This is a RISSB Australian Standard® development draft

Content in this document is for RISSB product development purposes only and should not be relied upon or considered as final published content.

Any questions in relation to this document or RISSB's accredited development process should be referred to RISSB.

RISSB Contact details:

Head office:

Phone:	Email:	Web:
(07) 3724 0000 +61 7 3724 0000	info@rissb.com.au	www.rissb.com.au

Standard Development Manager:

Name:	Phone:	Email:
Iaen Hodges	0447-619-338	ihodges@rissb.com.au

Copyright

Data entry – draft starts next page

Standard number	CoP
Version year	2024
Standard name	Risk Management for Driver Only Operation
Standing Committee	Safety and Operations
Development group member organisations	ARTC Inland Rail, Aurizon, QUBE, Rail Management Australia, Rio Tinto, Rail Tram and Bus Union
Review type	
First published	
ISBN	
SDM name	Iaen Hodges
SDM phone	0447-619-338
SDM email	ihodges@rissb.com.au

Development draft history

Draft version	Draft date	Notes
V 0.13	27/02/2024	Draft V 0.13 RISSB Template Conversion
V 0.14	05/03/2024	Reference appendixes in document
V 0.15	13/03/2024	Update DG Meeting 7
V 0.16	15/03/2024	Updated Principles
V 0.17	04/06/2024	Amend SFAIRP and R-SFAIRP methodologies. Consolidated Risk Factors. Adjusted information sequence
V 0.18	30/07/2024	Amend QA/IR/Peer Review

Background

In Australia, rail traffic may be managed by two crew members in various combinations, or as driver only operations. Two person operations can be a driver and a second person located in the driving cabin or on the rail traffic. The second person may be another driver, an assistant driver, a guard, or other competent workers. While with driver only operation, the driver is solely responsible for all train management activities.

Objective

This document aims to provide guidance on how hazards and risks associated with DOO are managed safe so far as is reasonably practicable (SFAIRP).

Table of Contents

Figures

Tables

Section 1 Scope and general

1.1 Scope

The scope of this Code of Practice includes the requirement for a rail transport operator (RTO) to demonstrate due diligence in developing and applying a risk methodology that confirms rail traffic operating as DOO are safe SFAIRP. The risk methodologies shall be applied before RTOs introduce driver only operations or before the removal of the second person on freight, heavy and light rail passenger services and infrastructure maintenance vehicles operating on the network.

This document does not deal with operational issues, but it does deal with the implication that any hazard associated with the redefined or re-engineered task/equipment to be included in the SFAIRP justification.

This document is not specifically intended to cover, autonomous train operations (GoA3 and GoA4), or heritage railways operating on a private or isolated railways, but items from this Code of Practice may be applied to such systems as deemed appropriate by the relevant RTO.

This document does not address technical steps/aspects of achieving DOO, the actual quantification of risk (assuming any accredited Australian railway will have a satisfactory method and schema for the determination of risk, be it qualitative or quantitative), or the assumption of any specific risk philosophy such as those espoused by ISO 31000 Risk Management – Guidelines.

1.2 References

Documents for informative purposes are listed in a Bibliography at the back of the Standard.

1.3 Defined terms and abbreviations

For the purposes of this document, the following terms and definitions apply:

1.3.1

ATP
automatic train protection

1.3.2
autonomous rail traffic
rail traffic operating to GoA3 or GoA4

1.3.3
driver alone operation (DAO)
operation in which one sole rail safety worker has the responsibility for the control, operations and procedures of rail traffic

1.3.4
driver assistant
authorized assistant (not a driver) who is within the rail traffic cab and has associated responsibilities and duties

1.3.5
driver only operations (DOO)
operation of a rail traffic by a driver without another driver or other person in the driver's cabin or train who is qualified in, and has suitable experience in, the operation of the rollingstock and the safe working system that form part of the network rules

1.3.6
guard
qualified worker on a passenger train who carries out safeworking duties and is responsible for the safety and supervision of passengers

1.3.7
passenger service staff
workers whose primary function is to manage the passengers on the rail traffic

1.3.8
second person
qualified worker on the rail traffic to assist the driver

1.3.9
SFAIRP
so far as is reasonably practicable

1.3.10
SPAD
signal passed at danger

General rail industry terms and definitions are maintained in the RISSB Glossary. Refer to: https://www.rissb.com.au/products/glossary/

Section 2 Safety concepts

2.1 Base case criteria

This Code of Practice focuses on addressing Driver Only Operation (DOO) based on two specific criteria. The following subsections provide background information and context for the risk methodology that will be applied for each criterion.

DOO criteria to be considered include:

(a) the removal of the second person from the rail traffic requiring the RTOs to demonstrate 'Reverse SFAIRP', at a minimum, as a means to prove that a review has determined other practicable controls that can be used, and

(b) the introduction of DOO as a new service requiring the RTO to demonstrate a SFAIRP argument.

RTOs planning to remove the second person to operate as DOO or introduce DOO as a new service shall, in accordance with the RSNL, demonstrate due diligence to ensure risks are eliminated or minimized SFAIRP and remain at levels that are not intolerable for the given railway.

Section 3 of this Code of Practice –The methodologies– provides guidance on the application of the Reverse SFAIRP and SFAIRP processes.

Removing the second person

RTOs are required to demonstrate a reverse SFAIRP assessment, at a minimum, when considering a move to DOO. In completing a reverse SFAIRP assessment it's important to understand that both the driver and the second person have tasks, skills, and responsibilities tied to hazard controls. These responsibilities can be formal and informal, unique, duplicated, or shared.

Removing the second person from rail traffic changes the risk profile, as it eliminates an operational component and/or a risk control (or supplementary risk control). This change must be assessed, and alternative risk controls considered to ensure identified risks are removed or reduced SFAIRP. This

process will continue until a new SFAIRP state is achieved that is at least as safe as two-person operation.

To identify risk using reverse SFAIRP, RTOs need to understand the reasons for having a second person and determine:

(c) which reasons were safety related (i.e. to provide a control measure to a hazard) and which were related to operations;

(d) whether or not each of those reasons is still valid; and

(e) whether or not each of those reasons that are still valid can be satisfied by some other mechanism.

In practice, the situation can be more complex and context-specific, especially in normal, degraded, and emergency operations involving freight, passenger and infrastructure rail traffic in remote and suburban environments. The driver and second person collectively provide a set of risk controls to a variety of hazards.

Where a task required two people to perform it and the plan is to move to DOO, the RTO may consider the option to either redefine the task so that the driver alone can safely and adequately perform the task, or re-engineering of the task/equipment such that a single person can perform a two-person task.

Further, in many cases, there are additional engineered defences (from the hierarchy of controls), which also contribute to the control any particular hazard. These engineered defences should be integrated and assessed to ensure continued safety without the second person.

A number of techniques are available to analysis the second person role and identify the task performed. Appendix A provides a non-comprehensive list of useful techniques and examples of tasks performed by the second person.

2.2 Introducing DOO

RTOs introducing DOO as a new service have a duty to demonstrate a SFAIRP argument.

Implementing SFAIRP typically involves a thorough risk assessment to identify potential hazards and an evaluation of the likelihood and severity of harm. Control measures should be identified and implemented to mitigate these risks. The measures taken should be proportionate to the risk, with higher risks necessitating more substantial measures. The RSNL require RTOs:

(a) to eliminate risks to safety so as far as is reasonably practicable; and

(b) if is not reasonably practicable to eliminate risk to safety, to minimize those risks so far as is reasonably practicable.

