



Learning from Aviation: How tailored NTS training has shown positive effects on error management in the Rail Industry

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RRM

Rail Resource Management

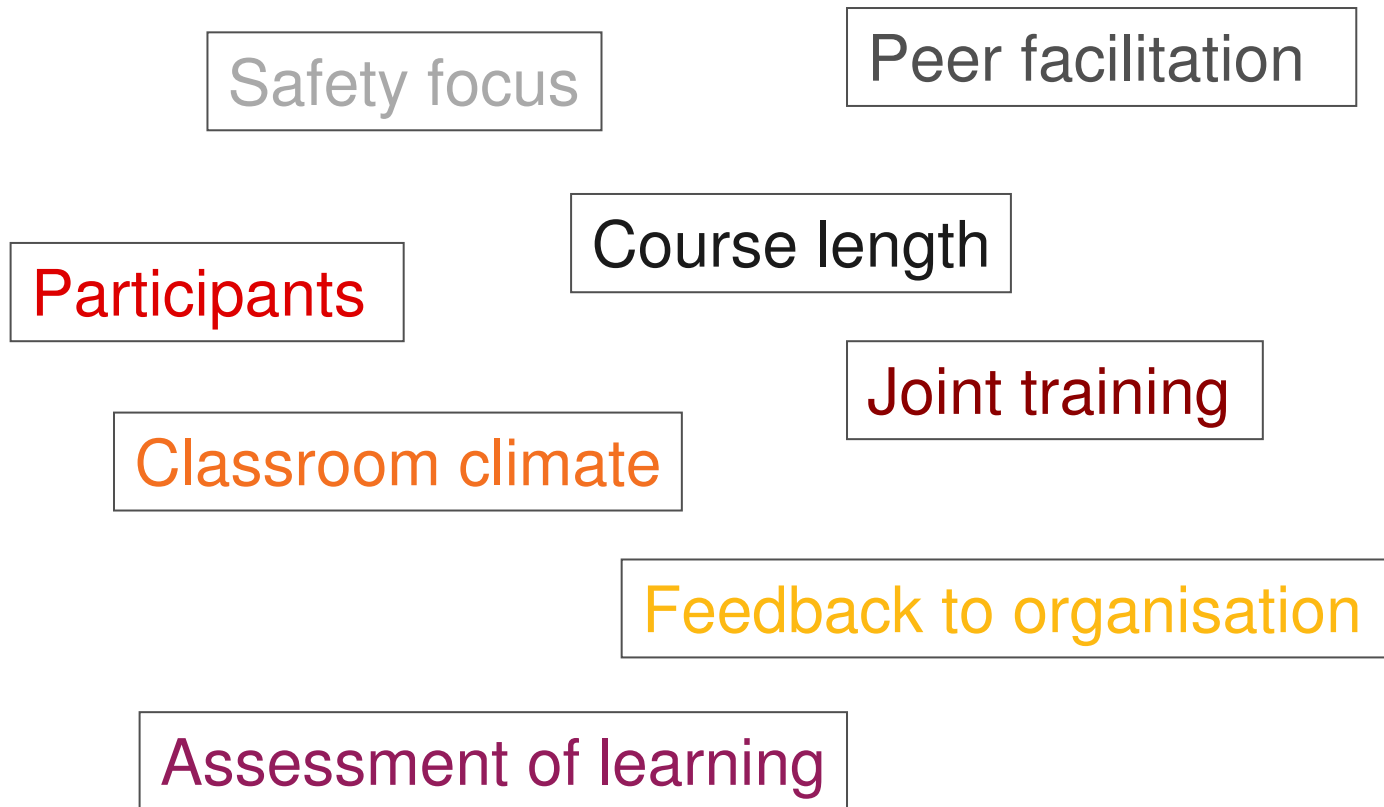


Non-technical skills

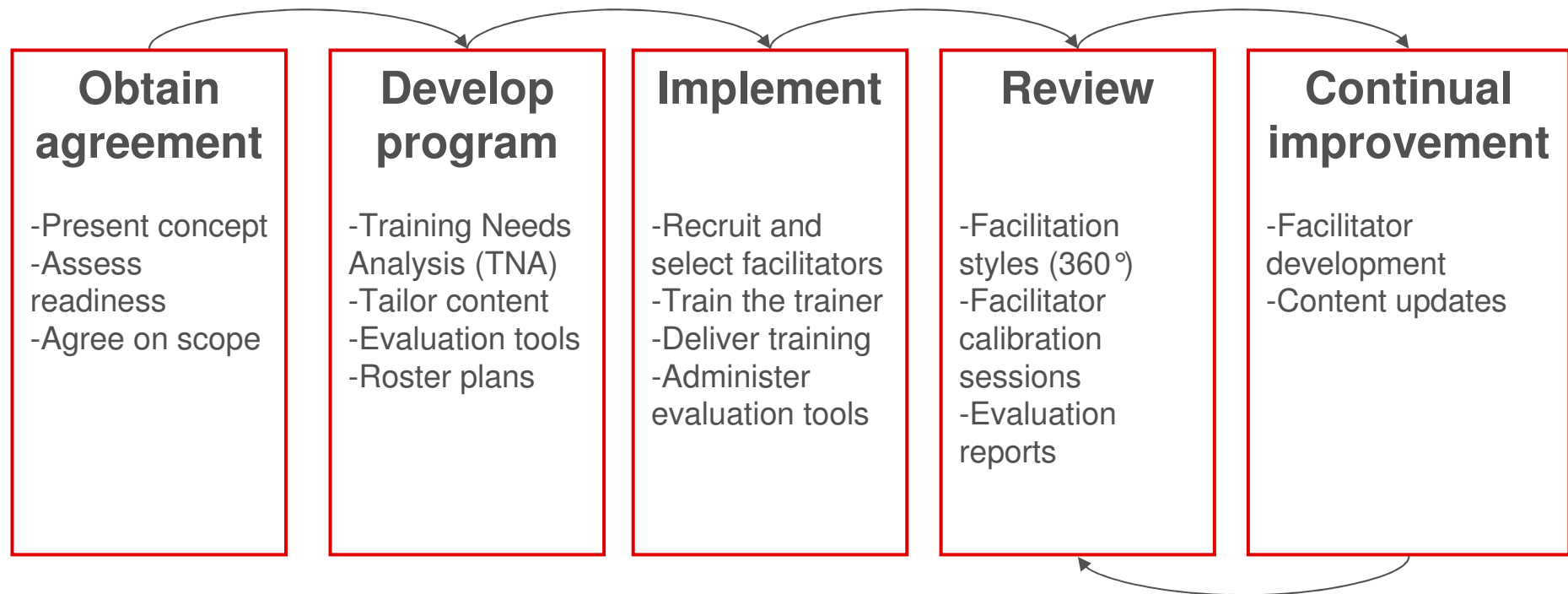
- Threat and Error Management
- Situational Awareness
- Leadership
- Teamwork
- Communication
- Decision Making
- Workload management



Core principles

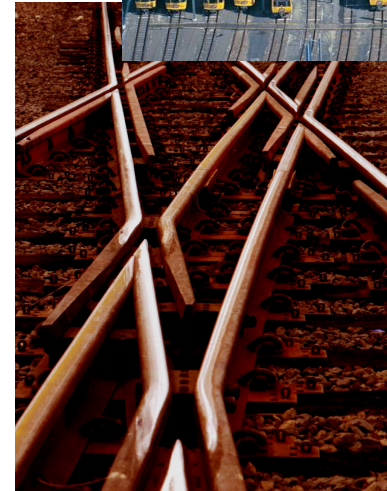
