

East Japan Railway Company

**Development of
human factors training tool
for rail operators
in emergencies or unusual situations**

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Director

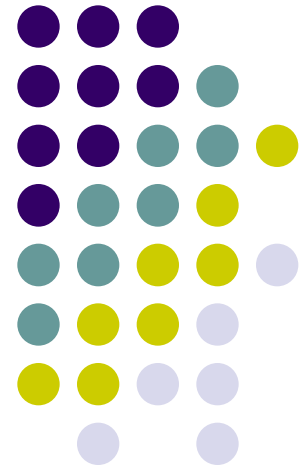
Safety Research Laboratory

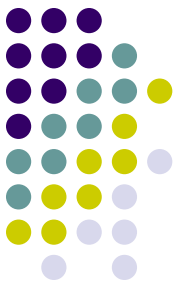
Research and Development Center

of JR East Group

East Japan Railway Company

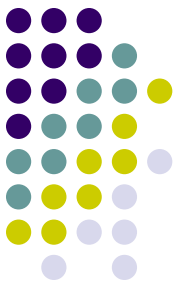
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Contents of presentation

- Background and purposes of development
- Features of the Training Tool
- Evaluation of the Training Tool



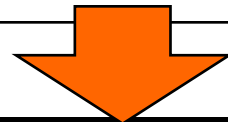
Background and purposes of development

- Installation of train safety systems has reduced human errors in normal situations.
- It is difficult to prevent errors in abnormal situations, since systems do not take them into account.



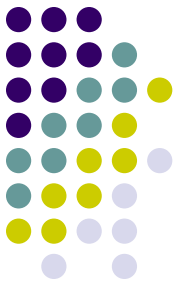
Two approaches are necessary to prevent an accident.

1. Information support system (hardware)
2. Education and training (software)



Today's presentation





Examinations of effective contents of training

To improve performance in abnormal situations, **experiencing actual abnormal situations** is effective.



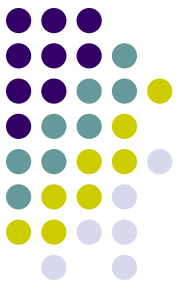
Current state of training

- **(Training Center)** training using actual rolling stock and simulators
→ Once every two years
- **(Worksite) 2-hour Education and training** every month

Typical contents

Confirmation of knowledge of recovery procedures

Necessity for new training method for **abnormal** situations at **worksites**.

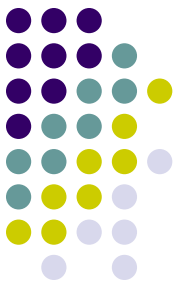


Features of the Training Tool

The training tool contains:

- Five serious **errors** in abnormal situations identified by risk analysis of the operators' tasks
- **Four-stage lesson** to deepen operator's understanding of points in error prevention
- Using **coaching staff's** capability to improve effectiveness of learning.

Conditions of using Training Tool



- The tool is to be used for **routine training sessions**.
- Required time for one lesson is to be about **30 minutes**.
- Training can be conducted either **individually** or in a **group**, using a personal computer.
- In a group session, a **single coaching staff member** can take the role of tool instructor at operators' worksite.

Serious errors in abnormal situations



Statistical analysis of incidents

Interviews with coaching staff at operators' worksites



Risk analysis of the operators' tasks



1. Definition of situation in which **serious error** easily occurs

2. Definition of **human weakness** related to each error

Definition of serious errors in abnormal situations



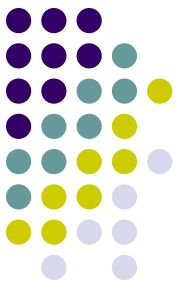
1. Definition of
serious error



2. Definition of **human weakness** related to the error

	Situations vulnerable to error occurrence	Human weakness
1	Reducing speed to prevent accidents in cases of natural disasters	Risk in interrupted operation
2	Train safety procedure to prevent a secondary accident	General human behavior in emergency situations
3	Operation after safety system (ATS-P etc.) starts working	Overconfident assumptions
4	Dealing with signal failure	Uncertain knowledge
5	Dealing with brake failure	Over-concentration of attention

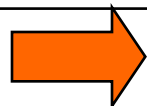
Definition of human weakness which is related to each error.



