

Moving the UK rail industry beyond compliance to better fatigue management

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- HMRI, ORR
- Royal Aeronautical Society seminar
- 11th May 2006



Plan

- Who are HMRI? What do they do on human factors risks?
- Safety consequences of fatigue in UK rail industry
- Legal duties, guidance and enforcement
- Risk assessment tools and advice to industry

HM Railway Inspectorate

- Safety regulator for UK railways including mainline, underground railways, light rail, and heritage.
- Enforcement of Health and Safety Law for railways
- Assessment of safety cases, inspection activities
- Investigation of accidents and incidents where may be legal breach
- Influencing dutyholder safety compliance to manage particularly catastrophic risk
- Now moved to Office of Rail Regulation

The First Inspector General ...



Lt Col Sir Frederick Smith of the Royal Engineers was appointed to be the first Inspector General of Railways.

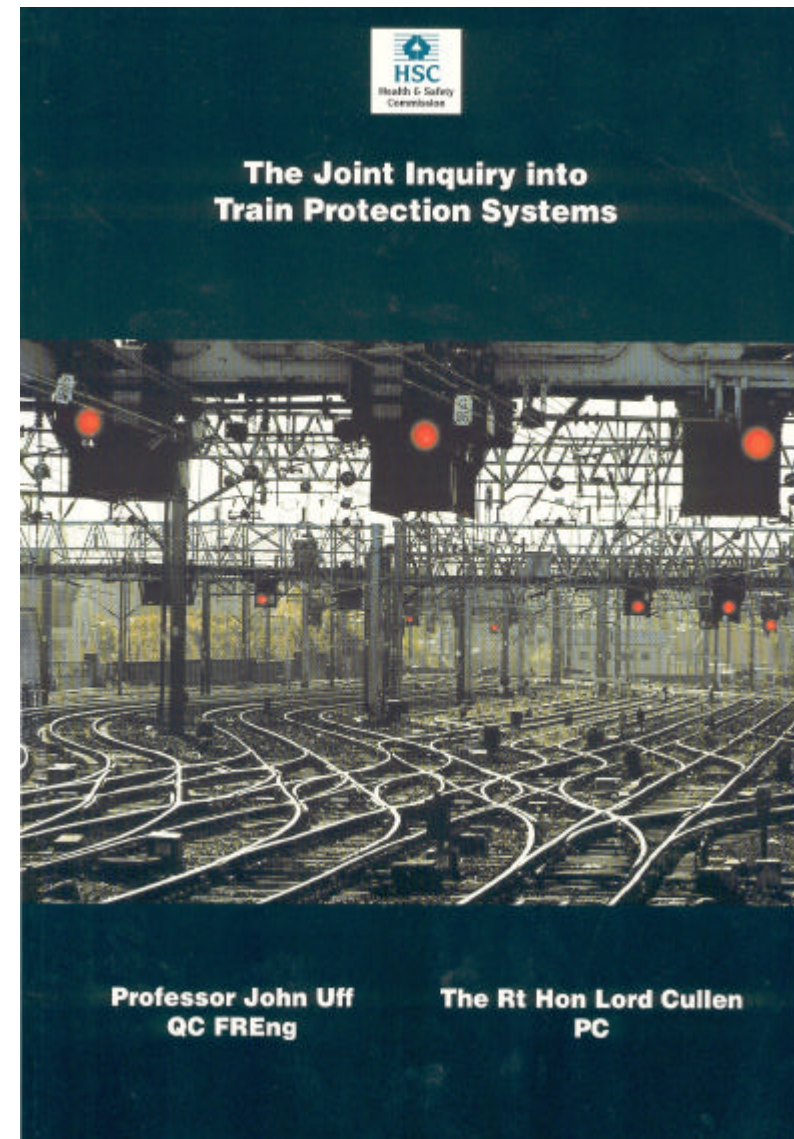
First human factors specialist in HMRI in 2003!