The following principles are provided as general guidance for RTOs identifying and controlling risk associated with the introduction of DOO. Further detail can be found in Appendix F Change management factors.

These principles and their practical applications form part of a framework for the safe and efficient operation of DOO including:

(c) Safety and change management: the RTO shall apply the organisational Safety Management System safety and change management procedures for the introduction of DOO;

(d) Platform-train interface (PTI): the platform design shall support safe DOO;

(e) Terminal and yards interface: the terminal and yard design shall support safe DOO;

(f) Rail Traffic Design: rail traffic shall be compatible for DOO operations at platforms, yards and terminal;

(g) Rail traffic operating environment: risks associated with the normal, degraded and emergency operation of passenger, freight, light rail and maintenance vehicles shall be eliminated or reduced SFAIRP;

(h) Industry standards and compliance: the RTO shall implement and demonstrate adherence to relevant industry good practice with assurance that all activities comply with RSNL;

(i) Role impact: all staff affected by the introduction of DOO including but not limited to, drivers, operators, shunters, signallers, train/network controllers and operation controllers shall be adequately prepared, supported and capable of maintaining safe rail operations;

(j) Business readiness: the business shall be ready for the change to DOO providing assurance that the transition has been managed safely and effectively; and

(k) Equipment suitability: equipment used shall be suitable to support safe and effective DOO in normal, degrade and emergency operations.

Section 3 The methodologies

3.1 General

Accredited RTOs have a duty to ensure the safety of their railway operations. These duties to ensure safety are qualified by the statement so far as is reasonably practicable in the RSNL. The methodologies presented in this Code of Practice are consistent with the ONRSR Guideline – Meaning of duty to ensure safety so far as is reasonably practicable and other relevant RISSB products supporting the safe operation of the railway. The information below aims to assist duty holders understand their obligations and responsibilities in managing safety, providing a framework for managing risks SFAIRP and the concept of reverse SFAIRP.

SFAIRP is a legal term that requires the diligent weighing up of all relevant matters to ensure safety.

The SFAIRP process is used to determine the level of safety that duty holders are expected to meet under the RSNL and National Regulations.

SFAIRP also requires that even for risks that are considered insignificant or adequately controlled, it is still necessary to demonstrate that there is no reasonably practicable means of further risk reduction.

The definition of reasonably practicable according to Section 47 of the RSNL, means what is, or was at a particular time, reasonably able to be done to ensure safety, taking into account and weighing up all relevant matters.

The determination of what is reasonably practicable is an objective test. It requires duty holders to meet the standard of behaviour expected of a reasonable person in the same position who is required to comply with the same duty.

SFAIRP is a stringent, comprehensive, and precautionary approach to ensuring safety. It requires the demonstration of a higher measure of diligence.

Two methodologies are presented in this Code of Practice; the first considers the case of moving from two-person rail traffic operations to DOO (a “reverse SFAIRP” argument), while the second considers DOO as the method of operation from day one (a standard SFAIRP argument).

In applying these methodologies, RTOs are required to demonstrate due diligence by:

(a) identifying and assessing all hazards to safety that may arise from DOO;

(b) weighing the likelihood against the severity of the hazard;

(c) specifying the controls to manage the hazards to safety;

(d) in the context of industry knowledge, what should be known of the hazards and controls;

(e) the availability and suitability (Accepted and Good Practice) of ways to eliminate or minimize the risk;

(f) consulting with all stakeholders on the hazards and controls;

(g) considering the cost of doing so;

(h) including procedures for monitoring, reviewing, and revising the effectiveness of controls;

(i) validating that the approach is comprehensive, exhaustive, and precautionary. Including why any controls were not adopted but particularly any accepted or good practices; and

(j) verifying the risk identified and the risk controls deliver safe SFAIRP DOO.

3.2 The reverse SFAIRP methodology

A reverse SFAIRP demonstration is a means to prove that risks associated with removing a safety control (like the second person from rail traffic) remain reduced SFAIRP.

When removing the second person from rail traffic, an RTO shall as a minimum demonstrate 'reverse SFAIRP. In demonstrating reverse SFAIRP, it is essential to understand what the second person on the rail traffic does, both formally and informally, and all the tasks and responsibilities that they have.

ONRSR Guideline – Meaning of duty to ensure safety so far as is reasonably practicable provides guidance on the concept of reverse SFAIRP including examples:

(a) where a reverse SFAIRP argument may be valid,

(b) when removal or reduction in the effectiveness of a control would not be acceptable.

The "Reverse SFAIRP" methodology presented below can be used for demonstrating that risks are still reduced SFAIRP, given the removal of the second person on the train:

3.2.1 Identify the hazard

For the reverse SFAIRP, the hazard identification is a matter of understanding what hazards were mitigated by the second person's presence.

The second person can be considered as having "standard" responsibilities, responsibilities in "out-of-course running" and responsibilities in emergencies. All these must be identified and documented with a view to understanding what risk controls the second person provides, and to which hazards, in the railway.

A number of techniques are available for this analysis. Appendix A provides a non-comprehensive list of useful techniques.

This activity will produce a list of hazards that are in some way impacted by the removal of the second person.

Appendix F provides additional guidance on change management factors to assist in identifying potential hazards/risks.

3.2.2 Evaluate the risk

Risk evaluation for the reverse SFAIRP argument is a matter of determining the increase in risk profile/quantum brought about by the removal of the second person. A RTOs safety management

system will have a method for evaluating the risk associated with any hazard and hence also method of aggregating a risk exposure across several hazards.

Such an aggregation may be expressed as fatalities and weighted Injuries per year (FWI/y) or as a table recording the number of each category of risk associated with the second driver etc. as best befits the organisations safety management system.

Appendix B lists potential risk factors in relation to DOO, Appendix D provides additional information on the potential risk issue of DOO.

3.2.3 Identify risk controls

All hazards representing an increased risk must be subjected to a SFAIRP process beginning with the identification of alternate risk controls.

The ONRSR Guideline- Meaning of duty to ensure safety so far as is reasonably practicable, contains the following statement at section 5.2:

“The knowledge about a hazard or risk, and any ways of eliminating or minimising the hazard or risk, will be what the duty holder actually knows, and what a reasonable person in the duty holder’s position (e.g. a person in the same industry) would reasonably be expected to know. This is commonly referred to as the ‘state of knowledge”.

It is the responsibility of the particular railway to inform themselves about the “state of knowledge” in terms of:

(a) Potential railway hazards.

(b) Potential likelihood/frequency and consequences of those hazards.

(c) Potential cause of those hazards.

(d) Availability of potential causal and consequence controls (risk controls) for those hazards.

Appendix B contains some guidance on potential risk factors relating to the operating of rail traffic.

Appendix C and D contains example risk controls relating to DOO.

Appendix F provides additional guidance on change management factors to assist in identifying potential hazards/risks.

Potential risk control measures aligning with a hierarchy of risk controls should be considered remembering that eliminate the hazard is the first consideration and then various types of engineering controls. These are the most effective but almost invariably are also the most expensive and time consuming to implement, whereas training and procedures are less effective over the long timeframe of the life of a railway asset but are cheaper and quicker to implement.

