Stop Signal Overrun (SSO) & Near Miss

An Investigation Template for Passenger Railroads

U.S. Department of Transportation
Federal Railroad Administration

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ABSTRACT: This stop signal overrun (SSO) and near miss investigation template represents a tool to identify contributing factors for SSO events and events which would have resulted in a SSO if not for positive train control intervention. As the SSO database grows, railroads can use the aggregate data to analyze how contributing factors change over time and as a way to understand the efficacy of particular mitigation efforts. This template serves to provide railroads with a starting point for the types of data to collect to understand why stop signal overrun events occur.

Table of Contents

PURPOSE OF THIS TEMPLATE

This template represents a tool to identify contributing factors for stop signal overrun (SSO) events and those that would have resulted in a SSO if not for Positive Train Control intervention.[1] As the SSO database grows, railroads can use the aggregate data to analyze how contributing factors change over time and as a way to understand the efficacy of particular mitigation efforts.

HOW TO USE THIS TEMPLATE

- The template is comprised of separate sections to be completed by:
    - Relevant departments within the railroad
    - Individuals involved in the event (e.g., train crew, dispatcher)
    - The person(s) overseeing the investigation (e.g., principle investigator)
- For each investigation:
    - Sections A, E, F, G, and I should be completed by the principle investigator, with the input of train crew members where applicable.
    - Sections B, C, and D should be completed by the relevant departments.
    - Section H should be completed by each employee with knowledge of the incident (e.g., train crew, dispatcher).
- The assumption is that the investigation will be coordinated by one department (e.g., the safety department), and this department will be responsible for compiling, storing, and maintaining the investigation forms so that they are centrally located.
- For the investigation template to be most useful, data from each incident should be entered into a database.
- Since SSO events are rare events, data from multiple events should be analyzed over time to understand the multiple interacting factors that contribute to SSO events and how they change over time.

LONGER TERM VISION

This template serves to provide railroads with a starting point for the types of data to collect to understand why stop signal overrun events occur. We hope that the investigation process will change from a paper-based data entry process to computer-based data entry process that will

[1] This template coincides with the Federal Railroad Administration's "Preventing Stop Signal Overruns: Good Practices for Passenger Railroads" lessons learned document.

simplify and streamline the data acquisition process. This will reduce the potential for making data entry errors, reduce the time it takes to collect the data, make it easier to share the data within the organization, and facilitate analysis that will enable railroads to identify important trends over time.

Incident Number: _____

A: Stop Signal Overrun Cover Page

Incident date: ____/____/_____

Incident time: _____:_____

Railroad(s) involved	Train(s) / equipment involved	Incident number(s)[2]
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

Railroad responsible for track maintenance: _____

Location

City and state:

_____

Milepost:

_____

County:

_____

Signal number:

_____

Division:

_____

Nearest interlocking:

_____

Location type:

- ❑ Main
- ❑ Siding
- ❑ Passenger Station
- ❑ Crossing
- ❑ Yard
- ❑ Industry
- ❑ Terminal
- ❑ Other _____

Nearest station:

_____

US DOT/AAR Crossing ID:

_____

Track number/name:

_____

[2] If multiple railroads are involved (such as in a stop signal overrun event followed by an accident), they may each have a separate incident number. There may also be multiple train/equipment numbers.

Investigation Information

Railroad performing investigation: _____

Investigator name and title: _____

Investigator phone number: _____

Investigator signature: _____

Date of investigation: _____

Incident Number: _____

B: Track Information and Environment

Track Information

Maximum allowable speed:

_____

Annual track density:

_____

FRA track class:

- ❑ Excepted
- ❑ 1
- ❑ 2
- ❑ 3
- ❑ 4
- ❑ 5
- ❑ 6
- ❑ 7
- ❑ 8
- ❑ 9

Track curvature:

- ❑ Straight
- ❑ Curved

Track grade:

- ❑ Ascending
- ❑ Descending
- ❑ Level

Were track conditions (e.g. rail adhesion) compromised by factors such as wet leaves, ice, etc.?