Human factors in published accidents

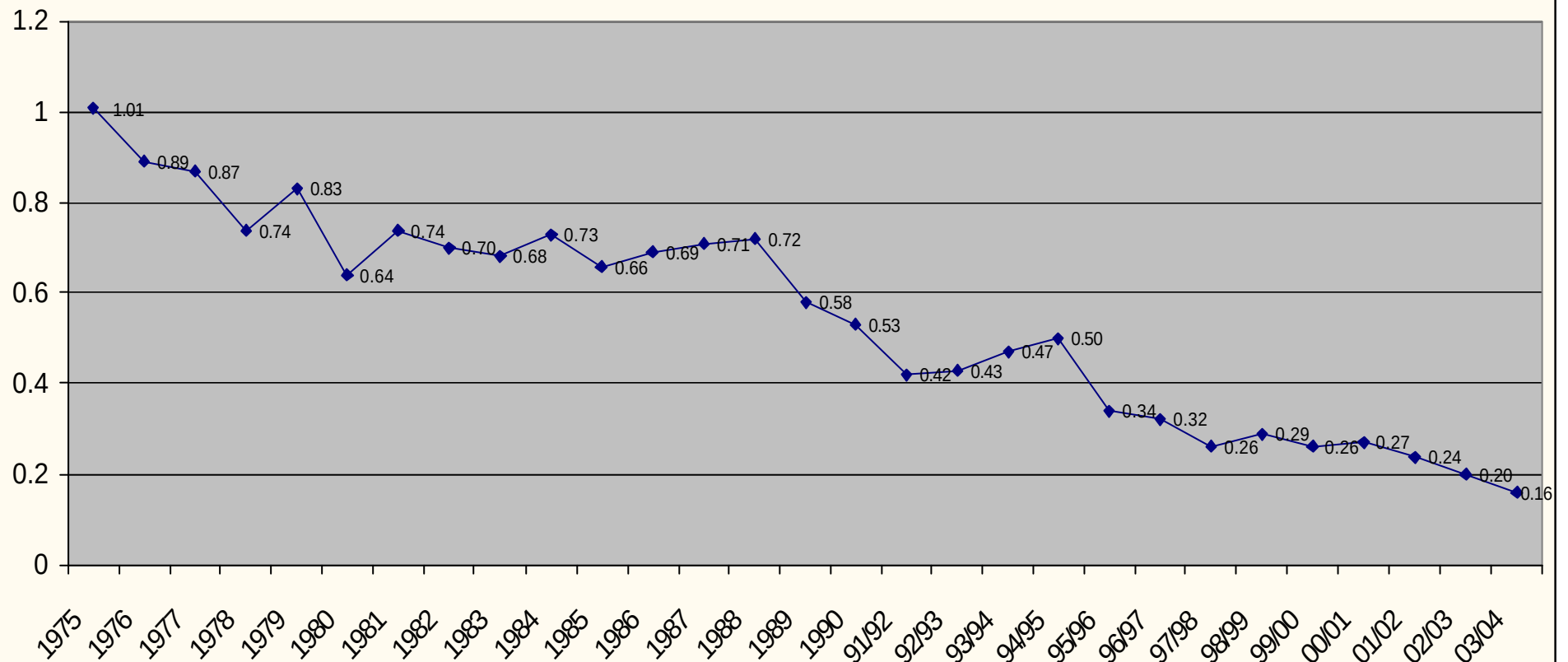
- Clapham Junction
 - Fatigue, Staffing Levels
 - Training
 - Culture/ 'Custom and practice'
 - Supervision
 - Communications
- Cannon Street
 - Fitness for work
- Great Heck
 - Fatigue
- Southall
 - Cab warning devices
 - Maintenance
 - 'Culture'
- Severn Tunnel
 - Emergency response