1. Definition of **serious error**

2. Definition of **human weakness** related to the error

	Situations vulnerable to error occurrence	Human weakness related to error
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5 scenarios

Ideas to deepen operator's understanding of points in error prevention

- four-stage lesson -



The training tool helps the operators:

1. Understand the **seriousness of accidents** through a typical accident case



2. Understand the **background and basis of rules**



3. Understand the relevant **human factors**



4. Learn effective **countermeasures**





Stage 1

Stage 2

4-1 事例紹介

出発信号機
第2場内信号機
故障
第1場内信号機
故障
451M
出発信号機
てまえ駅
指令 那須野

(指令:那須野・心の声)これで451Mは、故障している第1場内信号機と、第2場内信号機を通過して、むこう駅の所定停止位置まで進行するだろう。

戻る 再生 進む

スライドバー

First of all, to prime the trainee's learning attitude, the tool shows the **seriousness of accidents** caused by the operator's human error.

4-2 ルールの背景

指令通告による場内に対する進行の指示運転

1. 場内信号機の停止現示で停車
2. 無線による、指令からの故障や場内に対する進行の指示運転の通告
3. 運転通告受領券に記入
4. 運転通告受領券の確認と復唱
5. 指令へ保安装置の開放の連絡、開放の指示を受ける
6. 車掌乗務列車の場合は、車掌と運転再開の打ち合わせ
7. 運転再開
8. 所定停止位置に停車

今回の事故の原因は、速手さんが、指令の通告を受けず、その上、指令へ連絡をしないで保安装置を開放してしまったところにあります。

戻る 再生 進む

スライドバー

Next, the tool shows that the **procedure** has been set up to prevent an accident, so each point in the procedure is important.

Stage 3

4-3 ヒューマンファクターの解説

不安、価値観の圧力
遅らせたくない

+

(取扱いに対する)
あやふやな知識

→

都合の良い解釈

→

重大なエラー

1. 場内信号機の停止表示で停車
2. 無線による、指令からの故障や場内に対する進行の
3. 運転通告受領券に記入
4. 運転通告受領券の確認と復唱
5. 指令へ保安装置の開放の連絡、開放の指示を受
6. 車掌乗務列車の場合は、車掌と運転再
7. 運転再開

運転士 速手

でもそれは、取扱いの意味や、背後にある理由まで掘り下げたものではありませんでした。このような知識も、「あやふやな知識」と言えます。

戻る 再生 進む

スライドバー

In addition, the tool presents **human weaknesses** which disturb the operators' behavior in an abnormal situation, even though they may understand the rules.

Stage 4

4-4 対策

なぜ? どうして?

ここがわからないんですが?

①なぜ、その取扱いや作業をするのか考えてみる

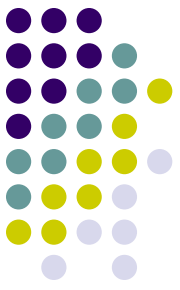
②わからないことは、調べたり指導員や先輩に聞く

そして、わからないことがあったら調べたり、指導員や先輩に聞いてみましょう。

戻る 再生 進む

スライドバー

Based on the presentation of weaknesses, the tool discusses **skill and technique** important to cope with abnormal situations and the points that all operators must keep in mind.



Using coaching staff's capability and experience

The training effect is not great enough if trainees only see the flow of these presentations on the screen.



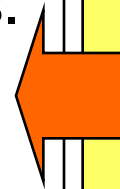
The training tool



Go back and forth in each **stage**

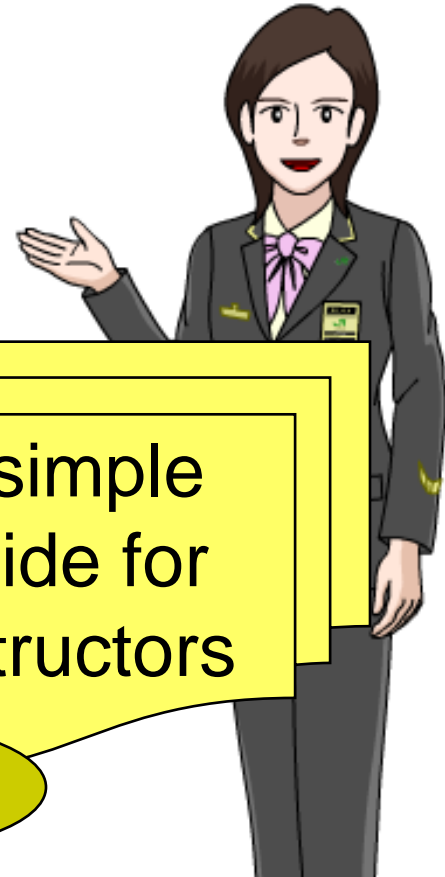
The coaching staff

- talk about their own experience and ideas.
- let operators talk about their experience.
- let operators have group discussions.
- have operators discuss places where errors tend to occur on their railway lines