All potential risk controls should be identified at this stage and not dropped from consideration.

3.2.4 Evaluate the reasonableness of implementing each risk control

An RTO should evaluate the reasonableness of implementing each risk control by:

(a) Estimating the safety benefit.

The safety benefit associated with each new risk control should be established.

An RTOs safety management system should have a method for evaluating the degree of risk associated with any identified hazard including:

i. Evaluate the level of risk reduction.

ii. Assess the value of existing controls to their effectiveness.

iii. Estimate the residual risk level if the measures are implemented.

(b) Estimating the cost:

The cost of each potential new risk control measure from (4.3) above should also be estimated. Note that it is often the case that one causal control measure controls more than one hazard. The cost of each potential risk control measure should be evaluated only once but its safety benefit must be included for all of the hazards to which it contributes some measure of control.

(c) Evaluating the cost/benefit

Compare the costs (financial, operational, etc.) and benefits (risk reduction) of implementing each measure.

The evaluation of the cost/benefit requires that both the cost and safety benefit be expressed in appropriate dimensions. Once the calculation is made, the resulting number must be compared with a "hurdle condition".

Appendix E provides further guidance.

3.2.5 Test of gross disproportionality

The test of gross disproportionality is a simple one. If the cost/benefit evaluation provides a result greater that the factor of gross disproportionality, then the new risk control must be implemented. See (4.6) below.

Appendix E provides further guidance.

3.2.6 Accept and implement

Any risk control that passes the test of gross disproportionality must be implemented and validated as being effective.

These control measures must be owned, managed and monitored as per the organisation's Safety Management System.

3.2.7 Reject and document

Any risk control that fails the test of gross disproportionality does not need to be implemented under a SFAIRP regime (although the organisation may decide to implement such a control for their own business reasons). However, there is a clear need for RTOs to:

(a) Document the findings of the assessment, including the identified hazards, potential measures, evaluation of each measure, and the decision-making process.

(b) Provide a rationale for why certain measures were not implemented, demonstrating that the decision was based on reasonable considerations.

3.2.8 Review and update the risk assessment

RTOs shall set and maintain a review schedule to ensure that the risk assessment remains valid.

Risk assessment should be updated based on new information, technology, operations, regulations or lessons learned from incidents or near-misses.

3.2.9 Estimate safety disbenefit

The overall safety disbenefit should now be determined. It is the difference between the risk profile before the removal of the second person and the risk after the removal of the second person and the implementation of the risk control measures adopted at (4.6) above.

A railway organisation's safety management system will have a method for evaluating the degree of risk associated with the identified hazards from (a). Again, this safety disbenefit may be expressed as fatalities and weighted injuries per year (FWI/y) or as a table recording the number of each category of risk associated with the second driver.

3.2.10 End state

An RTO may continue the evaluation to provided estimate of economic savings, an evaluation of savings/benefit and a final test of gross disproportionality of the saving/benefits.

This process shall continue for each identified risk control and for each identified hazard until all risk controls and all hazards have been considered.

The end result of the analysis will be a set of risk controls which will, in aggregate, eliminate risk or reduce risk SFAIRP. This analysis will undoubtedly form a cornerstone part of the railway organisation's accreditation submission to the ONRSR.

It should be noted that there may be certain cases where the SFAIRP solution is to have a second person on the train.

3.3 The SFAIRP methodology

The steps listed below are presented to assist an RTO to systematically assess risks, determine what is reasonably practicable to ensure safety, and implement appropriate risk controls. The process involves considering all relevant factors, such as likelihood and severity of risks, available control measures, suitability of controls, and cost-effectiveness. It also emphasizes continuous monitoring, review, and improvement to maintain safety standards.

To apply a SFAIRP methodology, an RTO should apply the following steps:

3.3.1 Identify the hazard

A RTOs Safety Management System will have a method for identifying hazards. Should the RTO consider augmenting their standard approach, the following recommendations are offered:

(a) Conduct a formalized hazard and operability study (See AS IEC 61882:2017 Hazard and operability studies (HAZOP studies) – Application guide. for an internationally accepted method of conducting a HAZOPS).

(b) Day-in-the-life-of (DILO) / Night-in-the-life-Of (NILO) Analysis (There is no formal standard for DILO/NILO analysis; it is a particular form of a HAZOPS centred around systematically identifying possible departures for the normal operating process/procedures (DILO) and the non-operating/maintenance processes, preventing them or dealing with them and returning operation to normal).

(c) Consult the RISSB Australian Railway Risk Model (ARRM)

(d) Review the railway's accident investigation reports.

The identification of hazards must consider both normal, degraded and emergency operation and what this may mean for the required task (or otherwise) of a Second person on the rail traffic.

Note that a key part of the hazard identification is the identification of all causal factors i.e. all causes of an identified hazard. In relation to the subjection of DOO, the causes of interest are those which negatively impact the driver's ability to provide causal controls to the identified hazards.

Appendix B and D provide additional guidance on some of the issues identified in various studies in DOO.

Appendix F provides additional guidance on change management factors and potential hazards/risks.

3.3.2 Evaluate the risk

A RTOs Safety Management System will have a method for evaluating the likelihood/frequency of hazards and the potential range of consequences arising, and thus the degree of risk associated with any identified hazard.

Appendix B contain some potential factors which may impact the degree of risk associated with any identified hazard

Appendix C and D provides additional information on the potential risk issue of DOO.

3.3.3 Identify risk controls

Complete the procedure for identifying risk controls as shown in Section 3.2.3.

3.3.4 Evaluate the reasonableness of implementing each risk control

Complete the procedure for evaluating the reasonableness of implementing each risk control as shown in Section 3.2.4.

3.3.5 Test of gross disproportionality

Complete the procedure for testing of gross disproportionality as shown in Section 3.2.5.

3.3.6 Accept and implement

Complete the procedure for accepting and implementing as shown in Section 3.2.6.

3.3.7 Reject and document

Complete the procedure for rejecting and documenting as shown in Section 3.2.7.

3.3.8 Review and update the risk assessment

Complete the procedure for reviewing and updating the risk assessment as shown in Section 3.2.8.

3.3.9 Estimate safety disbenefit

Complete the procedure for estimating the safety disbenefit as shown in Section 3.2.9.

3.3.10 End state

An RTO may continue with the evaluation to provided estimate of economic savings, an evaluation of savings/benefit and a final test of gross disproportionality of the saving/benefits.

This process shall continue for each identified hazard and risk control until all controls and all hazards have been considered.

The end result of the analysis will be a set of risk controls which will, in aggregate, eliminate risk or reduce risk SFAIRP. This analysis will undoubtedly form a cornerstone part of the railway organisation's accreditation submission to the ONRSR.

It should be noted that there may be certain cases where the SFAIRP solution is to have a second person on the train.

Appendix A Techniques for determining second person responsibilities

The following are recommended activities for eliciting the responsibilities of the second person on the rail traffic:

(a) Review the rules and procedures manual(s).

(b) Review the training manuals/materials.

(c) Interviews with rail traffic crew.

(d) Review the railway's hazard register.

(e) Review the data/failure recording and corrective action/s.

(f) Conduct a formalized hazard and operability study (See AS IEC 61882:2017 Hazard and operability studies (HAZOP studies) – Application guide)" for an internationally accepted method of conducting a HAZOPS).