Ladbroke Grove

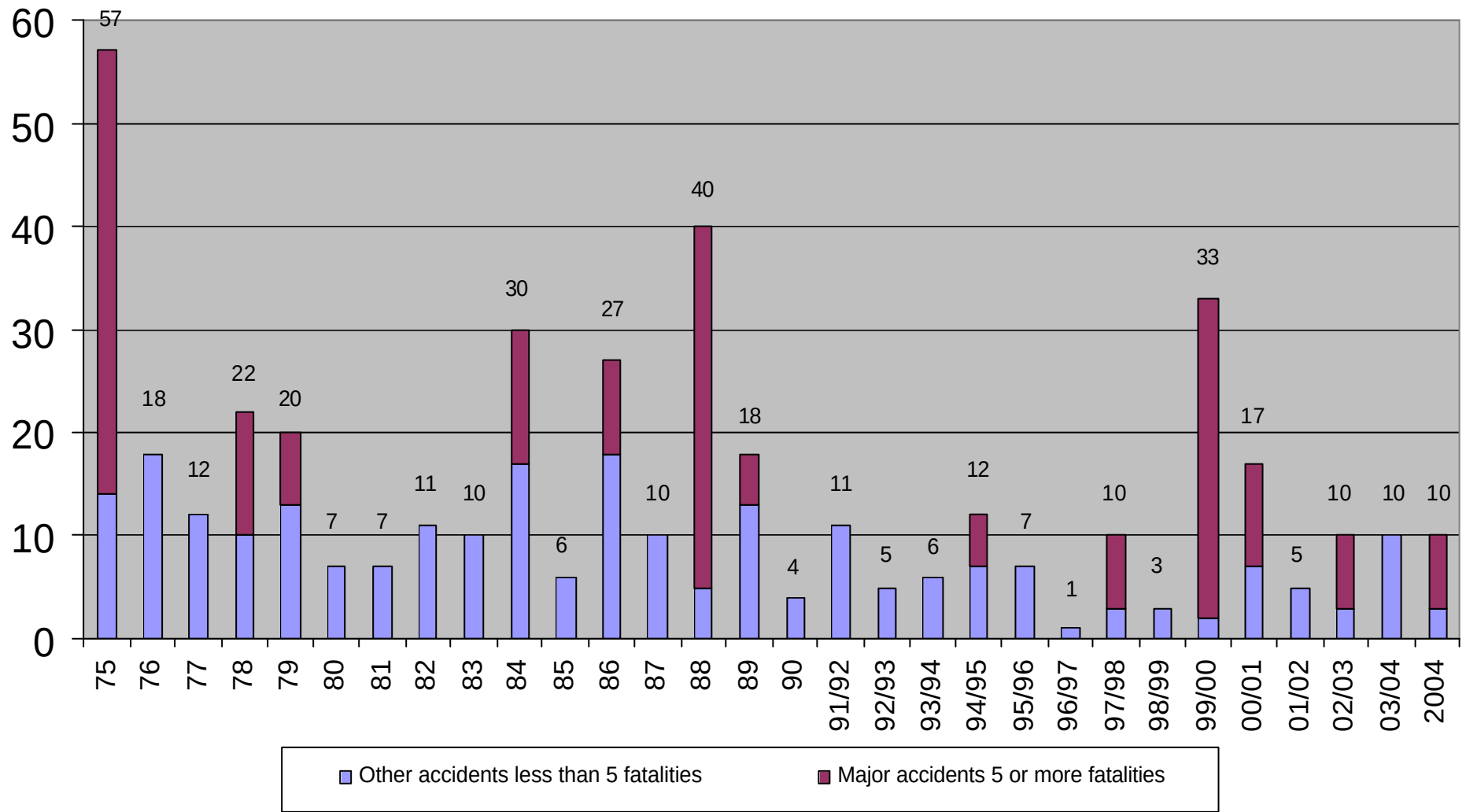
- Signal sighting
- Training and route knowledge of driver
- Signaller response
- SMS
- Safety leadership
- Culture



Significant train incidents per million train miles 1975 - 2003/04



Train accident fatalities 1975 - 2004



Moorgate(43)

Taunton(12)
Paisley(7)

Polmont(13)

Lockington(9)

Clapham(35)

Purley(5)

Cowden(5)

Southall (7)

Ladbroke
Grove(31)
Great Heck(10)

Potters Bar(7)

Ufton AHB LC (7)

Perceptions of railway risk

- MORI survey 2003
- Estimated deaths per year UK train accidents - 99
- Estimated deaths per year UK car accidents – 527
- Actual mean figures are 5 and 1700

Role of Human Factors specialist inspectors

- New role created 2003 – sending message to industry
- Incident investigation
- Advice to front line inspectors and to industry
- Support to enforcement action including expert witness work
- Advice for ‘approvals’ work
- Training inspectors on HF topics
- Applied research and development