A simple guide for instructors

Support





Demonstration of training tool

The screenshot shows a Macromedia Flash Player 8 window with the following content:

**運転士向け
ヒューマンファクター訓練ツール**

事例1	災害時の速度規制の取扱い (作業中断時の危険性の理解)	テキスト
事例2	列車防護の取扱い (パニック時の人間特性)	テキスト
事例3	保安装置動作後の取扱い (思い込みの怖さ)	テキスト
事例4	場内に対する進行の指示運転の取扱い (あいまいな知識の危険性)	テキスト
事例5	ブレーキ故障時の取扱い (注意の一点集中の怖さ)	テキスト

終了

The window title bar reads "Macromedia Flash Player 8". The Windows taskbar at the bottom shows the Start button, several application icons, and the system tray with the time "13:42".



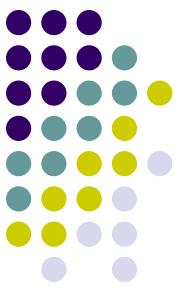
Evaluation of the Training Tool

The results of a questionnaire survey

Five stage evaluation*, N=25

Ability to project oneself with tool	4.5
Ease in demonstrating the seriousness of human error in accidents	4.9
Ease in understanding reasons for rules and operation methods	4.5
Ease in comprehending how human weakness causes error in abnormal situations	4.7
The tool gives some hints about how to prevent human errors	4.3
Time of explanation for each scenario is appropriate	4.4
Ease for coaching staff to apply in training	4.3
The guide for instructors is easy to understand	4.1
Ease of training tool use	4.5

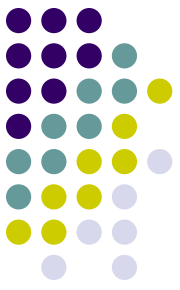
Five stage evaluation*: disagree | 1 | 2 | 3 | 4 | 5 | agree



The results of a questionnaire survey <1>

- Important items are given high scores.

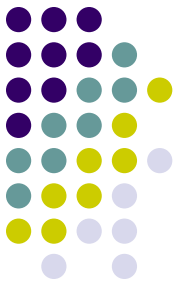
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Ease of training tool use	4.5



The results of a questionnaire survey<2>

- The score about the guide for instructors is rather low.

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Ease of training tool use	4.5



The reason why the evaluation of the guide is comparatively low

“Guide for instructors” = an assembly of hints for training

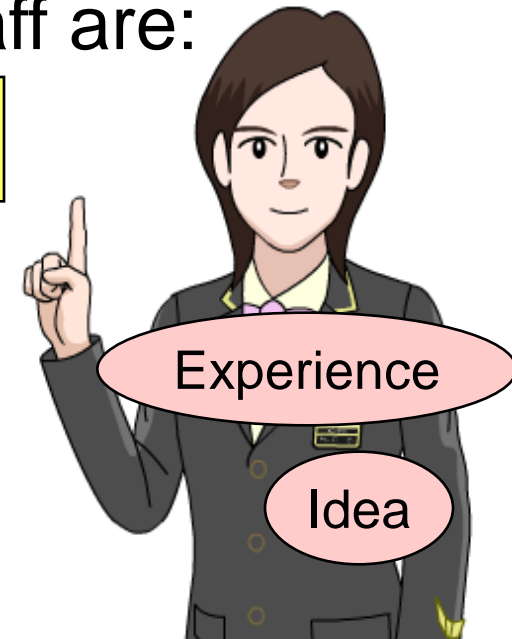
The coaching staff have to design training.

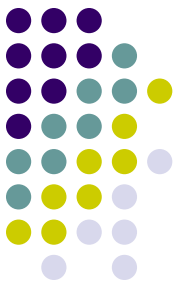


Recommendations to the coaching staff are:

”Study before the training”

- Plan the training with reference to the guide
- Rehearse questions and explanations





Conclusion

- This training tool was introduced in routine training sessions at operators' worksites and JR East General Education Center in April 2008.
- JR East will make a steady and continuous effort to help all staff understand human factors more deeply and to raise awareness of the importance of safety.



Thank you for listening.