(g) Day-in-the-life-of (DILO)/Night-in-the-life-of (NILO) analysis (There is no formal standard for DILO/NILO analysis; it is a particular form of a HAZOPS centred around systematically identifying possible departures for the normal operating process/procedures (DILO) and the non-operating/maintenance processes, preventing them or dealing with them and returning operation to normal).

(h) Consult the RISSB Australian Railway Risk Model.

(i) Review the railway's accident investigation reports.

The following are some examples of second person responsibilities and activities for consideration:

(j) Responsibilities for:

  (i) emergency evacuation of trains;

  (ii) rail traffic preparation and stabling;

  (iii) door operation and rail traffic despatch;

  (iv) rail traffic protection in emergency situations; and

  (v) rail traffic protection where assistance is required from another rail traffic;

(k) Responsibilities for train protection, both in the case of emergency and when assistance is required from another train.

(l) Arrangements in the case of the driver becoming incapacitated.

(m) Where appropriate, responsibilities for coupling and uncoupling.

(n) Where required, responsibilities for shunting and marshalling

(o) Providing assistance to passengers in the case of threat, assault or illness.

(p) Providing advice to passengers during extreme delays.

(q) Arrangements for assisting disabled passengers on and off rail traffics.

(r) Arrangements for degraded mode operation, when some part of the equipment required for DOO is not fully operational, or cannot be used as intended, for example because of glare on in- cab monitors, or failed cameras, whether they be train or station-mounted.

Appendix B Potential risk factors in relation to DOO

The following factors are presented as common risk factors being likely to influence DOO.

The risk factors have been grouped into 5 elements:

(a) People related factors. People risk factors are the aspects of a job or task that have the potential to impose an injury, illness, workload, or stress on the worker. This includes workers directly employed by the RTO, contractors or general public as each may be impacted by DOO.

(b) Environmental factors. Environmental risk factors, in the context of DOO, are the aspects of a worker's workplace or surroundings such as weather, site conditions or cab environment etc.

(c) Equipment related factors. Equipment risk factors are the equipment a worker uses in the workplace to perform a job or task such as rollingstock, infrastructure or personal protective devices etc.)

(d) Procedural related factors. Procedural risk factors consider the quality and comprehensiveness of the administrative controls which serve to instruct a person on how to undertake a job or task.

(e) Organisation related factors. Organisation risk factors relate to the RTO's broader SMS elements that should be used to ensure DOO risks are managed safe SFAIRP.

An RTO shall be able to present evidence of identifying and analysing the risk factors relevant to the scope and nature of their DOO.

People	Environmental	Equipment	Procedural	Organisational
Human error, workload • Signal sighting and responses • Speed management • Fatigue • Extended driving times • Distraction • Route requirements (workload related) **Medical events** • Incapacitation • Incapacitated and second driver not present • Wellbeing (outside of work and at work) • Driver ill while at controls • Stress (e.g., immediately following a near miss) **Task allocation** • On-line stabling/access processes/driver out of cab • First aid access • Monitoring for vigilance • Medical event support • Monotony of task • Emergency event responsibilities across DOO	• Cold/warm; wet/dry (i.e. impacts on person in different climates) • Visibility and sighting (vegetation; fixed obstructions, light/shade, sighting distance, sun glare, etc.) • Lighting (e.g., in yards, sidings, mainline) • Ground condition, pathways (e.g., if required to exit rail traffic to ground, such as to manage points) • Night/day operations • Platform stopping positions, for all rail traffic configurations. • Crowd control on platforms, peak and special events. • Availability of a safe walking space to inspect the rail traffic faults or incident. • Platform/train interface • Extent of DOO (both in geographic extent and duration). • Intensity of DOO rail traffic. • Intensity of all rail traffic (DOO plus non-DOO). • DOO on passenger lines or only freight lines.	**Rolling stock** • Coupler types/end of rail traffic markers (i.e. monitoring for rail traffic parting risk) • Securing of rail traffic • Reliability of rail traffic. • Performance characteristics of the rail traffic. • On-board equipment such as cameras/mirrors. • Fault detection and maintenance • Door and traction interlocking • Rollingstock Safety Controls (e.g., vigilance control type, deadman control, eye monitoring systems, etc. • Equipment provided supports safe and efficient DOO **Human factors** • Cab design – visibility of track (e.g., driver position(s), windscreen, locomotive profile etc. • Rolling stock design is suitable for DOO. • Cab ergonomics (e.g., availability/ usability of controls) **Route Specific Infrastructure**	**Network operating standards** • Safeworking Rule book • Operating standards including normal, degraded and emergency. • Dangerous goods operating procedures including emergency response. • Operational and safety Interface agreements including RIM, Network Operation, Stations and RTO. **Communications** • Communication protocols internal, external and black spots. • The driver's ability to talk to station staff to manage passenger movements. • The driver's ability to talk to the Network Controller to manage rail traffic movements, • The signaller's ability to talk directly to passengers, in the event of the driver becoming incapacitated. **Plans** • Fatigue Management • Emergency Management	• Safety Management System • Risk Management • Change Management • Roles & Responsibilities • Culture • Rolling stock standards • Terminal and Yard design • Platform Interface standards • Training and competency management plan • Emergency management plan including rail management of dangerous goods. • RIM / RTO interface agreements. • Notice of Accreditation

People	Environmental	Equipment	Procedural	Organisational
• Communication requirements /expectations (normal, degraded, emergency) **Route knowledge** • Speed (and changes) • Temporary condition changes • Routing options • Gradients • Route risks **Personal security** • Working at night • Working in isolation **Competence** • Route experience • Task competency **Fitness for duty confirmation** • Sign-on processes • Drug and alcohol checks • Psychological profile (introvert/extrovert).		• Route Complexity (complex and/or mundane) • Number of tracks • Safeworking system(s) (including signalling) • Train protection system e.g., ATP, TPWS, Train Stop • Corridor/wayside Signage • Level crossings (and nature of these – passive, active, etc.) • Point mechanisms (e.g., manual vs. automatic) • Key locks, post phones, etc. • Signal and signage positioning (distance between, sighting, visibility) • Multi SPAD signals including SAS and SOY locations • Unsignaled locations • Track condition/gradient (train parting/runaway) • Train access and egress • Inconsistent braking • Low adhesion • Short sections • Multiple routes **Communication equipment** • In cab equipment	• Health and fitness • Drug and alcohol **Processes** • Processes supporting driver needs (e.g., rest, personal needs breaks) • Rostering • Shift length • Emergency management processes (including integration with emergency services). • Signal sighting. • Out of cab and Inservice rail traffic inspections. • Vegetation management. • Travelling to/from workplace • Rail traffic shunting and marshalling in yard and terminals. • Platform/train interface. • Safe train platform arrival and departure. **Training** • Competence management processes. • Training dedicated DOO and ongoing competence management.	

People	Environmental	Equipment	Procedural	Organisational
		• Yard/depot • Post-phones • Out of cab systems (radios) **Working Alone Devices** • In cab • Yard/depot • Out of cab	• Route knowledge • Safety critical communications	

Appendix C Potential risk controls in relation to DOO

C.1 General

The following risk control measures are derived from UK and Australian rail experience. These may be used as reference when exploring risk controls under DOO conditions:

(a) Multiple aspect signalling with the location of rail traffic always monitored in the signal box, by track circuits or axle counters.