Clapham Junction Accident 1988

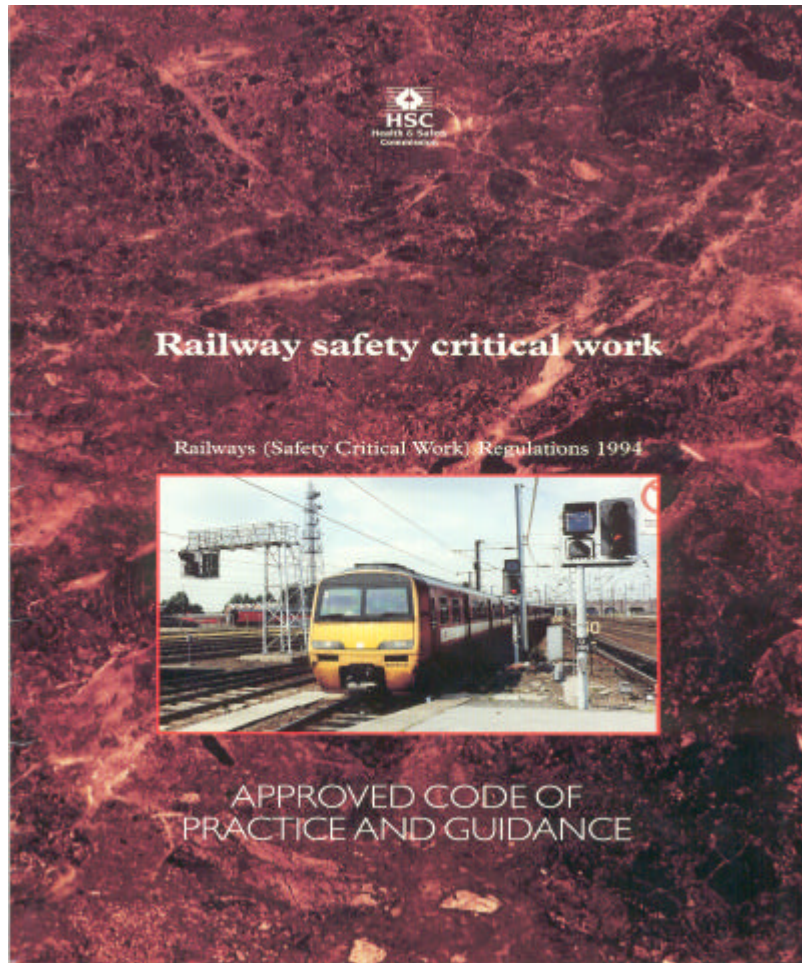


- Maintainer fatigue was one cause of error
- No system existed for monitoring hours or limiting excessive working
- Led to industry 'Hidden limits'
- What was 'operationally achievable' in 1980s
- Not based on science of sleep and fatigue

GH/RT 4004 Appendix A

- *Railway Group Standard*
- *Non mandatory limits, (so called Hidden Limits)*
 - ***No more than 12 hours per turn***
 - ***No more than 72 hours per week***
 - ***Minimum of 12 hours between shifts***
 - ***No more than 13 turns in any 14 days***
- *Railway safety case holders have to comply with group standards*
- *In practice may authorise 'exceedances'*

On privatisation of the UK railways: Railway (Safety Critical Work) Regulations 1994 and ACoP



- Competent
- Fit
- Carry identification
- Not extremely fatigued....

