# CREATING A CULTURE FOR SAFETY

*Introduction*

Thank you for asking me to speak to you at this safety conference. Today I would like to talk to you about how Shell Australia has improved its safety performance over the past decade by integrating work and safety. It has involved the difficult task of making each and every person in the line from top management to work place operators directly responsible for safety. I will illustrate with examples of how we are responding to the safety challenge in our various businesses. Our non-traditional businesses, particularly coal, have benefited from the experiences gained in our traditional oil business. This transfer of ideas has been a catalyst for safety improvement.

The safety performance of Australian industry does not rank highly in the world because it seems that safety is not yet an integral part of our culture. It is estimated by Worksafe Australia that about 600 workplace deaths occur each year in Australia; together with almost 200,000 cases of occupational injury or disease. The total cost of occupational injury and disease in Australia, in terms of workers' compensation claims, is about $5 billion a year (Chart 1). When direct and indirect costs are aggregated, according to Worksafe Australia, the total costs are likely to be about $ 9 billion. It is clear from these dismal figures that not only are workers incurring painful and debilitating injury and illness, but also the cost to employers, through compensation and lost production, and to taxpayers, is enormous.

Operating in a potentially hazardous industry - oil and gas - Shell has had to have high safety standards and consequently it has a good track record. In 1993, The Royal Dutch/ Shell Group's Oil & Gas Exploration and Production ventures recorded a Lost Time Injury Frequency per million hours worked (LTIF) of 1.2 for employees and 1.6 for contractors. In total, employees and contractors worked more than 300 million hours in 1993 often in remote locations and under difficult conditions. This should demolish the myth that one should excuse a poor safety record in a hazardous business. However, complacency is fatal, so our upstream businesses are driven to be vigilant and to constantly better their safety performance.

Our improved safety record has much to do with a an international campaign the Royal Dutch /Shell Group launched in the mid-eighties to further

improve safety performance. In Shell Australia, our push to improve safety performance coincided with the steady diversification of our business which took us into less familiar operating environments. Since the seventies, Shell Australia has not only been diversifying from its oil base into coal and metals, but also it has been managing a capital expenditure and exploration program running at about $500 million annually. Yet between 1984 and mid-1994, Shell Australia's LTIF declined from 14.6 to 6.8 despite the inclusion of three underground and four surface coal mines during that period (Chart 2). Our objective is to achieve a company-wide lost time injury frequency rate of less than four by 1996.

*Tools of the Trade*

I would like to look first at our downstream oil business in Shell Australia, which involves the refining, distribution and marketing of oil products, and discuss how we have improved safety performance in that sector. Downstream Oil's LTIF has dropped from 14.6 in 1984 to 4.5 by June 1994. This improvement is mainly attributable to Shell's insistence that safety is a line management responsibility. This philosophy is given practical support through an Enhanced Safety Management program introduced in 1985 . It is a program that centres on safety as a line management responsibility. Our experience since its introduction confirms that this is the best route to improved safety. There are eleven elements in this program (Chart 3) of which I would like to mention two: visible management commitment and training.

Visible commitment begins from the top with the CEO and with senior management which must be willing to devote sufficient time and attention to the subject in order to convince the organisation of the importance of safety. It must be demonstrated that management commitment to safety is just as great as, say, the commitment to completing a major project or to clinching a vital deal.

However, management exhortation will not itself bring about improvement. Managers have to bring about a change in the way an organisation works so that supervisors at every level communicate safety priorities directly to their subordinates as part of the normal course of doing business. Of course, if managers and supervisors are going to perform this vital role properly they must be

trained, especially to identify unsafe acts and situations, and to correct them. Managers also need to be trained to analyse accidents so that they can look behind the obvious causes and identify areas of safety weakness.

Our move from being a joint venture participant to actively managing coal mines in NSW and Queensland in recent years put us into a less familiar work environment that has had a poor safety record generally. Injuries in mining activities are much greater than in many other industries. For example, mining in Australia has a LTIF of 54 compared with manufacturing at 32 (Chart 4). We knew we had a challenge on our hands from the outset. So how did we handle our move into the coal industry?

The Enhanced Safety Management program designed for use in our core businesses has been applied with good results (Chart 5). For example, in Queensland our open cut mines have achieved more than 12 months operations free of LTIs. In NSW, the South Bulli underground mine has improved its LTIs from 271 in 1990 to 27 in 1994. Although the successes are mixed with examples where performance has slipped, in general we have made good progress. These achievements reflect the shared discipline and commitment of management and employees to improving workplace safety and their ultimate aim of achieving an accident-free workplace.