(b) Power-operated doors on the rail traffic, interlocked with the traction and braking systems.

(c) A driver's safety systems which cannot be circumvented.

(d) A passenger communication alarm which can be overridden by the driver so that the rail traffic can continue to a suitable place where any emergency can be dealt with.

(e) Driver's aids to ensure safe rail traffic despatch, such as platform mirrors, monitors, or in-cab monitors with body-side cameras.

(f) Enhanced station and terminal lighting.

(g) Enhanced rail traffic bodyside and door lighting (as required).

(h) A secure form of radio communication between the rail traffic and the controlling signaller which permits:

  (i) the signaller to call and speak to the driver and vice versa without any other rail traffic being able to hear the conversation;

  (ii) the signaller to send emergency stop messages to a particular rail traffic, or to all rail traffic in a specific area;

  (iii) the driver to make an emergency call to the signaller, and for emergency calls to take priority over other calls;

  (iv) the signaller to be able to speak to the rail traffic's passengers via the rail traffic public-address system.

(i) Training needs are assessed, and risk-based training programmes developed to support critical DOO skills for all affected staff (including non-technical skills).

(j) Train operating procedures are introduced including:

  (i) driver incapacitation;

  (ii) passenger emergency and evacuation;

  (iii) rail traffic exceeding authority limit (SPAD) or safeworking incident;

  (iv) rail traffic, in service, fault identification and rectification;

  (v) rail traffic recovery.

(k) Alignment and consideration of existing platform hazards and risk controls.

(l) Alignment and consideration of existing terminal/yard hazards and risk controls.

(m) Alignment and consideration of existing RIM operational risk controls.

C.2 Engineering and technical control examples

The following lists provides examples potential engineering, technical and administrative controls consistent with Australian rail operations that may be applicable for a given risk or risk factor associated with DOO. An RTO should consider whether the controls listed below can apply for a risk or risk factor identified, in addition to any other potential controls the RTO may be or become aware of.

(a) Rail traffic automation:
  (i) Implementation of GoA4 (Unattended) or GoA3 (Driverless) operations.
  (ii) Remote control rail traffic operations.

(b) Rail traffic protection systems:
  (i) In-cab signalling systems.
  (ii) Signalling enforcement (e.g., ATP, TPWS).

(c) Infrastructure automation:
  (i) Replacement of manual points with automatic points.
  (ii) Key switch systems replaced with automatic systems.

(d) Infrastructure reconfiguration:
  (i) Signal sighting improvements (e.g., moving all signals to the left side of the track to improve sighting from primary driver position).
  (ii) Removal of vegetation that may impact sighting.
  (iii) Improve lighting (e.g., in yards/sidings).
  (iv) Add derailers/catchpoints (mitigate uncontrolled movements).
  (v) Level of automation.

(e) Rollingstock reconfiguration:
  (i) Improvement to vigilance systems (e.g., optimize time to activation, brake application, methods of protecting against tampering, control versus random responses, alarms or warning provided to network control when activation irregularities are detected).
  (ii) SPAD/PAE warnings provided in rail traffic cab.
  (iii) Eye-monitoring systems.
  (iv) Speed limiting devices.
  (v) Automatic brake application when driver out of cab.
  (vi) Cab reconfiguration to enable ease of access to controls by rail traffic crew in their primary position.
  (i) Level of Automation.

(f) Personal engineering devices:
  (i) Safety Alert device.
  (ii) Fatigue detection device.

C.3 Administrative control examples

(a) Fitness for duty:

(i) Self-assessment at sign-on (if no other person is present to support).

(ii) Review of Health Risk Assessment to ensure addressing associated risk factors.

(iii) Remote drug and alcohol check.

(iv) Remote 'crib' arrangements.

(b) Training and competence:

(i) Training personnel who have changed/different tasks, degraded and emergency operations.

(ii) Training or experience for updated, new or changed route.

(iii) New risk-specific training (based on risks identified.)

(c) Fatigue management:

(i) Alter shift start times.

(ii) Increase frequency of breaks.

(iii) Increase duration of sleep opportunity.

(iv) Use fatigue modelling tools to assist in demonstrating a modified roster is appropriate.

(d) Amend procedures, plans and agreements for DOO (examples only):

(i) Work on track.

(ii) Fault finding.

(iii) Operation of defective equipment (e.g., defective automatic points).

(iv) Out of cab procedures.

(v) Communication protocols.

(vi) Emergency response plans.

(vii) Working alone arrangements (e.g., remote areas at night).

(viii) Engage with emergency services and integrate emergency management plans

(ix) Supervision or control monitoring increased (e.g., increase in lighting tests, increased yard inspections, increase driver reviews).

(x) SMS risk and risk controls.

(xi) Operational and safety interface agreements including RIM, network control, stations and rolling stock operators.

(xii) Rail operation accreditation.

(e) Rollingstock pre-start check modifications:

(i) Change in testing regime for communication systems/processes.

(ii) Brake and air testing may be undertaken by other parties' pre-operation.

(f) Engineering activities:

(i) Alteration to infrastructure standards to allow for DOO.

(ii) Signal sighting to be carried out to inform signal alterations.

(iii) Improving wayside signage.

(g) New driving protocol introduction:

(i) Risk based commentary.

(ii) Confirmation of points and signals.

(h) Personal protection equipment:

(i) Wear hi-visibility clothing when out of cab.

(ii) Gloves available for use when activating point levers etc.

(iii) Flags/lanterns for safeworking protection when on track alone.

(iv) Torches available for use at night.

Appendix D Potential issues for driver only operation

The following scenarios provide some examples of the type of issues faced when operating driver only. They are presented in the form of a causal analysis, identifying the potential causes of the scenario, and proposing possible causal and consequence control measures against the scenario. These are provided for guidance only and are not intended to be complete nor universally applicable to all railways.

D.1 Driver incapacitation

The subsequent section shows some of the possible causes of driver incapacitation and the related causal controls, consequence controls, and restoration of service measures, as detailed in the following tables.

Appendix Table D.1-1 Health Episode

Causal Controls	Consequence controls	Restoration of service
• Regular health checks • Drug and alcohol testing • Medical standards	• ATP (including vigilance function) • Distress alarm within reach of driver • AED and first aid kit in cab • First aid training • Communications	• Incapacitated driver recovery procedures to send assistance to an incapacitated driver, to recover the driver from a potentially locked rail traffic cab, administer on-site first aid, and transport to hospital. • Interface coordination plan with local medical services

Appendix Table D.1-2 Cabin Environment Not Suitable (Too Hot/Cold or Noxious/Toxic Fumes)

Causal Controls	Consequence controls	Restoration of service
• Air conditioning/heater • Warm clothing storage • Gas alarm in cab	• ATP (including vigilance function) • Distress alarm within reach of driver • Openable window	

Appendix Table D.1-3 Physical Attack

Causal Controls	Consequence controls	Restoration of service
• Lockable cab doors	• Communications • Self-defence training • Capsicum spray • In-cab CCTV surveillance • Distress alarm	

Appendix Table D.1-4 Gross Fatigue

Causal controls	Consequence controls	Restoration of service
• Fatigue management (see also D4 below)	• ATP (including vigilance function) • Communications	