Railway (Safety Critical Work) Regulations

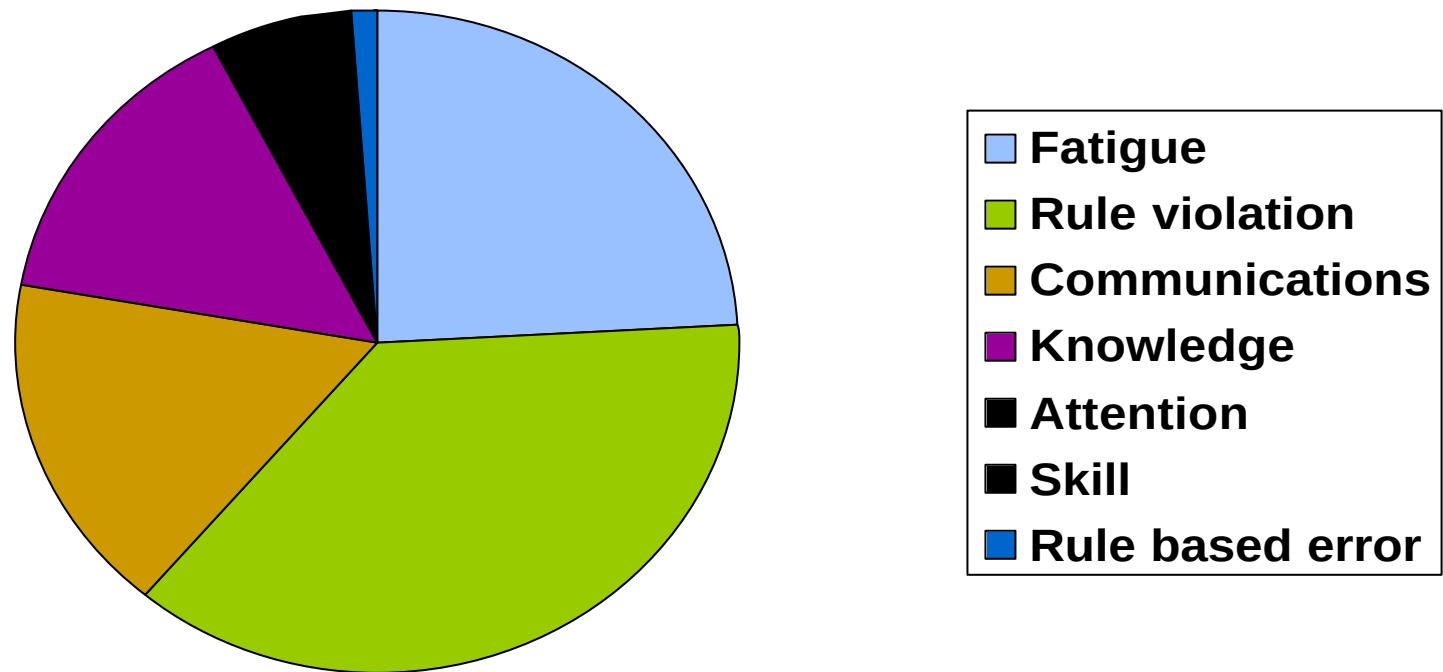
Regulation 4 Hours of Work

- *‘Every employer shall ensure, so far as is reasonably practicable, that no employee of his undertakes any safety critical work for such number of hours as would be liable to cause him fatigue which would endanger safety;....’*
- Approved Code of Practice (ACoP) – set limits, risk assessment, plan breaks, when can exceed, monitoring, etc.

Prosecution by HSE vs Amec Rail Ltd & Primat Recruitment Ltd

- Death of safety critical track worker at Purley Oaks 2001
- Had worked max of 46 consecutive 10 hour day shifts
- Companies pleaded guilty and were fined £20,000 each
- The risk of being fatigued regarded seriously by courts

CIRAS (Confidential reporting) (n=95)





- More use of VDU based tasks
- Better working environments
- More system supervision
- Pay versus working sensible hours issue
- View that compliance with Hidden limits is enough
- Need to educate and inform
- Need to provide tools and guidance for dutyholders

HSE's Fatigue Index risk assessment tool

- Developed in support of Railway (Safety Critical Work) Regulations 1994
- Assesses daily and cumulative fatigue risks associated with rotating shift work
- How to do a 'fatigue risk assessment' when work patterns change
- As an aid to education/information transfer
- Based on science