Our coal mines are proving that safety cultures can be transplanted into that industry using the same theories as we have applied in our traditional businesses. Why? Because they are based on making management responsible and accountable for safety, and winning the 'hearts and minds' of everyone at work in the enterprise.

*Maintaining Momentum*

Enhanced Safety Management has been successful in focussing the safety commitment in Shell. Our experience has been that while it takes time for the principles to take root, improvements can be observed as early as in two to three years. It has also been our experience that some companies which have consistently applied Enhanced Safety Management principles nonetheless notice a plateauing after an initial reduction in the accident rate. In an effort to continue our downward trend, we looked for tools that would enable us to gain a deeper understanding of the precursors to accidents.

Accidents provide important learning points to prevent future disasters. If our analysis of accident causation is more thorough, it follows that our learning points are also more effective. In our approach to accident investigation, one technique that Shell uses is the 'accident investigation tree' which is a relatively simple but powerful tool for analysis (Chart 6).

When an accident occurs it is essential to find out all of the reasons which could have caused the accident, not just the few that directly contributed to it. This system classifies where failures may have occurred, for example, in hardware, design, maintenance, in the organisation or from incompatible goals (Chart 7 is an example of an investigation into a drowning accident in an upstream environment).

Accident investigation trees are part of a broader initiative aimed at understanding the underlying causes of accidents. To take this a step further, considerable resources have been invested into research of a new program called Tripod (Chart 8) which seeks to identify workplace safety problems and determine factors that provoke unsafe acts and allow human errors to turn hazardous situations into accidents.

Tripod is based on three basic elements:

- learning from accidents;
- training and motivating to avoid unsafe acts; and
- a set of instruments to measure these disruptive processes, called General Failure Types (GFTs), which can be resolved to reduce accidents.

There are 11 GFTs identified including incompatible goals, poor communications, design failures, poor defences, hardware failures and poor housekeeping (Chart 9). A profile of GFTs can be built on any project or site to illustrate areas which are in most need of attention (Chart 10). In this example, communication failure may be identified as a mjor contributor to potential accidents.

The new Dartbrook underground coal mine project offered us a unique opportunity for developing and operating a mine with safety built into the mine's life cycle. If we refer back to the Tripod model I explained a moment earlier, I discussed the notion of General Failure Types. At the top of this list is 'hardware design defects'

which refers to management decisions resulting in design faults that can lead to accidents. The Dartbrook mine design has been scrutinised thoroughly from a safety perspective and consequently substantial changes were made. By taking safety into account during the design stage it will reduce the probability of accidents occurring.

Accident statistics by themselves are not a reliable indicator of an organisation's safety 'health'. Tripod is a system designed to continuously monitor the organisation's 'health', identifying deficiencies and attending to all problems identified (Chart 11).

In addition to the use of Tripod to analyse accidents, Hazard and Operability, 'Hazop' techniques are used to identify risks to people, plant and production. Hazops are used at various stages of design and construction to provide a forum for 'thinking the job through', and identifying where design and methods of operation can be changed to improve safety. For example, the team to operate the new dragline at our Callide coal mine in Queensland carried out a Hazop on the equipment to identify operational and maintenance aspects that could be hazardous. This provided a good opportunity to develop teamwork between designers, constructors, managers and operators.

Hazop has been used extensively in the Dartbrook coal mine's conceptual designs, final designs and methods of construction. Hazop teams include personnel from the company, government authorities, contractors and specialists. Many changes to the mine plan and construction methodology have resulted from the Hazop sessions. Some were common sense 'why didn't the designer think of that' types of changes, others were simple changes to increase protection against unlikely but possible occurrences, and other more substantial changes will protect against a combination of events that might occur.

These reviews take time and cost money but they are, I believe, both necessary and worthwhile, and in the long-term, save money. It is much more cost-effective to make changes on the drawing board than it is in the field. Also, once a plant or machine is constructed, it is often difficult, if not impossible, to satisfactorily reengineer design shortcomings, so that potential safety hazards or plant limitations are locked in for the life of the project.

The introduction and use of such safety management techniques and the use of tools such as Hazop have been effective. During 18 months of construction, no lost time injuries have occurred on the Callide dragline project.