- ❑ Yes
- ❑ No

If yes, please specify conditions:

_____

_____

_____

Environment

Weather (check all applicable)

- ❑ Bright sun
- ❑ Clear
- ❑ Overcast
- ❑ Fog
- ❑ Haze/Smoke
- ❑ Wind/Rain
- ❑ Thunderstorm/Lightning
- ❑ Snow
- ❑ Hail
- ❑ Ice
- ❑ Other: _____

Light Conditions

- ❑ Dawn
- ❑ Daylight
- ❑ Dusk
- ❑ Night

Was visibility reduced?

- ❑ Yes
- ❑ No

If yes, car lengths visible: _____

C: Operation Information

Train Information

Railroad: _____

Train number: _____

Power type:

- ❑ Locomotive
- ❑ Cab control car
- ❑ EMU (Electric Multiple Unit)

Distributed power:

- ❑ Yes
- ❑ No

Remotely controlled:

- ❑ Yes
- ❑ No

Total train length: _____

Total train weight: _____

Number of locomotives:

_____

Head end locomotives: _____

Helper locomotives: _____

Number of cars in consist:

_____

Loaded cars: _____

Unloaded cars: _____

Number of cabooses: _____

Other Equipment Involved

Please describe any other equipment below:

_____
_____
_____
_____
_____
_____
_____

Schedule Information

Departure time: _____ : _____ am / pm

Origin:

_____

Destination:

_____

At the time of the incident, the train or job was:

- ❑ More than 5 minutes ahead of schedule
- ❑ On time or within 5 minutes of schedule
- ❑ 5–10 minutes behind schedule
- ❑ 10–15 minutes behind schedule
- ❑ More than 15 minutes behind schedule
- ❑ Other

  _____

Reason for delay (if applicable):

_____

Operation Type

Type of operation (check all applicable):

- ❑ Freight
- ❑ Passenger / Commuter
- ❑ Yard Assignment
- ❑ Maintenance
- ❑ Other: _____

Movement type:

- ❑ Shoving
- ❑ Pulling
- ❑ Push/pull
- ❑ Other: _____

Activity:

- ❑ Departure
- ❑ Enroute
- ❑ Arrival
- ❑ Switching in yard
- ❑ Other: _____

Direction of travel:

- ❑ North
- ❑ South
- ❑ East
- ❑ West
- ❑ Not applicable

Actual (recorded) speed:

_____

Estimated speed (if actual speed unknown):

_____

Was the equipment unattended at the time of the incident?

- ❑ Yes
- ❑ No

Operating Rules

Rules in effect:

- ❑ GCOR
- ❑ NORAC
- ❑ Other: _____

Was the crew operating on a foreign railroad (i.e. train not owned by the host railroad)?

- ❑ Yes
- ❑ No

Rules in effect/method of operation (check all applicable):

- ❑ Main block
- ❑ Timetable
- ❑ Radio
- ❑ Verbal permission
- ❑ Train order
- ❑ Centralized traffic control
- ❑ Interlocking
- ❑ Track warrant control
- ❑ Direct traffic control
- ❑ Yard limits
- ❑ Other than main track rules
- ❑ Positive train control
- ❑ Automatic train control
- ❑ Automatic block signal
- ❑ Automatic cab signal
- ❑ Automatic train stop
- ❑ None/dark
- ❑ Other: _____

Did the train start from a stationary position?

- ❑ Yes
- ❑ No

Was section (block) ahead occupied?

- ❑ Yes

❑ No

D: Signal and Train Control

Signal Type and Placement

Signal Type:

- ❑ Position
- ❑ Colored
- ❑ Semaphore
- ❑ Other: _____

Lighting Type:

- ❑ Incandescent
- ❑ LED
- ❑ Other: _____

Are there markers to indicate stop locations?

❑ Yes ❑ No ❑ N/A

Is the signal in a non-standard position?

❑ Yes ❑ No

If yes, describe how it is non-standard:

_____

_____

Are there other signals in close proximity (e.g., that might have resulted in a 'read through') or confusion as to which was the controlling signal)?

❑ Yes ❑ No

If yes, specify other signal and explain:

_____

_____

Have prior overruns happened at this signal?

❑ Yes ❑ No

If yes, give incident numbers or dates:

_____

_____

Signal Visibility and Maintenance

What is the furthest distance from which the signal could be seen by a crew?

_____

Was signal visibility impaired?

