The Safety Case Journey

The original Safety Case vision

a bit about bowties

What Safety Cases became

How workforce engagement can restore the vision

Where next?
Piper Alpha – The legacy

- 167 people killed
- Platform destroyed
- Total insured loss $3.4B
- 10% of North Sea production lost
- Cullen Report
  - To understand what happened & why
  - 106 Recommendations
  - No 1 – requirement for Safety Case

1. The operator should be required by regulation to submit to the regulatory body a Safety Case in respect of each of its installations. The regulation should be analogous to Reg 7 of the CIMAH Regulations, subject to recommendations 2-13 (paras 17.33-43).
The original vision for Safety Cases

Safety Cases were intended:

- to be the means by which an operator demonstrated to itself the safety of its activities
- to present a Formal Safety Assessment
- to involve personnel from the Duty Holder
- to be part of a continuing dialogue with Regulator
- to be part of establishing a strong safety culture
- not to be an end in themselves

“It is not acceptable that installations should be operated without a thorough assessment of what [the] risks are.”

To insert text on the left and a portrait image on the right.
What does a Safety Case look like?

■ Fundamentally, the Safety Case is a
  “… demonstration that all the major hazards have been identified, their likelihood and consequences assessed, and that their control measures are suitable so as to reduce risks of a major hazard event to persons and the environment to an acceptable extent” Annex II 2(4) of EU Directive

■ The process of developing the safety case, its structure and its contents should be seen in the light of this objective.

■ Detail included should be proportionate to the risks involved.

■ Should be accessible to those who need to understand the demonstration.
What’s in a safety case?

A good safety case should tell a story:

- **Safety Case**
  - **Site Description**: This is what we’ve got, what we do, where we are.
  - **Safety Management System**: This is how we organise people to prevent, control or respond to accidents.
  - **Hazard Identification & Risk Assessment**: This is what could go wrong.
  - **Risk Control Measures**: This is the equipment that will prevent or limit the accidents.
  - **Emergency Response**: This is how we respond if a major accident occurs.
It’s all about the major accident hazards!

- **Description**
  - What is present that could cause, contribute to or be affected by the site HAZARDs?

- **Risk Assessment**
  - What are the consequences and likelihood of accidents arising from the site HAZARDs?

- **Control Measures**
  - What safety measures are needed to manage the site HAZARDs to acceptable levels of risk?

- **Safety Management System**
  - How do you organise people to minimise harm from the site HAZARDs?

- **Emergency Response**
  - How do you limit the harm to people should the HAZARDs be realised?
Comparison With OSHA PSM

- Safety Case Preparation & Consultation
  - Employee participation

- Site Description
  - Process safety information
  - Employee Participation

- Safety Management System
  - Process safety information
  - Employee Participation
  - Process Hazard Analysis
  - PSSR
  - Operating Procedures
  - Training
  - Contractors
  - Mechanical Integrity
  - Hot Work Permits
  - Management of Change
  - Incident Investigation
  - Compliance Audits

- Hazard Identification & Risk Assessment
  - Process safety information
  - Employee Participation
  - Process Hazard Analysis
  - PSSR

- Risk Control Measures
  - Process safety information
  - Employee Participation
  - Process Hazard Analysis
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  - Mechanical Integrity
  - Compliance Audits

- Emergency Response
  - Employee Participation
  - Process Hazard Analysis
  - Operating Procedures
  - Training
  - Incident Investigation
  - Emergency Planning
  - Compliance Audits
What Safety Cases Achieved

Prompted a massive change in the rigour of formal safety assessments (FSA)

- Focussed major accident research programmes
- Spurred cross-industry collaboration

Provided a focus and framework for reporting and drawing together results of FSA

Raised profile of process safety and major accident hazard assessment
Telling the story with bowties
Various distinct causes of the top event

A physical situation with a potential for harm

Realistic worst-case outcomes of the top event

The scenario which represents losing control of the hazard

Measures to mitigate the consequences of a top event

Conditions which could cause barrier to fail

Measures to prevent a top event due to a particular threat

PREVENTION

MITIGATION
Barriers as part of risk management

**Manage**
- Are changes to barriers covered in Management of change processes?
- What competency requirements are there for operating this barrier?
- What do we do if it fails?

**Understand**
- What is it supposed to do?
- Who is responsible?
- What associated activities?
- What maintenance/testing inspection is required?
- Dependencies on other kit/utilities

**Monitor**
- Is the barrier likely to fail? (Leading KPI)
- Is it working? (Lagging KPI)

**Audit**
- Are there any relevant audit findings?
- What should we look for when carrying out an audit?
Barriers - Performance Standard

COMPLIANCE CRITICAL EQUIPMENT PERFORMANCE STANDARD (EXAMPLE)

CCE-01: Oil in Water Detection and Shutdown System

CCE Description: Storage tank water draw off oil in water detection and isolation/shutdown system.