D.2 Driver error (in driving task)

Appendix Table D.2-5 Distraction

Causal controls	Consequence controls	Restoration of service
• Policy on the use of mobile electronic devices on the rail traffic • Policy on the use of entertainment systems on the rail traffic • Communications management protocols • Alarm management function and protocols • Reduce rollingstock fault rates	• ATP (including vigilance function)	

Appendix Table D.2-6 Loss of Situational Awareness

Causal controls	Consequence controls	Restoration of service
• In cab signalling • In cab reminders, alerts and warning for approach to limit of authority and CAN warnings. • Policy on the use of mobile electronic devices on the rail traffic • Route knowledge (and regular refresher) courses (on simulator covering both day and nighttime)	• ATP (including vigilance function)	

Appendix Table D.2-7 Unfamiliarity with the Handling Characteristics of the Rail Traffic

Causal controls	Consequence controls	Restoration of service
• Driver certification on rail traffic type (and regular refresher) under DOO	• ATP (including vigilance function)	

Appendix Table D.2-8 Rollingstock Not Suitable for DOO

Causal controls	Consequence controls	Restoration of service
• All rollingstock types which are planned for use on DOO are to be assessed for DOO operability under normal, off normal and failure modes	• ATP (including vigilance function)	

Appendix Table D.2-9 Stress

Causal controls	Consequence controls	Restoration of service
• DOO driver qualification to include psychological testing for suitability for lone working.		

D.3 Driver cognition (error therein)

Appendix Table D.3-10 Misreading in-cab Indications

Causal Controls	Consequence controls	Restoration of service
• Control and indications layout to subject to human factors assessment, operability and sight lines assessment. • Recommendations to be implemented.	• ATP	

Appendix Table D.2.3-11 Loss of Situational Awareness

Causal Controls	Consequence controls	Restoration of service
• In cab signalling • Policy on the use of mobile electronic devices on the rail traffic • Route knowledge (and regular refresher) courses (on simulator covering both day and nighttime)	• ATP	

Appendix Table D.3-12 General Competence Deficiency

Causal Controls	Consequence controls	Restoration of service
• DOO competence and training regime	• ATP	

D.4 Driver fatigue

Appendix Table D.4-13 Insufficient Rest between Shifts

Causal Controls	Consequence controls	Restoration of service
• Fatigue management • Rostering principles	• ATP (including vigilance function)	

Appendix Table D.4-14 Environment Too Hot/Cold

Causal Controls	Consequence controls	Restoration of service
• Air conditioning/heater • Warm clothing storage		

Appendix Table D.4-15 Dehydration/Hypoglycaemia

Causal Controls	Consequence controls	Restoration of service
• Availability of refreshments (water and snacks)		

Appendix Table D.4-16 Shift Duration Too Long

Causal Controls	Consequence controls	Restoration of service
• Limit shift duration (linked to workload analysis of proposed driving task on a per-route basis)		

Appendix Table D.4-17 Stale Air (Insufficient O2, Excess CO2)

Causal Controls	Consequence controls	Restoration of service
• Fresh air intake/extraction in air conditioning • Openable windows		

Appendix Table D.4-18 Eyestrain

Causal Controls	Consequence controls	Restoration of service
• Variable lighting on the rail traffic • Sunglasses/sun blinds on cab windows • Period health checks to include eyesight test		

Appendix Table D.4-19 Excess Workload

Causal Controls	Consequence controls	Restoration of service
• Task analysis and workload analysis to be undertaken for DOO operations (by rail traffic type; per-route; and combinations thereof). • Recommendations to be implemented.		

D.5 Communications (error therein)

Appendix Table D.5-19 Overload

Causal Controls	Consequence controls	Restoration of service
• Policy on the use of mobile electronic devices on the rail traffic • Task analysis and workload analysis to be undertaken for DOO operations (by rail traffic type; per-route; and combinations thereof). • Communications management protocols		

Appendix Table D.5-20 Misunderstood

Causal Controls	Consequence controls	Restoration of service
• Apply RISSB guideline on safety critical communication • Technical communications system to provide high intelligibility for voice comms		

Appendix Table D.5-21 Unintended Recipient

Causal Controls	Consequence controls	Restoration of service
• Comms systems to provide both group and selective calling • Apply RISSB guideline on safety critical communication		

D.6 Rail Traffic recovery

Appendix Table D.6-22 Poor Rollingstock Reliability

Causal Controls	Consequence controls	Restoration of service
• Rollingstock to be reliable and fit for DOO purpose		

Appendix Table D.6-23 Rail Traffic Faults

Causal Controls	Consequence controls	Restoration of service
• DOO driver training. • Network Controller safeworking support and assistance • RIM and RTO Interface agreements • Procedures for in-service inspection and repairs • Emergency response plans		

D.7 SPADs (increased rate/severity thereof)

Appendix Table D.7-24 Driver Underestimates Rail Traffic Braking Distance

Causal Controls	Consequence controls	Restoration of service
• Route knowledge and regular refresher courses including the use of simulators covering both day and nighttime.	• ATP	

Appendix Table D.7-25 Driver Misreads Signal

Causal Controls	Consequence controls	Restoration of service
• In-cab signalling • In cab reminders, alerts and warning for approach to limit of and CAN warnings. • Route knowledge (and regular refresher) courses (on simulator covering both day and nighttime) • Lineside signals to be place in accordance with Signal Sighting Committee recommendations (site-by-site inspection required) to ensure DOO visibility • DOO driving position provides clear sight lines to all signals on the DOO route.	• ATP	

D.8 Safeworking (breaches therein)

Appendix Table D.8-26 Rail Traffic Not Properly Secured when Required

Causal Controls	Consequence controls	Restoration of service
• ATP (roll-away and incorrect movement direction prevention are inherent functions of ATP systems)		

Appendix Table D.8-27 Rail Traffic Departs Platform when Not Safe to Do So

Causal Controls	Consequence controls	Restoration of service
• External mirrors for driver to see passengers • CCTV coverage of platform edge (displayed on platform or in-cab) • Provide platform assistant to give "right-o-way" • Platform edge markings for danger zone, entry and exit passenger flow		

Appendix Table D.8-29 Driver Fails to Sound Horn on Approach to Level Crossing

Causal Controls	Consequence controls	Restoration of service
• Automatic function to sound horn (Available in some ATP systems)	• All level crossings in DOO area to have flashing lights (and boom gates)	

Appendix Table D.8-28 Driver Fails to Perform Brake Test before Commencement of Operation

Causal Controls	Consequence controls	Restoration of service
• ATP (brake test in an inherent function of ATP system.)		

Appendix Table D.8-29 Driver Fails to Sound Horn on Approach to Trackside Workers

Causal Controls	Consequence controls	Restoration of service
• Automatic function to sound horn	• Trackside worker protection system • Lookouts	

Appendix E Methodologies to determine SFAIRP factors

E.1 Cost of eliminating or minimising the risk

ONRSR Guideline – Meaning of duty to ensure safety so far as is reasonably practicable, provides guidance for estimating the cost of eliminating or minimising risk with clear direction that "Although the cost of eliminating or minimising risk is relevant in determining what is reasonably practicable, there should be clear favourability of safety ahead of cost."