❑ Yes ❑ No

What factors limited signal visibility, if any?

- ❑ Weather (e.g. rain, snow, fog)
- ❑ Lighting (dawn, dusk, or nighttime)
- ❑ Glare – sunlight
- ❑ Glare – train headlights
- ❑ Track curvature
- ❑ Obstruction – structure
- ❑ Obstruction – vegetation
- ❑ Obstruction – other crewmember

- ❑ Obstruction – locomotive design
- ❑ Other: _____

Were there any maintenance issues with the signal?

- ❑ Bulb burned out – signal improperly displayed
- ❑ Bulb burned out – signal entirely dark
- ❑ Signal post down
- ❑ Signal obstructed by dirt / snow
- ❑ Signal malfunction
- ❑ Other: _____

Reason for Stop Signal

Why was the signal displaying a stop indication?

- ❑ Protecting a switch
- ❑ Meet or pass with another train
- ❑ Equipment in the block ahead
- ❑ Obstruction or broken rail detected
- ❑ Protected work zone
- ❑ Signal malfunction or circuit failure
- ❑ None—stop signal was unnecessary
- ❑ Other: _____

Preceding Signals and Unsignaled Stops

Preceding signal Identifier(s):	Milepost/control point(s):	Signal aspect(s):
_____	_____	_____
_____	_____	_____
_____	_____	_____

Distance between immediate preceding signal and the signal that was overrun: _____

Did the train make an unsignaled stop or unscheduled stop between the immediately preceding signal and the signal that was overrun?

- ❑ Yes, Unsignaled stop
- ❑ Yes, Unscheduled stop
- ❑ No

If yes, please give the reason for the stop (e.g. "unsignaled station stop" or "unscheduled stop due to a passenger incident").

_____
_____

Please describe any actions taken by the crew and events that took place during the stop(s) which may have contributed to the stop signal overrun:

_____
_____

Locomotive Technologies

Were any of the following technologies present in the locomotive? Check all that apply.

- ❑ Cab signal
- ❑ Positive train control
- ❑ Energy Management
- ❑ Other Locomotive Technology: _____

If cab signals were present:

Were cab signals operating at the time of the SSO?

❑ Yes ❑ No

If they were not operating, why were they not operating?

- ❑ Manually cut out
- ❑ Malfunctioning
- ❑ Other: _____

What was the cab signal at stop signal overrun location, if applicable?

_____

What was cab signal in preceding block, if applicable?

_____

If PTC was present:

Type of PTC system:

_____

Was it operating at the time of the SSO?

❑ Yes ❑ No

If it was not operating, why was it not operating?

- ❑ Outside of PTC territory
- ❑ Manually cut out
- ❑ Malfunctioning
- ❑ Other: _____

If it was operating—What state/mode was the system in?

_____

Did the system provide any alerts or indications to the crew?

❑ Yes ❑ No

If yes, please describe any indications or alerts:

_____
_____
_____
_____

Did automatic braking activate?

❑ Yes ❑ No

If yes, when did automatic braking activate?

_____
_____
_____
_____

If energy management was present:

Type of energy management:

_____

Was it operating at the time of the SSO?

❑ Yes ❑ No

If it was not operating, why was it not operating?

- ❑ Manually cut out
- ❑ Malfunctioning
- ❑ Other: _____

If it was operating—What state/mode was the system in?

_____

Did the system provide any alerts or indications to the crew?

❑ Yes ❑ No

If yes, please describe any indications or alerts:

_____
_____
_____
_____

Describe any other relevant information about the role of energy management in the stop signal overrun.

_____
_____
_____
_____

E: Train Crew Overview

This section provides an overview of the train crew's experience during the incident. Sections E, F, and G contain questions that pertain to the experience of individual employees.

Crew Composition

Please fill in the number of crew members in the table below:

	Regular crew members:	Extra board crew members:
Locomotive Engineers		
Conductors		
Assistant conductors (Rear brakemen)		
Ticket takers		

How long has this crew been working together, if applicable?

_____

Which individuals were in the cab at the time of the stop signal overrun?

- ❑ Engineer
- ❑ Conductor
- ❑ Other (specify job title): _____

Total number of employees in the cab: _____

Crew Response to Stop Signal

When did the crew first recognize the stop signal?

