504
9:29	Dispatcher called RWIC on phone - (See below from documents; TT209 and TT210)
9:31	Track and Time 209 "Ok'd" (Main Track 2 between Sierra and Scott until 1600)
9:32	Track and Time 209 "Acknowledged Received" by SC on the form maintained by the RWIC
9:32	Track and Time 210 "Ok'd" (Main Track 2 between N. Limit CP Scott and Center until called)
9:33	Phone conversation between RWIC and SC (Duration 3:13)
9:34	Track and Time 210 "Acknowledged Received" by SC on the form maintained by the RWIC
9:37 - 9:40	RWIC made 18 unsuccessful attempts to contact the dispatcher on the phone
9:40	RWIC gave Form B Track Bulletin to Train 407
9:41	RWIC made 9 unsuccessful attempts to contact the dispatcher on the phone
9:43	RWIC called Dispatcher on the phone, was put on hold, RWIC asked for an additional TT for MT1 (Scott to Center, need track for 5-7 Minutes) Dispatcher to call back.
9:45	RWIC called the SC on cell phone
9:47	Dispatcher called RWIC on phone - (See below from documents; TT211)
9:48	Track and Time 211 "Ok'd" (Main Track 1 between Scott and Center until called)
9:49	RWIC called the SC
	Work group begins to set on the track at Center Street. RWIC had told dispatcher this would take 5-7 minutes. A shunt is applied to MT2
9:49	Train 112 Called RWIC

9:50	RWIC talked to Train No. 112 on Main Track 1 - Do you stop at Bayshore? Already passed, going through CP Geneva. --Other Transmissions-- Do you stop at South City? RWIC transmits Form B to Train 112 but then holds the train at South San Francisco Station 'until further instructions' (non-standard practice?)
	The crew is set on MT2, with MT1 now physically clear. The shunt from MT2 is removed.
9:54	SC called RWIC on cell phone.
9:54	RWIC called dispatcher twice, no connection
9:54	RWIC called dispatcher on phone -
9:54	Track and Time 211 "Released" Time
	Work group traveled on Main Track 2 to materials yard. Loaded one catenary pole between 9:54 and 10:32
9:56	RWIC called dispatcher four times, no connection
9:56	RWIC contacted Train Number 112 - "I'm gonna keep you rollin"
9:57	SC radioed RWIC for a "Radio Check". No RWIC reply
9:57	Train 112 radioed RWIC for permission to pass through Form B without stopping (no need to hold at S. San Fran.)
9:58	RWIC called dispatcher on phone -
9:58	Track and Time 210 "Released" Time
	Train 112 on MT 1 passed work group on MT 2 (Work group was unprotected at that time, but train was routed on adjacent track)
9:58	Train 112 announces they are delayed in block. This occurred during the phone conversation above at the moment the dispatcher said "ready to copy", the radio transmission starts.
10:00	SC radios RWIC for a "Radio Check".
10:00	RWIC radios to SC - "I have you loud and clear. What is your location?" SC radios to RWIC - "Radio check was good. We are at 11.6, the San Bruno Yard. They are picking up their material" RWIC radios to SC - "11.6, yeah, ok, great great. After you do that, go ahead and proceed north on the main track 2 down to South San Francisco and you'll pick up your other individual. SC radios to RWIC - "Understood, once we're done here we're gonna proceed north and pick up watchman and proceed to the worksite. RWIC radios to the SC - "That is correct sir"
10:09	Train 111 radioed RWIC for Form B and received it.
10:14	Train 506 Departed San Francisco station by operating on Main Track 2
10:23	Train 506 passed Bayshore Station
10:19	Train 506 made a station stop at 22nd Street Station
10:24	Train 506 made a radio call, "Approach limited, going to be crossing over at Sierra"
10:25	RWIC talked to Train No. 506 and gave Form B authority
10:27	Train 506 announced "slow clear" and crossed from MT 2 to MT 1 at CP Sierra
10:29	Train 506 passed S. San Francisco Station
10:30	Dispatcher radioed 506 job briefing a stop at Millbrae. Engineer of Train 506 made a radio call regarding approach limited limited clear CP Scott

10:30	Train 506 crossed from MT 1 to MT 2 at CP Scott
10:31	Train 506 passed San Bruno Station
	Engineer first saw construction vehicles
	Engineer reduced throttle and positioned himself for a better view
	Engineer determined construction vehicles to on same track
	Engineer placed train into emergency braking at 63 MPH
	Train 506 slowed to 37 MPH
10:32	***Collision***
10:32	SC to Dispatcher/All-Call; emergency

3. Medical Factors

a. Health

The RWIC indicated that his overall health was “normal.” He took prescription medication for high blood pressure and high cholesterol. He denied having any type of acute medical conditions (including allergies). He has never been diagnosed with any type of sleep disorder, including sleep apnea.