E.2 Determination of costs

Determination of costs is best performed as a whole-of-life cost model. AS4536 "Life cycle costing – An application guide" and BS 60300-3-3 "Dependability management – Application guide – Life cycle costing" both provide similar methods of calculating either the average annual cost or the Net present value of a project/activity etc. (given a projected life span of the project/activity and a depreciation/inflation rate).

Estimate of safety benefit

Estimate of safety benefit is achieved by conducting two risk assessments; one before the application (or removal) of a proposed risk control, and the other after such application (or removal) projecting over the life of the project/system/operation. The difference between these two results is the safety (dis)benefit.

Exactly how these are expressed will depend on how the individual organisation expresses risk.

Two common measures are:

(a) fatalities and Weighted Injuries (FWI) per year; and

(b) a "category" step reduction in consequences or likelihood/frequency.

Note that for the calculation of a cost/benefit, the units of each (cost and safety benefit) must be equivalently expressed (i.e. both as per-year, or both as total lifetime).

E.3 Hurdle conditions

A hurdle condition can be expressed in several forms. It is note that the ONRSR SFAIRP guideline speaks of a value of statistical life (VoSL) noting that "There is currently no standard VoSL in the Australian rail industry" but cites "although various values have historically been published by government departments. The Office of Best Practice Regulation 6 provides a credible estimate of the VoSL of $5.0m (2020 figures). This estimate is based on international and Australian research and is derived from empirical evidence that has been assessed to ensure it is comprehensive and rigorous. If a duty holder intends to undertake analysis using a VoSL, it should document the selected VoSL in its SMS. The VoSL may also be referred to as the value of a prevented fatality (VPF)".

An alternative method is illustrated below using a fictitious (and simplified) risk matrix.

Here, the railway organisation determines that it is prepared to expend a certain value represented as or (and which may or may not be the same for each "step") to take a "one-step" reduction in risk as measured as a one-category reduction in either consequence or likelihood/frequency of a particular risk.

$	Minor injury $	Major injury $	Fatality $
Every Month $	D	B	A
Every Decade $	G	E	C
Every Century	I	H	F

Appendix Figure E.3-1 Hurdle condition risk matrizx

Note that, for this method to be useful, there needs to be either a sufficiently fine level of "granularity" in the definitions of likelihood/frequency and consequence, or a method established of interpolation within each defined category.

E.4 Gross disproportionality

A factor of "gross disproportionality" is a number (expressed on appropriate dimensions) that is factored into the overall SFAIRP determination. It can be a single number for all hazards however it is noted that some organisations use a different number depending on the exposed group of any particular hazard or the potential consequences of the hazard.

Appendix F Change management factors

Management of change is a methodology used as part of the risk assessment and control process to be applied by RTOs to ensure that safety risks associated with changes to railway operations, assets, or systems are identified and eliminated or reduced SFAIRP. Additional change management guidance may be found in RISSB AS 7472 Railway operations Management of change.

The following key topics and actions are presented as an example of the change factors an RTO should include in their change management plan. The topics and actions have been developed considerate of the Australian rail environment to assist RTOs manage risks associate with DOO.

Some topics and actions may differ across RTO functions in terms of passenger, freight, or maintenance operations.

F.1 Integration and safety

(a) Safety management & risk assessment – Apply Safety Management Systems procedures to the change, including conducting risk assessments.

(b) Platform-train interface (PTI) safety – Review safety risks at PTI against current risk levels to understand and mitigate the impact of DOO. This review should also examine past PTI incidents to ensure that proper risk controls are established.

(c) Rail traffic operating environment – Review rail traffic operations safety risks including passenger, freight, light rail and maintenance vehicles, against the current risk level to understand and mitigate the impact of DOO. The review shall consider risks associated with normal, degraded and emergency operations.

(d) Industry standards & compliance – Implement and demonstrate adherence to relevant Safety Management System requirements, industry good practice guidelines with assurance that all activities comply with the requirements of RSNL.

(e) Rail Accreditation – the RTO shall review its Notice of Accreditation or Notice of Registration and advise ONRSR of any proposed change required to implement DOO.

F.2 Role impact

This task emphasizes the importance of ensuring that all roles including rail traffic drivers, shunter, signaller, network controllers and operation controllers affected by the transition to DOO are adequately prepared, supported and capable of maintaining safe operations.

(a) Training & skill development – Assess training needs and develop a risk-based training programs for DOO, including both technical and non-technical skills. Consider skill set and previous experience in relation to the operations to manage the impact of transitioning to DOO. Suitable training environments should be introduced including simulators (SIMs) and other training aids or tools to support effective learning outcomes for DOO. Arrangements to maintain driver competency after DOO implementation shall also be confirmed.

(b) Operational support – Review rules, procedures and instruction, and update as required to support all operational scenarios – normal, degraded, and emergency.

(c) Health management – Implement controls for rostering and fatigue to ensure drivers are fit for duty including fitness for duty assessments at the start of shifts. Medical classifications should also be reviewed to align with DOO requirements.

(d) Incapacitation procedures – Review and put in place controls for driver incapacitation, including post-incident support.

F.3 Equipment suitability

The equipment used should be suitable to support safe and effective DOO in normal, degrade and emergency operations, including consideration for the introduction of technology that supports the driver and reduces the potential for human error.

(a) Rail vehicle design & modification – Review and modify rail vehicle designs to support DOO or decide whether to modify existing assets or procure new assets tailored for DOO.

(b) Automation to support DOO – Implement automated systems to reduce DOO workload and enhance safety controls.

(c) Safety system review – Upgrade safety systems, such as driver safety systems, to detect and respond automatically. This should include the installation of fire systems that react to triggers and alert both crew and onshore roles. Additionally, ensure emergency egress systems provide suitable exits for all users in accordance with AS 7522.

(d) Human factors in technology – Review operating systems and equipment with human factors principles in mind including the communication, alert and alarm logic to support users and minimize human error.

(e) Technology assurance – Conduct progressive assurance demonstrations, like using external CCTV for PTI views.

(f) Rail vehicle modes – Review vehicle modes to aid the driver in degraded conditions or when away from the cab. Consider out of cab modes for security while keeping systems operational and the use remote communication technologies for continuous situational awareness.

(g) Equipment location – Assess equipment placement to minimize the need for drivers accessing difficult points, such as placing isolating cocks within the train cab.

(h) Equipment tolerances – Ensure equipment tolerances are suitable for extreme conditions to maintain DOO operational integrity, like verifying CCTV functionality in various weather scenarios.

F.4 Procedure suitability

The procedures used shall be suitable to safely operate DOO.

(a) Operations task review – Review and document the tasks of all positions interacting formally or informally with the rail traffic driver to ensure that responsibilities are clear and manageable by all persons. This includes delineating tasks between rail traffic operations and customer service, which may require support from external roles.

(b) Procedure accessibility – Procedures shall be clear and easily accessible to all positions impacted by the introduction of DOO. Leveraging modern technology platforms can enhance access and usability, ensuring that drivers have the information they need at their fingertips.

(c) Driver workload assessment – Assessing driver workload is crucial to ensure it is appropriate for DOO. During times of heightened workload, technology or external support should be available to assist the driver.

(d) Minimizing distractions – Limiting distractions is important for safety. For example, implementing automatic switch-off for PTI CCTV views after a train

departs the platform can help. However, there should be flexibility for drivers to extend the view time if they deem it necessary for safety.