- ❑ Before passing the signal (unable to stop in time)
- ❑ After passing the stop signal
- ❑ Unknown
- ❑ Other _____

Did the crew attempt to brake before passing the stop signal? ❑ Yes ❑ No

If yes, at what distance from the stop signal was braking initiated? _____ ft.

How much time elapsed between the brakes being applied and passing the stop signal?
_____ mins

How far past the stop signal did the train go before stopping? _____ ft.

Did the train pass the point of danger (e.g. switch, broken rail)? ❑ Yes ❑ No

If no, how close did the train come to the point of danger, if applicable? _____ft.

Did the train strike another train or piece of equipment before stopping? ❑ Yes ❑ No

If no, how close did the train come to other equipment, if applicable? _____ft.

Who initiated communication between the dispatcher and the train crew that a stop signal overrun took place?

- ❑ The crew called the dispatcher
- ❑ The dispatcher notified the crew
- ❑ Other _____

Which crewmembers were calling out signals?

- ❑ Engineer only
- ❑ Conductor only
- ❑ Both engineer and conductor
- ❑ Neither
- ❑ Other _____

Which crewmember(s) correctly identified the stop signal prior to passing it? (check all applicable)

- ❑ Engineer
- ❑ Conductor
- ❑ Other _____

Was there any miscommunication or confusion between crewmembers?

❑ Yes ❑ No

If yes, please describe the miscommunication or source of confusion:

_____

Did they read the wrong signal (e.g., read through to the following signal, or believe that an adjacent signal was the controlling signal)?

❑ Yes ❑ No

If yes, please explain which signals the crew misread:

_____

For the previous signal(s), please indicate whether the crew adjusted speed correctly in response.

Signal identifier:	Signal aspect:	Crew correctly adjusted speed?	
_____	_____	❑ Yes	❑No
_____	_____	❑ Yes	❑No

_____ _____ ❑ Yes ❑No

Attention / Task Demands

Did any factors inside or outside the cab draw the crew's attention away from the signal?

- ❑ Factors inside cab
- ❑ Factors outside cab
- ❑ Personal factors (e.g. mind wandering to internal thoughts)
- ❑ None

If yes to inside cab, indicate which factors inside the cab drew the crew's attention away from the signal, if any?

- ❑ Radio communication (describe: intra-train, with dispatcher, train-to-train, or overheard?)
- ❑ Cab signal
- ❑ Cab displays
- ❑ Equipment malfunction
- ❑ Visual alerts/warnings
- ❑ Audio alerts/warnings
- ❑ Reviewing paperwork
- ❑ Work-related conversation
- ❑ Non-work-related conversation
- ❑ Cell phone/PED use
- ❑ Other _____

Please elaborate on any factors checked above. For example, if "equipment malfunction" is checked, describe the malfunction that occurred, or if "radio communication" is checked, describe the nature of the communication and who was involved.

_____

_____

If yes to outside cab, indicate which factors outside the cab drew the crew's attention away from the signal, if any?

- ❑ Interaction with passenger(s)
- ❑ Wayside hazard (e.g. trespasser, wildlife, object on track)
- ❑ Other train or equipment
- ❑ Other signal (e.g. next signal after the stop signal)
- ❑ Switch points/switch alignment
- ❑ Other _____

Please elaborate on any factors checked above. For example, if “wayside hazard” is checked, describe the hazard.

_____

_____

If yes to personal factors, please elaborate:

_____

_____

Expectations

Was the crew anticipating a permissive signal?

- ❑ Yes
- ❑ No

If yes, why did the crew anticipate a permissive signal? (check all applicable)

- ❑ Did not see or respond to prior restricting signal
- ❑ Prior signal was not restricting
- ❑ Permissive signals are typical at this location
- ❑ Dispatcher did not communicate an unusual condition (e.g., a stop signal at a location where there is normally a permissive signal)
- ❑ Other _____

Was the crew anticipating a different route?