The RWIC had returned to work on February 1, 2022, after being off work the previous 10 months (beginning March 11, 2021) due to a work-related injury (torn biceps tendinosis of the left shoulder).

b. Postaccident Toxicological Results

Postaccident toxicology testing for alcohol and other drugs was performed on the RWIC and the crewmembers on the accident train in accordance with FRA regulations.⁴ The results were negative for all tested-for substances.

4. Operational Factors

Training / Experience

The RWIC began working for TASI on July 5, 2000. He had worked several different positions, including trackman, machine operator B, welder helper, watchman, flagman, and in his current position of a flagman / flagging foreman for about 15 years. He stated that the flagman foreman/RWIC main focus is to talk with trains, clear the trains, make sure men and equipment are in the clear. It required cording work with contractors, and working with both experienced

⁴ As part of postaccident toxicology testing required by the FRA, the conductor’s blood was tested for sedating antihistamines, amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, MDMA/MDA, methamphetamine, methadone, opiates/opioids, phencyclidine, tramadol, and ethyl alcohol; no urine was available.

and non-experienced crews. He said that the most difficult aspect of the job was knowing where the crews are located at all times. He stated that the RWIC was a stressful position.

Train 506 Operating Crew and the Train Dispatcher

The Human Performance Group interviewed the operating crew of Caltrain Train No. 506 and the train dispatcher. The areas relevant to the Human Performance investigation are discussed below.

1. Behavioral Factors

a. Sleep/Wake/Work History

Engineer -- On March 10, the engineer went on duty at 3:54 a.m. and deadheaded to San Francisco beginning at 4:54 a.m. The day before, the engineer went on duty at 5:22 a.m. and worked until 2:03 p.m. That night he fell asleep about 7:00 p.m. and slept until 1:00 a.m. He said that he slept well that night.

Conductor -- On the day of the accident the conductor went on duty at 3:54 a.m. He said that he felt "normal" when he went on duty. The day before the accident he worked from about 4:00 a.m. to 10:00 a.m.

Assistant Conductor -- On the day of the accident the assistant conductor went on duty at 4:54 a.m. The previous day he had an early shift and returned home by 10:30 a.m. That night he went to bed no later than 9:00 p.m. and departed his home the next day about 3:15 a.m. for his one-hour commute to work.

Train Dispatcher -- On the day of the accident the dispatcher went on duty at 5:00 a.m. He had worked the previous day from 5:00 a.m. to 1:00 p.m. That night he went to bed about 7:30 p.m. His commute time to work is about 15 minutes.

2. Medical Factors

a. Health

None of the train crewmembers or dispatcher told investigators that they had any type of medical conditions (chronic or acute) that affected their performance on the day of the accident.

b. Postaccident toxicology testing

Post-accident toxicology testing was performed on the train crew and train dispatcher for alcohol and other drugs in accordance with FRA regulations. The results were negative for all tested-for substances.

3. Operational Factors

a. Training / Experience

The locomotive engineer was hired by BNSF in 2018. He worked as a conductor and later trained and became a certified locomotive engineer. He was hired by Caltrain in July 2021 as an engineer. He was qualified on the accident territory and had operated as an engineer about 60 times over it. His most recent certification was September 20, 2021.

The conductor was hired by Amtrak in December 1992 as an assistant conductor. He became a Conductor in 1994. He remained with Caltrain when TASI took over. His most recent certification was May 5, 2021.

The assistant conductor was hired on December 13, 2021. During his training he spent 1½ months of classroom training, and one month of on-the-job training. He had operated as an assist conductor for about one month before the accident.

The train dispatcher was hired on December 6, 2014 and worked solely as a dispatcher. He had primarily worked the extra board and had worked several different shifts. He had worked seven years as a dispatcher, primarily working the extra board, and had worked several different shifts.

-End-

Compiled by: /s/ _____

Date: February 2, 2023

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