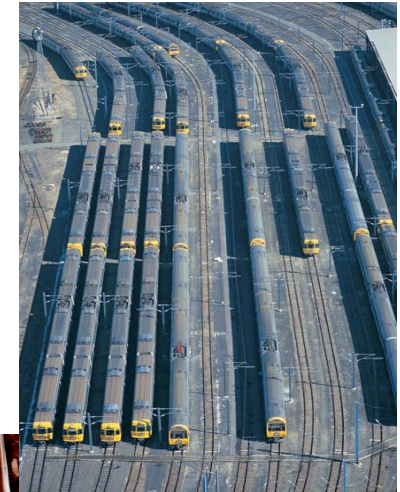


Process



Evaluation

- Course Evaluation Forms
- Attitude Surveys
- Knowledge Tests
- On-track Observations
- Incident rates (SPAD)
- LOSA results (CORS)



Signal Passed At Danger 101

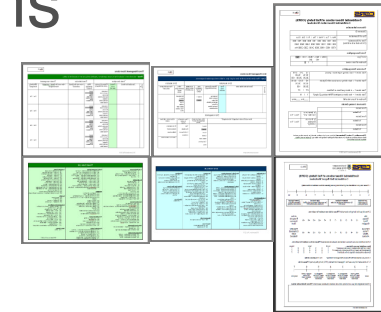


- **RRM:** 13.71% drivers (first 12 months) had a SPAD
- **NO RRM:** 26.32% drivers (first 12 months) had a SPAD
- While the likelihood (of having a SPAD) has traditionally been higher for drivers within their first 12 months of driving, this may be reduced by RRM.