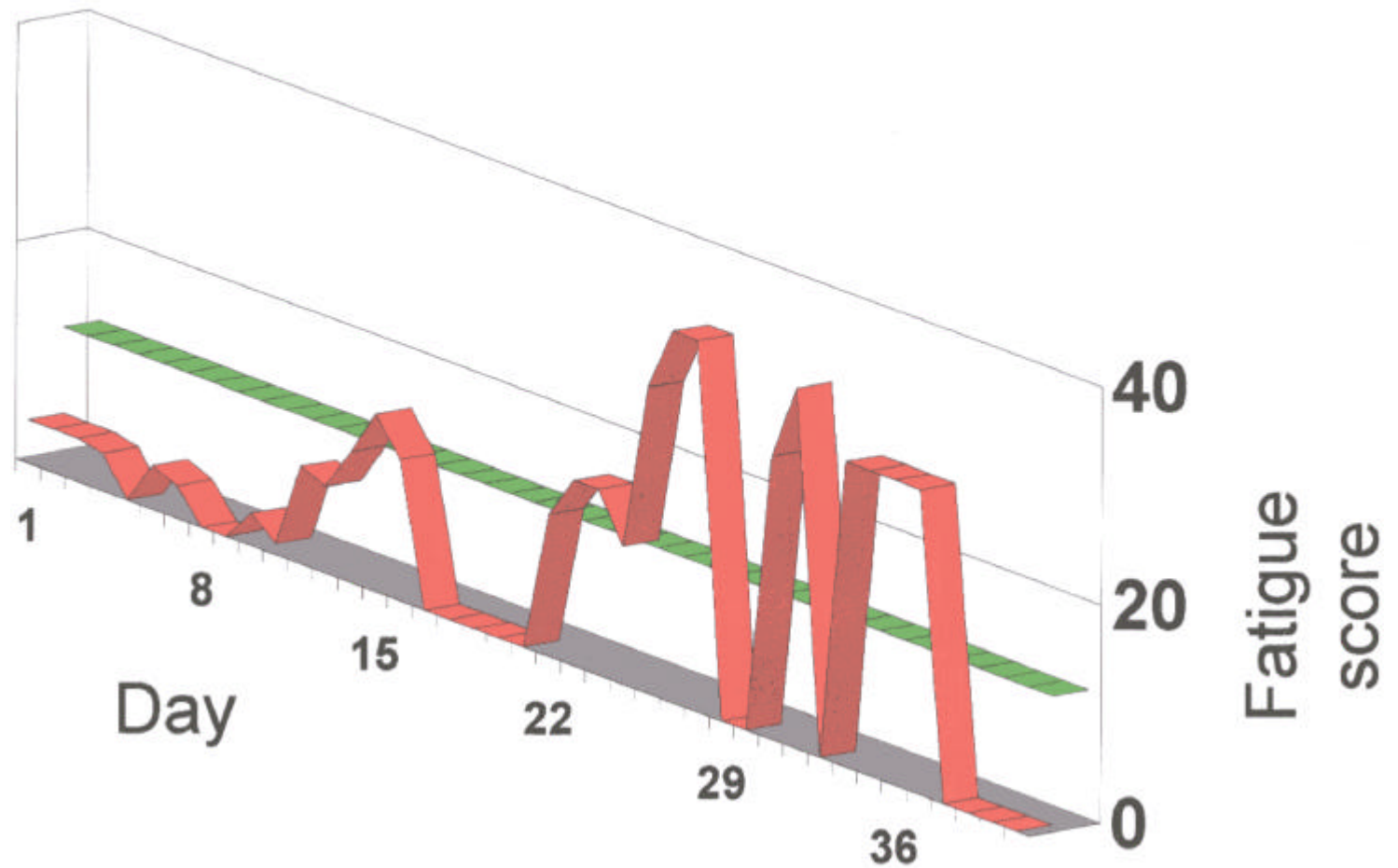
HSE's Fatigue Index

- 5 main factors which impact on fatigue
 - shift start time
 - shift duration
 - length of time between duty spells
 - breaks within duty spells
 - number of consecutive shifts
- Based on a system of rating scales
 - Developed by HF experts at DERA
 - Validated by comparison with MOD data
 - Freely available to all & open to scrutiny

[illegible]