CCE Goal: To detect hydrocarbon in water content, in stream to waste water treatment and close tankside isolation valve upon detection hydrocarbon (> XX ppm). This system prevents excessive hydrocarbon in water content reaching the wastewater treatment plant.

Performance Standard: To detect XX ppm of hydrocarbon in water with a response time of YY mins and close tankside isolation valve in ZZ mins.

Dependencies: Site power supply system, instrument air.

Management of Downgrade Situations: If system offline then alternative means shall be implemented for detection of hydrocarbon in water in this stream. Manual operation of system carried out with increased supervision.

SCM Elements:

<table>
<thead>
<tr>
<th>Ref</th>
<th>Description</th>
<th>Assurance Regime</th>
<th>Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>HC Detector head</td>
<td>Annual PM, 3 monthly calibration</td>
<td>Maintenance System Records</td>
</tr>
<tr>
<td>02</td>
<td>Cabling</td>
<td>Annual visual inspection</td>
<td>Maintenance System Records</td>
</tr>
<tr>
<td>03</td>
<td>Junction box</td>
<td>Annual visual inspection</td>
<td>Maintenance System Records</td>
</tr>
<tr>
<td>04</td>
<td>PLC</td>
<td>Annual vendor inspection</td>
<td>Vender inspection report</td>
</tr>
<tr>
<td>05</td>
<td>Tankside isolation valve</td>
<td>Annual PM, 3 monthly stroke test</td>
<td>Maintenance System Records</td>
</tr>
<tr>
<td>06</td>
<td>Overall system</td>
<td>End to end test annually</td>
<td>Maintenance System Records</td>
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<td>07</td>
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<td>10</td>
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KPI Cross Reference (Refer to KPI Report For Details):

- Leading:
  - Testing of Oil in Water Detection System completed in line with assurance schedule

- Lagging:
  - Number of activations of the system
  - Number of instances of failure of the system (under test or incident)

Notes:

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When safety cases go bad
What some Safety Cases became

Highly Technical, but without “telling a story”

- Primarily technical documents, loaded with detail of formal safety assessments.
- Compartmentalised, disjointed and repetitive
- Inaccessible to the workforce

Adversarial

- Viewed as a document for “going into battle” with the Regulator.
- Written for safety professionals by safety professionals

Missed opportunity for learning and change

- Large parts often outsourced to external (or internal) consultants
- Limited engagement with workforce
Safety Case Shortcomings – HOSL (Buncefield)

■ Missed opportunity to identify shortcomings in safety systems
■ Documented safety management systems did not reflect the reality of site
■ Prepared by a contractor but not reviewed by the HOSL Board,

“In preparing its safety report HOSL missed an ideal opportunity to look critically at its own systems and managerial arrangements intended to ‘prevent major accidents’.”
Buncefield – Why did it happen? HSE website

“a greater interest in the safety report would have allowed [HOSL] to see that some aspects of the report were ‘aspirational’, rather than a true reflection of conditions on site.”
Buncefield – Why did it happen? HSE website
Safety Case Shortcomings – Nimrod XV230

- Safety Case was “a lamentable job from start to finish … riddled with errors”
- Assumption that Nimrod was safe anyway and that the Safety Case was “documentary”
- Inadequately resourced
- Assessment of many hazards left unresolved

“If the Nimrod Safety Case had been prepared with proper skill, care and attention, the catastrophic fire risk to the Nimrod MR2 fleet … would have been spotted and XV230 would not have been lost”

The Nimrod Review – Charles Haddon-Cave QC
Safety Case Shortcomings – Anonymous UK

“I’ve never been involved in the Safety Case. Ever. On any rig.”

“People get confused by 1E-6/yr etc type terminology”

“You have people in silos doing different assessments (SIL, HAZOP etc) but that doesn’t help us with Operational Risk Assessment”

“In isolation, people don’t realise the importance of their job. If they can see the bigger picture, they will understand the role their job has in preventing major accident events.”