*Managing Safety on Major Projects*

As I mentioned in my introduction, Shell Australia has had an enormous capital expenditure and exploration program underway over the past decade in all sectors of its operations. Over the past five years alone, we have built a $600 million cat-cracker and new control room at the Geelong Refinery, a $200 million polypropylene plant and $100 million reformer at our Clyde Refinery, refurbished the retail network and undertaken vast amounts of seismic exploration onshore and offshore, as well as many smaller projects. We are also in the construction phase of a $240 million coal mine at Dartbrook.

Major projects such as these require the expertise and assistance of contractors. While we have worked hard to establish a safety culture in our own workforce, bringing large numbers of contractors on to our sites adds a whole new dimension to safety management. New factors such as different standards, poor communications, unfamiliarity with the site and heavy traffic have to be taken into account. In addition, major projects usually involve the construction industry which has a poor safety record in Australia. Occupational injuries and illness in the construction industry come in second only to mining at a frequency rate of 38 injuries per million hours worked.

We believe that the only way to maintain and improve our safety performances during major projects is for contractors working at our locations to have the same commitment to safety that we have.

So how do we ensure this?

The first important step is in the contractor selection process. In general, to qualify for tendering contractors must pass a rigorous pre-tender test, covering safety history and past project performance. Interviews and audits are used extensively to uncover any weaknesses in the contractor's commitment to safety. A contractor who passes these tough tests is then required to attend a safety induction course covering policy, systems, emergency procedures and accident reporting. Systems are put into place to

communicate, monitor and provide feedback on safety performance.

Before contractors start work at a Shell location, their staff are put through an induction and safety training course. Once the project is underway, we bring in either external or internal safety auditors periodically to uncover any deficiencies to maintain high standards.

As an example of the contractor selection process, for the construction of the dragline at our Callide coal mine, prospective tenderers for the project had to have either achieved quality accreditation or satisfy us that they had quality systems and processes in place within their organisations. This is based on our belief that businesses with quality systems established have recognised the association between safety and quality performances. The second test contractors had to pass was to demonstrate a good safety track record, the right attitude to safety and that there would be strong safety management systems in place. A 'two envelope tender system' is used to further enforce the importance of safety in choosing contractors. One envelope, opened first, contains the technical and safety tender, and the second, opened only if the first is satisfactory, the financial tender. We cannot afford to look merely at a contractor's technical abilities and costs.

On another major coal project, we introduced a bonus penalty system for safety performance. Here, the contractor has a large component of his profit dependent on his safety performance.

A quite different example of safety management on project work is in the area of exploration for oil and gas. Exploration tends to involve short bursts of activity, for example, a fortnight on a seismic boat or three months in the bush or desert. Because the surveys are over so quickly, there is no time for learning on the job. We have to hit the ground running, so preplanning is everything. A great deal of emphasis is placed on pre-qualification of contractors.

I referred briefly at the start of my address to the hazardous nature of oil and gas operations. Offshore oil and gas production presents a unique safety challenge. Offshore operations must take account of the presence of an unusual combination of risks and hazards. These are largely the result of

the concentration of a number of complex activities, extreme environmental conditions and remote locations. Quantitative Risk Assessment (QRA) is used by Shell exploration and production areas to assess the potential safety hazards of a new project. QRA studies can lead to surprising results. For example, one study on a new offshore platform which was to have been unmanned - and so presumed 'safer' - concluded that a small permanent crew was a safer option(Chart 12). Unmanned operation would have entailed many helicopter flights by production and maintenance staff on regular visits to the platform.

Finally, the CEO has a special role to play in a program to improve safety because he or she sets the tone and commitment. A lack of commitment at the top will be seen through quickly. At Shell, without exception, we insist that safety performance is one of the first items to be discussed in the report of any operating unit - whether at a Board meeting or the appraisal of a small operating section. At an individual level, safety performance is assessed in all of our staff appraisal reviews.