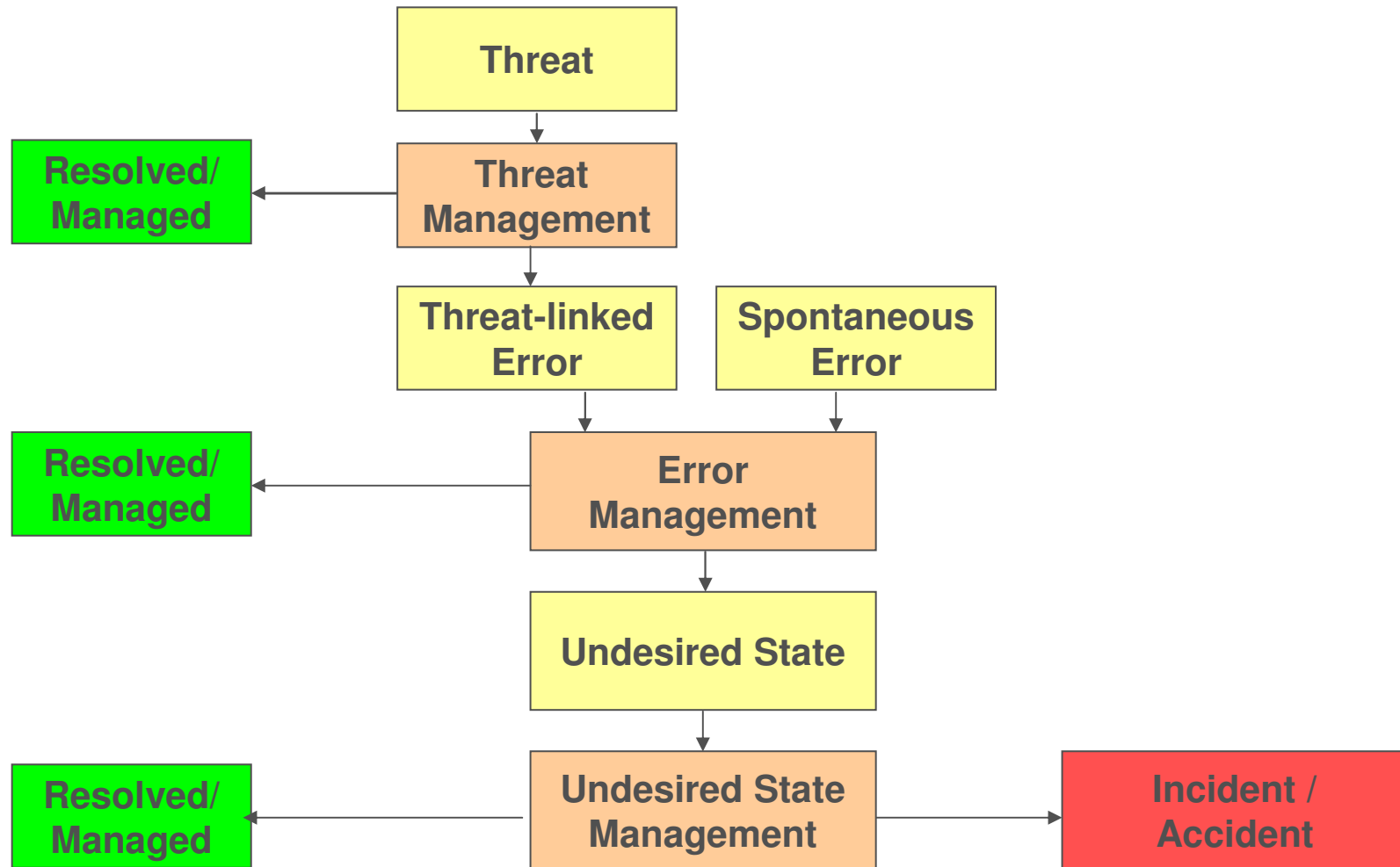


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- ✓ Jump-seat observations - normal operations
- ✓ Safety-targeted data collection tool
- ✓ Joint management / union sponsorship
- ✓ Voluntary participation
- ✓ Anonymous and confidential data collection
- ✓ Trusted data collection site - UQ
- ✓ Feedback of results to drivers
- ✓ 8 trusted and trained observers
- ✓ Data verification 'calibration' sessions
- ✓ Data-derived targets for enhancement