- ❑ Yes
- ❑ No

If yes, why did the crew anticipate a different route? (check all applicable)

- ❑ Current route is different than usual routing
- ❑ Dispatcher did not communicate different-than-usual routing
- ❑ Other _____

Incident Number: _____

F: Crew Member Information (*one copy per employee)*

Name: _____[3]

Age: _____

Gender: _____

Occupation/Job title: _____

Employee number: _____

Experience and Current Assignment

Time in current craft: _____years _____ months _____weeks

Time at this railroad: _____years _____ months _____weeks

Seniority date: _____

Date of last rules class: _____

Job assignment:

- ❑ Regular job
- ❑ Pool board
- ❑ Extra board

Time in current assignment: _____years _____ months _____weeks

Date most recently qualified on this territory: _____

When was the last time this employee was routed by this signal? _____

Was the employee ever tested on the signal that was overrun during an exam? ❑ Yes ❑ No

If yes, did it take them multiple attempts to correctly identify the aspect on the exam? ❑ Yes ❑ No

How much experience did the crew have operating this particular type of locomotive?

_____ years/months/weeks/days (circle one)

How frequently did the employee work on this particular portion of track (e.g., this yard, this route) prior to the incident?

- ❑ First time working this portion of track
- ❑ Rarely (did not work this track for over 6 months)
- ❑ Infrequently (less than once a month)

[3] For railroad use only; black out this field to de-identify reports if shared externally.

- ❑ Consistently (once per week or more)
- ❑ Always (all or most shifts)

Stop Signal Overrun and Rule Violation History

Has this individual had any prior stop signal overruns? ❑ Yes ❑ No

If yes, explain. Give dates or other incident identifiers.

_____

_____

_____

Has this individual had other prior rule violations? ❑ Yes ❑ No

If yes, explain. Give dates or other incident identifiers.

_____

_____

_____

Schedule and Rest

Shift start time on the date of the incident: ____:_____ AM/PM

Job assignment type (49 CFR Part 228.5): ❑ Type 1 ❑ Type 2

Day of work cycle: ____ of _____

Time off prior to shift: _____days _____hours

Total time on duty at the time of the SSO: _____hours _____minutes

Most recent turn time duration (if applicable): _____

Summarize the employee's sleep and work schedule over the past 72 hours prior to the accident:

_____

_____

_____

Fitness for Duty[4]

Date of last medical exam: _____

Did the employee have any known medical conditions that would impair his or her ability to perform this job?

- ❑ Hearing impairment

[4] Railroads may wish to attach separate documentation of drug/alcohol test results, medical records, etc.

- ❑ Color deficit
- ❑ Other visual impairment
- ❑ Sleep apnea
- ❑ Other sleep disorder
- ❑ Other: _____

Was the employee using any prescription or over-the-counter medications that could affect their job performance?

❑ Yes ❑ No

Was there evidence of drug or alcohol impairment at the time of the incident?

❑ Yes ❑ No

If yes to either of the above, please elaborate.

_____
_____

Actions related to the SSO

Could the crewmember see the signal from their location?

❑ Yes ❑ No

Did the crewmember recognize that it was a stop signal before passing it?

_____
_____

G: Dispatcher Information *(one copy per employee)*

Basic Information

Name: _____[5]

Age: _____

Gender: _____

Experience and Current Assignment

Occupation/job title: _____

Employee number: _____

Job assignment:

- ❑ Regular
- ❑ Extra board

Desk(s) dispatcher normally covers: _____

Desk(s) dispatcher was covering at the time of the passed stop signal:

_____

How long have they been qualified on this desk (s): _____

Length of time working at this desk: _____years _____ months _____weeks

Length of time working in this craft: _____years _____ months _____weeks

Length of time working at this railroad: _____years _____ months _____weeks

Schedule and Rest

Time employee came on duty: ____:_____

Time off prior to coming on duty: ____ days, _____ hours

Summarize the employee's sleep and work schedule over the past 72 hours prior to the accident:

_____

_____

_____

Routing and Communications with Crews

Were there any unusual conditions affecting the train movement?

[5] For railroad use only; black out this field to de-identify reports if shared externally.

- ❑ Different route than usual
- ❑ Maintenance issue (e.g. dark signal)
- ❑ Meet or pass at different time or location
- ❑ Other: _____

If yes, did the dispatcher contact the train crew ahead of time to let them know of the unusual conditions?

❑ Yes ❑ No

Did the last train that passed the signal note any abnormalities related to the signal or route?