*Conclusion*

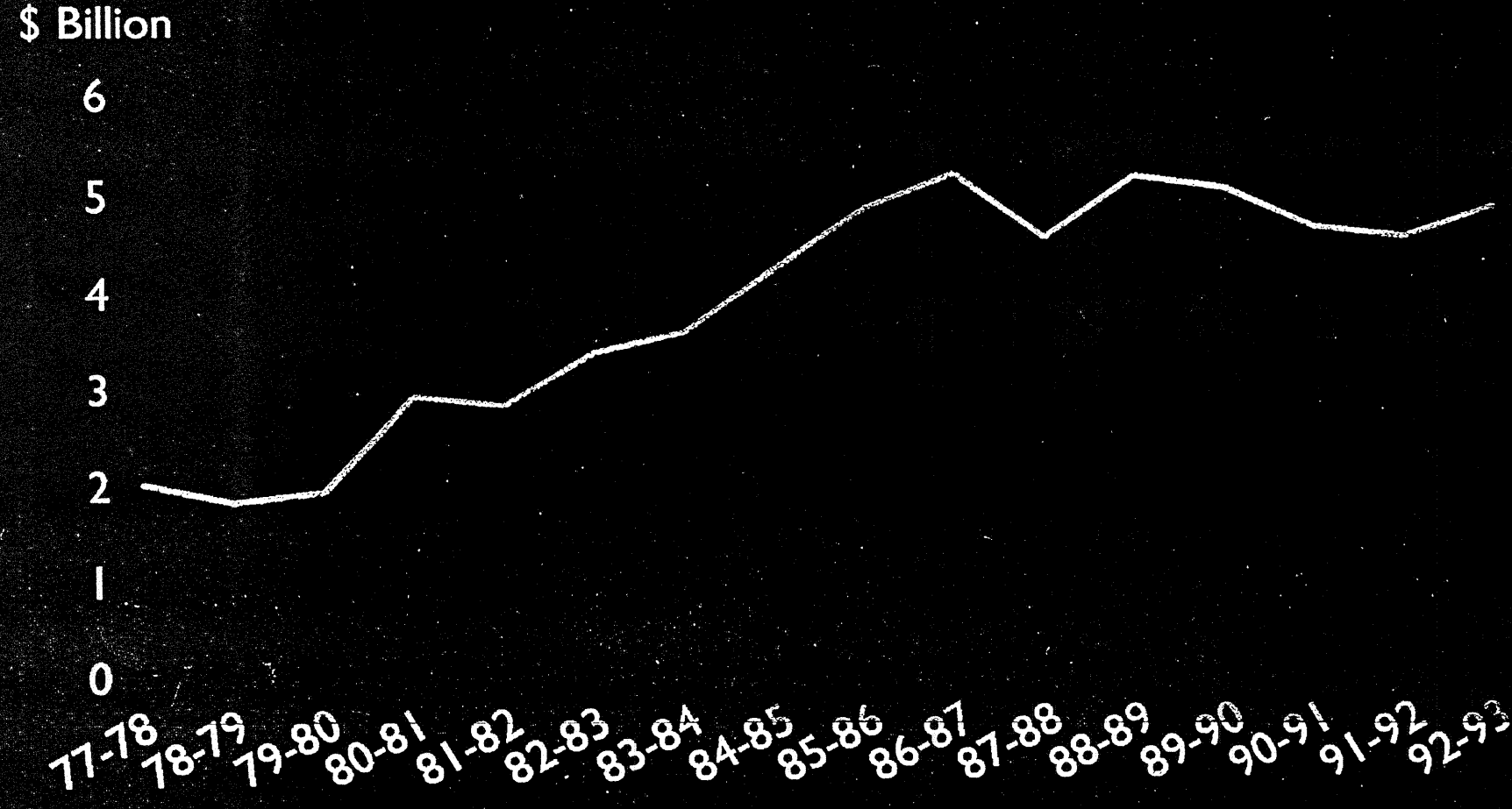
I believe Shell is achieving a cultural change in safety which has helped us to improve our performances in all of our businesses, both traditional and non-traditional. This cultural change his coming about through management commitment, employee involvement, training and communication. However, our work on safety has only just begun, and it would be dangerous to rest on our achievements so far. We still have a long road ahead to achieve our ultimate safety performance goals.

Safety can no longer be seen in isolation or as an afterthought. It has to be integrated with other key business indicators such as production, financial and quality measurements.

In concluding I leave you with this final thought. Safety requires hard work by line management, but with safety improvements we get greater efficiency, improved productivity, better industrial relations, and higher morale. These are the attributes of a successful organisation.