Real TOC example

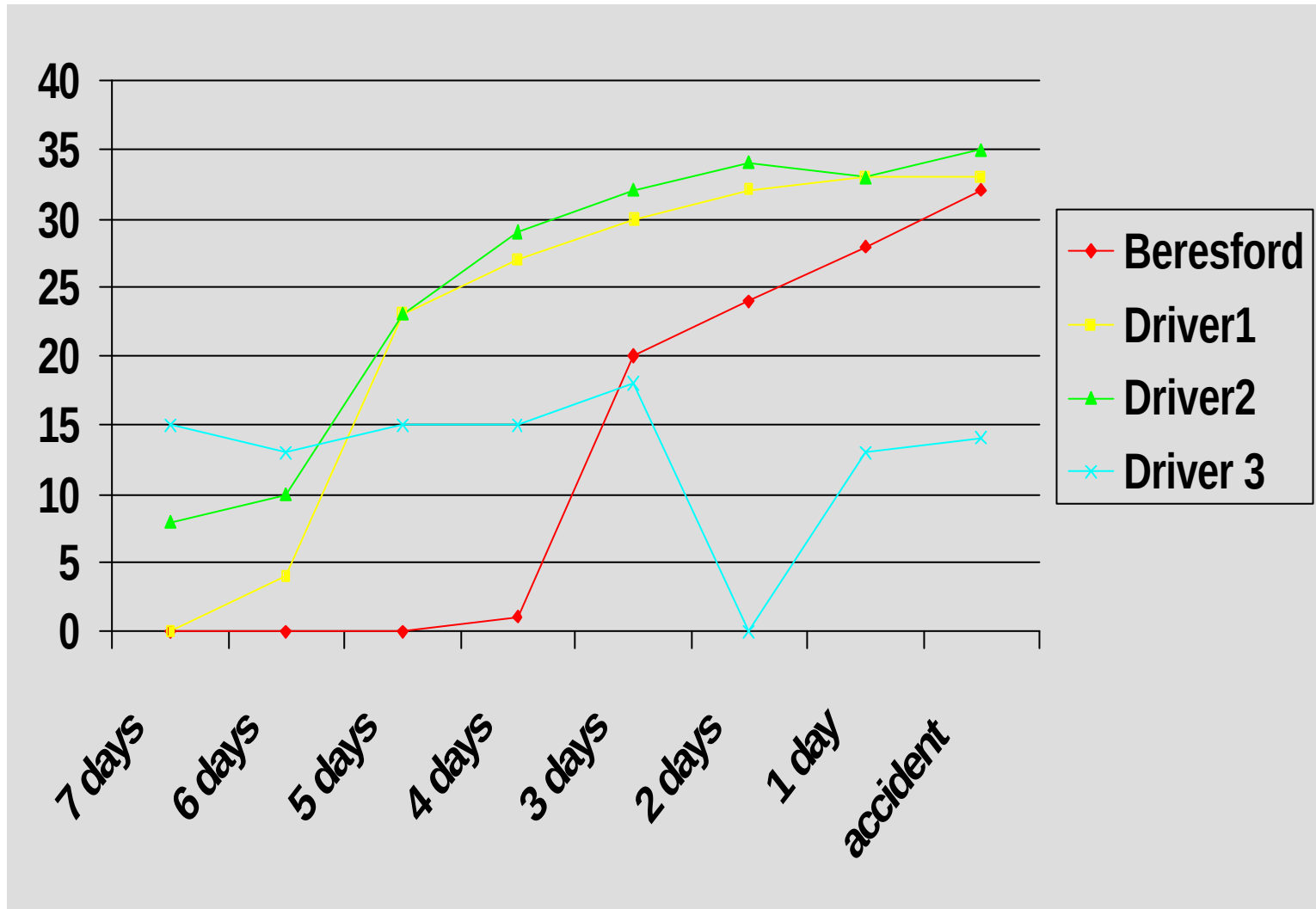
Fatigue Index



Uses of the HSE FI

- Risk assessment when work patterns change
- Profiling duties within a roster – which need to be reconsidered
- Post accident – to look to see if the work pattern may have contributed
- Selection of staff for overtime duties – who would be least fatigued

Effect of fatigue on rail incidents



Updated Fatigue and Risk Index

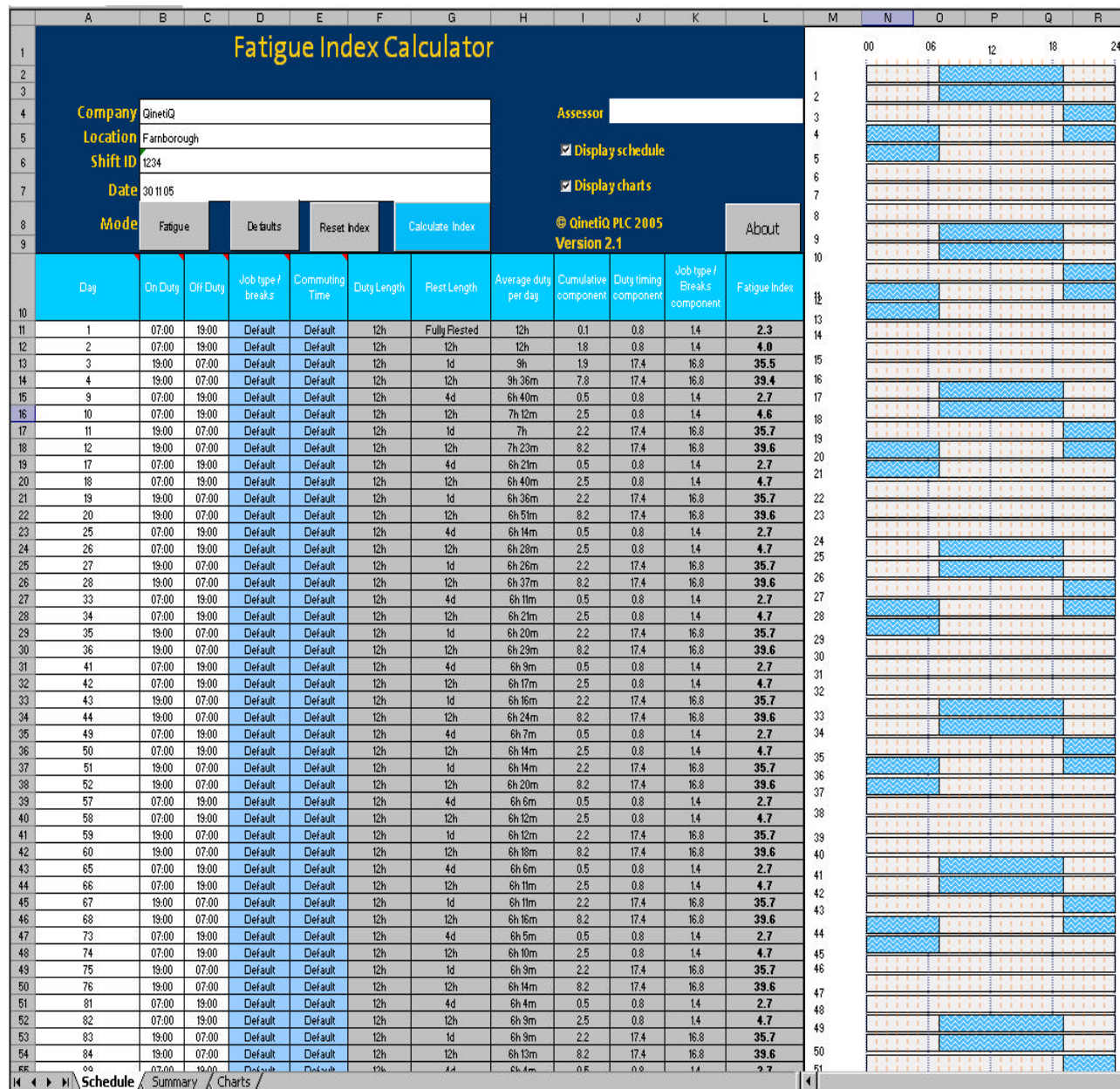
- The FI and the new FRI are based on published scientific literature on fatigue, alertness, sleepiness, and occupational injuries
- The new FRI has been updated to include literature from 1999-2005
- The tool was developed by Qinetiq and Professor Simon Folkard under contract to HSE
- The background report and the new FRI index will be available on HSE's website.