(e) Day in life reviews – Conducting thorough reviews with stakeholders to map tasks and operational controls can identify opportunities for technology design to reduce risks, support roles for drivers, and necessary procedural or training updates.

(f) Customer needs and accessibility – Ensuring customer needs and accessibility requirements are met is a key part of DOO. This includes boarding assistance and compliance with standards like the Disability Standards for Accessible Public Transport (DSAPT).

(g) Dwell time management – Dwell time impacts are analyzed to ensure that any variations do not compromise safety or efficiency. Controls are put in place to manage these impacts effectively.

(h) Rail traffic fault management – Processes for fault identification, reporting, rectification, and adherence to minimum operating standards are established. These processes shall be designed to be managed solely by the driver under DOO conditions, ensuring safe, prompt and effective resolution of issues.

(i) Proceed Authority Exceedance (PAE) management – A review of PAE management includes establishing procedures for dealing with PAE occurrences and post-PAE situations. This ensures that drivers are equipped to handle such incidents safely under DOO conditions.

(j) Rail traffic protection procedures – Rail traffic protection procedures are designed to provide safety to the driver, the rail vehicle, and the wider network. This includes ensuring that all safety systems are functioning correctly and that drivers are trained to operate them effectively.

(k) Emergency services and incident responders – The roles of emergency services and incident responders are considered, with plans in place for awareness and briefings. The plans shall assist first responders to effectively support DOO rail vehicles, including special access, personal safety when working remotely and system awareness for secure and safe emergency responses.

(l) Rail traffic recovery arrangements – Rail traffic recovery arrangements shall be reviewed to confirm safety under DOO. This includes examining coupling arrangements and system interoperability to ensure both the DOO rail vehicle and the recovery vehicle can operate safely.

(m) Safety validation procedures – Before any changes are implemented, procedures are demonstrated as safe through some level of operational validation. This may involve independent verification and validation studies to ensure all safety aspects are addressed.

F.5 Platform, terminal and yard compatibility

Platforms, terminals and yards should be compatible to safely complete rail operations including:

(a) Platform characteristics – The characteristics of platforms shall be assessed to support the appropriate train length, number of doors, and positions along the platform. Modification to operational information via signals and other platform indicators/markers should be used as to mitigate risk.

(b) Freight terminal and yard characteristics – The characteristics of freight terminals and yards shall be assessed to support the appropriate train length, point operation, shunting and marshalling and securing trains. Modification to

operational information via signals and other platform indicators/markers should be used as to mitigate risk.

(c) Technology and on-board equipment – Technology and on-board equipment to support DOO should be provided, such as an appropriate CCTV view of the safety target zone along the full length of the train or ECP braking to secure freight trains and auto-start locomotives.

(d) Passenger door technology – Technology provided at passenger doors to reduce safety incidents should be considered, such as obstacle detection, sensitive edge, and selective door opening safety measures to enable only doors on the platform to open.

(e) Train-based facilities – The provision of train-based facilities to enhance safety, such as bodyside lighting and doorway lighting, should be reviewed.

(f) Industry best practice PTI advances – A review of industry best practice PTI advances should be conducted to demonstrate that continued safety improvements can be realized.

(g) Platform-based facilities – The provision of appropriate platform-based facilities should be reviewed, such as platform markings to allow safe dispatch, platform lighting, platform gaps, platform shape, and any impacts on the driver's view. The impact of platform furniture on customer flow or access/egress should also be considered.

(h) Terminal and yard-based facilities – The provision of appropriate terminal and yard-based facilities should be reviewed, such as the location of signals and signs, clearance point markers, yard lighting, narrow track centres, access and pathways, and any impacts on the driver's view.

(i) Local platform and freight terminal risk assessments – Local platform and freight terminal risk assessments should be considered.

F.6 Business readiness

The business should be ready for the change to DOO. The following activities will assist the business preparation for the change to DOO and provide some assurance that the transition can be managed safely and effectively:

(a) Workforce modelling – The organization should complete workforce modelling to ensure that there are enough trained drivers for DOO services.

(b) Staffing shortfalls – Provisions are in place for managing any staffing shortfalls that may occur.

(c) Role impact assessments – Role impact assessments have been completed for front-line staff, customers, and secondary impacted users.

(d) Stakeholder consultation – Consultation with appropriate stakeholders, including RTOs, unions, safety representatives, staff, employees and customer groups, has been completed.

(e) Timescales for change rollout – The timescales for the change rollout are appropriate and can be demonstrated as supporting a safe DOO transition.

(f) Operational validation activities – Operational validation activities are planned and can be conducted at the appropriate time to support the demonstration that DOO changes are as safe as reasonably practicable (SFAIRP).

(g) Governance – Appropriate governance is in place, and duty holders are aware of the residual risks imparted by the change to DOO.

F.7 Ongoing reviews

Provisions shall be in place for ongoing reviews to support safe DOO post initial roll out.

(a) Performance monitoring – Implement key point indicators for monitoring and measuring rail traffic data, rail operations and driver performance to identify any areas of concern or improvement.

(b) Post-implementation plan – Have a plan and processes in place to address emerging issues after the implementation of DOO.

(c) Safety review – Provisions shall be in place to review any emerging safety incidents and ensure safety controls remain appropriate.

(d) Lessons learned – Activities shall be completed to identify lessons learned from the implementation and operation of DOO.

(e) Feedback mechanism – Establish a mechanism to gather feedback from staff and passengers. This could provide valuable insights into the practical operation of DOO and identify potential areas for improvement.

(f) Regular audits – Conduct regular independent audits to ensure compliance with safety and operational standards.

(g) Continuous training – Ensure continuous training and development programs for staff to address any skill gaps or areas of improvement identified during the operation of DOO.

(h) Technology updates – Regularly review and update technology used in DOO to ensure it remains current and effective.

(i) Regulatory compliance – Regularly review operations to ensure compliance with any changes in regulations or industry standards.

These topic and tasks form part a framework for the safe and efficient operation of DOO rail systems. Continuous monitoring and improvement of these processes are essential to adapt to changing conditions and technological advancements.

Appendix G ARRM Hazard register

Hazard number	Hazard	Heading number(s)
2.0	Accreditation	2.1
5.0	Rolling Stock	5.3, 5.6, 5.8, 5.9, 5.15, 5.16, 5.17, 5.19, 5.20, 5.21, 5,32, 5.33, 5.34, 5.39, 5.45,
6.0	Infrastructure	6.4, 6.5, 6.7, 6.12, 6.13, 6.14, 6.16, 6.17, 6.18
7.0	Human Factors	7.1 ~ 7.4
8.0	Operations	8.1 ~ 8.6
9.0	Signals Infrastructure	9.17, 9.18, 9.37, 9.42,
10	Degraded Working	10.1 ~ 10.14

Bibliography

- AS 4536, *Life cycle costing – An application guide*
- AS 7472, *Railway operations Management of change*
- AS IEC 61882:2017, *Hazard and operability studies (HAZOP studies) – Application guide*
- ISO 31000, *Risk management – Principles and guidelines*
- BS 60300-3-3, *Dependability management – Application guide – Life cycle costing*
- *ONRSR Guideline – Meaning of duty to ensure safety so far as is reasonably practicable*
- *Rail Safety National Law* (RSNL)