❑ Yes ❑ No

If yes, please describe:

_____

How long did it take from the time the passed stop signal occurred to the time the dispatcher became aware that a passed stop signal occurred?

_____

How did the dispatcher first become aware that the stop signal was passed?

- ❑ Contacted by train crew that passed stop signal
- ❑ Contacted by some else: _____
- ❑ Audio/visual alert or indicator on dispatch computer system
- ❑ Overheard radio communication

What actions did the dispatcher take upon becoming aware of the passed stop signal?

_____

Technology Factors

Did the dispatcher's computer system display an indication of the passed stop signal?

- ❑ Visual
- ❑ Audio
- ❑ Both
- ❑ Neither (no indication)

If so, did the dispatcher detect the audio or visual indication of the passed stop signal on the computer system display?

- ❑ Yes, immediately
- ❑ Yes, but delayed
- ❑ No

Did the dispatcher correctly interpret the visual/auditory indication?

- ❑ Yes, immediately
- ❑ Yes, but delayed
- ❑ No

Were there any anomalous, erroneous or misleading indications on the dispatcher computer system at the time that the train passed the stop signal?

_____
_____

Was there visual or auditory indication that a passed stop signal occurred on anyone else's computer system (e.g., computer system of supervisor or manager)?

_____
_____

Incident Number: _____

H: Employee Narratives (*one copy per employee)*

To be filled out by crewmembers, dispatcher, and any others with knowledge of the incident.

Basic Information

Name: _____ Date recorded: _____

Employee Number: _____ Time recorded: _____:_____

Occupation/Job Title: _____

Narrative

Please describe, from your own perspective, the events leading up to the stop signal overrun (use the backside of this sheet or additional sheets if needed.)

_____
_____
_____
_____
_____
_____
_____
_____

How did you identify or learn about the stop signal overrun?

_____

What actions (if any) did you take after becoming aware of the stop signal overrun?

_____
_____

Please list any factors you observed that you believe contributed in any way to the stop signal overrun. (These may include environmental factors, characteristics of the territory, technology or infrastructure, organizational factors, etc.)

_____
_____
_____

Please describe any suggestions for how to address the factors you listed above to prevent future stop signal overruns.

_____
_____
_____
_____

Incident Number: _____

I: Incident Severity[6]

Was the incident reported to FRA?

❑ Yes ❑ No

Select incident type (check all that apply):

❑ Stop signal overrun
❑ Repeat stop signal overrun at signal
❑ Near miss—PTC enforcement prevented stop signal overrun

Was there an obstruction on the tracks?

❑ Yes ❑ No

If yes, specify what the obstruction was: _____

Did the crew pass the point of danger (e.g. ran through switch or hit obstruction)?

❑ Yes ❑ No

Distance past signal: _____ft.

Distance from point of danger: _____ft.

Select any accidents that occurred as a result of the stop signal overrun, if applicable:

❑ Derailment
❑ Head on collision
❑ Rear end collision
❑ Side collision
❑ Raking collision
❑ Broken train collision
❑ Other (please describe)
_____

[6] Some of this information may already be collected on FRA forms in the case of a more serious accident following a stop signal overrun. However, by collecting it here it can be used to populate additional forms as needed.

Derailments

Locomotives derailed: _____

Freight: Loaded cars derailed: _____

Unloaded cars derailed: _____

Passenger: Occupied cars derailed: _____

Unoccupied cars derailed: ____

Hazardous Materials

Were there hazardous materials onboard?

❑ Yes ❑ No

Number of hazmat cars damaged/derailed: ___

Number of hazmat cars releasing product: ____

Number of people evacuated: _____

Damage Estimates

Estimated equipment damage:

$_____

Estimated track, signal, and way damage:

$_____

Estimated structure damage:

$_____

Estimated cleaning costs:

$_____

Injuries and Fatalities

Number of fatalities: _____

Employee fatalities: _____

Passenger fatalities: _____

Other fatalities: _____

Number of injuries: _____

Employee injuries: _____

Passenger injuries: _____

Other injuries: _____

J: Incident Diagram

Sketch train positions, signal positions, switches and interlockings—or attach photographs, track charts etc. as needed to illustrate the incident.