The FRI

- Contains two indices
- **Fatigue Index** – built on knowledge of factors affecting fatigue and alertness
- **Risk Index** – based on a review of trends in risk related to shift work
- The two are similar in many aspects, but different in others eg time of day
- Users must consider both and **treat a high value on either index as needing action**

The 3 components

- In the calculator you see
- **Cumulative** component – relates to fatigue associated with the way duties are put together to form a schedule
- **Duty timing** component – effects of start time, shift length and time of day
- **Job type/breaks** component – content of the shift eg activity undertaken and breaks



Default values: job type, workload, breaks, commuting time

Defaults

✕

Fatigue / Risk Assessment

Commuting Time

What is the typical commuting time of employees to OR from work (to the nearest 10 minutes):

About hours mins
(Please specify the typical commuting time)

Type of Job: Workload

The workload and/or work pace of the job is typically:

Extremely demanding, no spare capacity. ☐

Moderately demanding, little spare capacity. ☒

Moderately undemanding, some spare capacity. ☐

Extremely undemanding, lots of spare capacity. ☐

Type of Job: Attention

The job typically requires continuous attention

All or nearly all the time ☐

Most of the time ☐

Some of the time ☒

Rarely or nearly none of the time ☐

Breaks

How frequently (to the nearest 15 mins) are rest breaks typically provided OR taken?

Every hours mins
(please specify the typical interval between breaks)

What is the typical average length of these breaks (to the nearest 5 minutes) that are provided or taken?

hours mins
(please specify the average length of breaks)

What is typically the longest (to the nearest 15mins) period of continuous work before a break?

hours mins
(please specify the longest period between breaks)

What is typically the length of the break taken after this longest period of continuous work (to the nearest 5 minutes)?

hours mins
(please specify the length of the break following the longest period between breaks)

NB Please note that the answers you provide above will be set as the 'default' for the entire work schedule, but that you can alter the value(s) for any given duty if appropriate.

OK

CANCEL

Risk assessment NOT prescription

- The HSE Fatigue Index (FI) and the new Fatigue and Risk Index (FRI) tools are **risk assessment methods**
- You should use them to **identify** where your most serious fatigue risks are
- You should then put **suitable and sufficient controls** in place, e.g.
 - Altering the work pattern to reduce the risk
 - Or, planning the work differently
 - Or, introducing additional supervision, checks, etc.

NEW REGULATIONS

Railway and Other Guided Transport Systems Regulations 2006 (ROGS)

- Regulation 25
- Duty on controller of safety critical work to have **arrangements in place** to ensure, sfairp, that safety critical worker doesn't work when **so fatigued** (or liable to become so fatigued) that could **significantly affect** his H&S or that of other persons on transport system
- Duty to review the arrangements when reason to doubt their effectiveness

Change of approach

- From focus on 'number of hours' (in practice meant compliance with industry standard)
- To 'arrangements' ie management system for fatigue risks
- Recognition that fatigue influenced by hours, work patterns, working environment, nature of task, travelling time, social and domestic factors.
- (Working Time Regs – recognise that provisions as applied to UK rail sector not sufficient to prevent person working when so fatigued that could endanger safety)

New guidance on ‘Managing fatigue in safety critical work’

- Based on information from series of HMRI inspections on TOC/FOC companies
- What we know is good practice in UK rail sector
- Should match the majority of what sector currently does
- They will need to review what they currently do against the guidance

The 9 stages of a Fatigue Management System

- Identify safety critical workers
- Set standards and design working patterns
- Limit exceedances
- Consult with safety critical workers
- Record the arrangements
- Provide information to safety critical workers
- Monitor arrangements
- Take action when safety critical workers are so fatigued that....
- Review the arrangements when reason to doubt

Designing shift patterns – good practice principles

- Minimise build up of fatigue – restrict no of consecutive nights/very early starts
- Plan adequate rest between shifts and blocks of shifts – allows fatigue to dissipate
- Plan work patterns to minimise sleep disturbance



Conclusions

- Increasing awareness of need to manage fatigue in safety critical workers
- Widespread use of Fatigue Index tool
- Moving slowly from compliance to 'management system'
- Planned diagrams are better – actual hours work often differ significantly
- HMRI inspectors raise issue in investigations
- Working with industry to advise and encourage.

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