“This is the first time anyone involved in updating the Safety Case has consulted the general workforce”
## Some general themes

<table>
<thead>
<tr>
<th>What it should have been</th>
<th>What it became</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accurate reflection of site, systems and practices</td>
<td>Inaccurate, misleading or ‘aspirational’</td>
</tr>
<tr>
<td>Opportunity for self appraisal</td>
<td>Information gathering exercise</td>
</tr>
<tr>
<td>A clear demonstration that risks are ALARP</td>
<td>A series of technical studies</td>
</tr>
<tr>
<td>Opportunity for corporate learning and dialogue with workforce</td>
<td>An outsourced documentary exercise</td>
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<tr>
<td>Have some relevance throughout the organisation</td>
<td>A document for the “safety elite”</td>
</tr>
<tr>
<td>Mainly for self-improvement</td>
<td>Mainly for compliance</td>
</tr>
<tr>
<td>A ‘living document’ used by many</td>
<td>A document on a shelf used by few</td>
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</table>
Workforce Engagement
“… safety has to be organized by those who are directly affected by the implications of failure. These people are in the best position to determine the detailed measures necessary on their own particular installation to achieve the safety objective.”

If the Safety Case if going to be a meaningful exercise, it is vital that it reflects the experience, knowledge and opinions of all those affected by the operation in question.
Safety Cases – Engaging People: Before

Setting the vision

■ What do people want the safety case to be?
■ How would they use it?
■ How does it interface with the broader risk management process?
■ Create a sense of ownership

Practicalities

■ What have been the pros/cons of previous safety cases?
■ What platform or range of platforms would suit which user?
■ What additional content would be useful?
Safety Cases – Engaging People: During

Factual

- Up to date operational information
- Contribution to HAZOP/HAZID/bowtie workshops etc
- Review of external input
- Experience of operational problems or near misses.

Opinion

- Are existing arrangements for managing major accidents good enough?
- Are there better options?
Safety Cases Engaging People: After

- Communicate **effectively** to personnel at all levels
- Not communicating detail, but overview, conclusions, key learning points
- Make relevant to people’s routine jobs
- Applies to office based decision makers *and* operators
- Use appropriate terminology
Safety Case Roll Out and Training: Aims

Develop and Deliver a Programme:

- To ‘communicate’ the safety case
- To engage personnel at all levels
- To improve major accident hazard awareness and process safety culture

Hazard Identification

Major Hazards

Frequency

Consequences

Bowtie Analysis

Safety Critical Measures

Safety Case

Major Accident Hazard Assessment and Management Process
Safety Case Roll Out & Training: Delivery

- Integrated Team
- Visual Materials
- Applied Safety Critical Controls to people’s routine work activities
- Workshop Based
- Engagement Exercises
<table>
<thead>
<tr>
<th>3 ½ Hours</th>
<th>Introduction – Key Terms and Topics</th>
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<tbody>
<tr>
<td></td>
<td><strong>Exercise:</strong> Think about and write down your routine work activities</td>
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<tr>
<td></td>
<td>Process Safety Management – what is it, what are the challenges to managing it. Multiple layers of control</td>
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<tr>
<td></td>
<td><strong>Exercise:</strong> Major Accident Case Studies – identify the controls that failed</td>
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<tr>
<td></td>
<td>High level overview of HAZID process – how MAHs are identified</td>
</tr>
<tr>
<td></td>
<td>Description of site specific MAHs illustrated with photos/video</td>
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<tr>
<td></td>
<td>Bowties – How we work out Safety Critical Measures</td>
</tr>
<tr>
<td></td>
<td><strong>Exercise:</strong> My job roles and SCMs</td>
</tr>
<tr>
<td></td>
<td>Overview of Safety Case</td>
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</tbody>
</table>
“Effort has been made to communicate risk in a way that makes sense”

“I see the point and purpose of the Safety Case”

“I would definitely report an issue with a safety critical control measure now”

“I now understand the safety critical measures that relate to my routine work – I will do better shift handovers now”

“The Safety Case is a useful document we can use it as a reference in a day to day context”
Future Developments
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Conclusions
So why have a safety case?

- Opportunity to pull together all process safety aspects of a site, consider them as a whole and see what’s missing or weak.

- Focusses attention on major accident hazards and the controls in place to prevent or mitigate associated accidents

- ‘One-stop shop’ for workforce engagement in process safety management

- Provides focus for auditing, integrity assurance etc around critical controls
Top tips for a ‘living’ Safety Case

- **Have a bold vision** for what the Safety Case is for and what it should achieve.
- **Know who the readership will be** and make sure that relevant parts of the document are accessible to them.
- Make sure that the **Safety Case tells a clear story** and that all parts of the document support the telling of that story.
- **Make the document accessible**, navigable and comprehensible whether it’s paper, PDF or web-based.
- **Involve the workforce** (including senior management) when developing the vision, when preparing the document, when reviewing the document, when rolling it out and when revising it to reflect changes.
- **Remember that the journey of producing the document is as important as the document itself**.