Threat and Error Management



Threats

Threat Data	CORS Round 1 (2005)	CORS Round 2 (2008)	CORS Round 3 (2011)	LOSA (Archive)
% of observations with Threat(s)	99%	99%	99%	97%
Average Threats per Observation	3.9	4.4	4.7	4.2
Threats by Phase of Journey	53% Mid-section 16% Approach Platform 15% At Platform	46% Mid-section 14% Approaching Platform 14% At Platform	43% Mid-section 12% At Platform 6% Approaching Platform	40% Predeparture / Taxi 30% Descent/ Appr / Land
Most Frequently Observed Threats	In-cab Events 27% Trackside Events 22% Passenger Events 18%	Trackside Events 27% In-cab Events 17% Operational Issues 16%	Trackside Events 30% Operational Issues 16% In-cab Events 12%	Weather 25% ATC 25% Aircraft Threats 13%
% Threats that are Managed	78%	89%	88%	90%
% of Threats Leading to Error	17%	12%	8%	10%
Most Frequently Mismanaged Threats	In-cab Events, Radio Communication, Trackside Events	Trackside Events, In-cab Events, Operational Issues	Radio Communication, In-cab Events, Trackside Events	Aircraft, ATC, Adverse Weather
% of Undesired States linked to Mismanaged Threat(s)	37%	36%	42%	30%

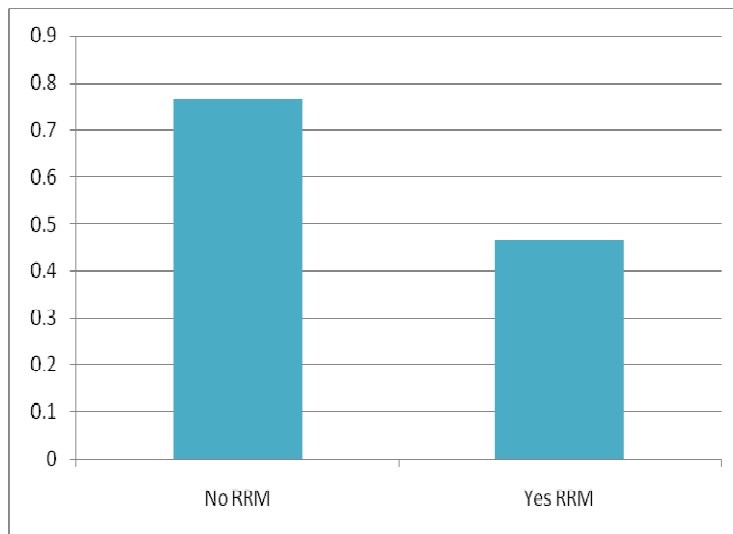
Errors

Error Data	CORS Round 1 (2005)	CORS Round 2 (2008)	CORS Round 3 (2011)	LOSA (Archive)
% of observation with Error(s)	75%	60%	74%	80%
Average Errors per Observation	1.6	1.2	1.4	3.0
Errors by Phase of Journey	57% Mid-section 21% At Platform 13% Approach Platform	44% Mid-section 22% At Platform 10% Approaching Platform	44% Mid-section 15% At Platform 5% Approaching Platform	40% Descent/App/Land 30% Pre-departure/Taxi
Most Frequently Observed Errors	34% Procedural 23% Train Management 16% Train Handling	42% Procedural 27% Train Management 13% Train Handling	46% Train Management 14% Procedural 14% Train Handling	50% Procedural 33% Aircraft Handling 17% Communication
% of Errors Leading to Additional Error	6%	2%	1%	6%
% of Errors Leading to Undesired States	47%	44%	23%	19%
Most Frequently Mismanaged Errors	Train Management Station Start/Stop Radio Communication	Procedural Prioritising Radio Communication	Radio Communication Train Handling	Flight control errors Automation System / Instr / Radio

CORS results

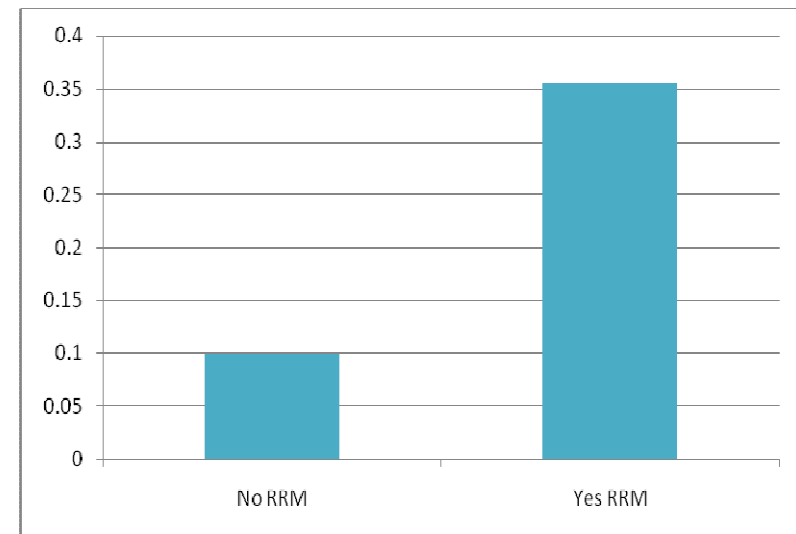
Train Management Errors

Average rate per journey



Errors trapped

Average rate per journey





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