CHART 1

# Workers Compensation Costs: Australia




*SOURCE: National Occupational Health & Safety Commission*

CHART 2

# Shell Australia Safety Performance

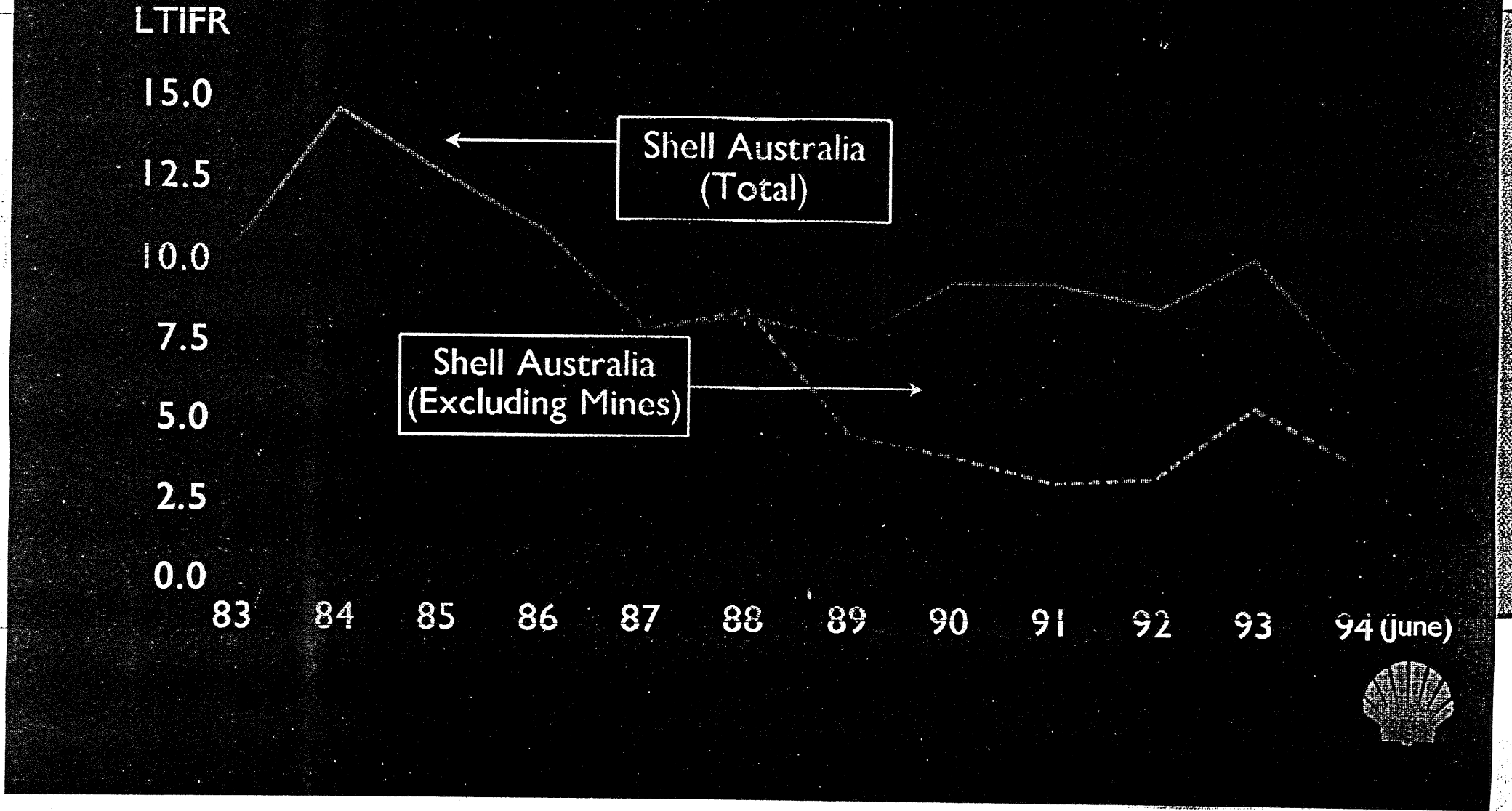


Chart 3

# Enhanced Safety Management

1. Management commitment
2. Policy
3. Line responsibility
4. Advisers
5. Standards/Procedures
6. Performance monitoring
7. Plans and objectives
8. Safety audits
9. Training
10. Accident investigation
11. Motivation and communication

Chart 4

# Occupational Injuries Australia 1986-87

| *Industry* | *Frequency Per Million Hours* |
|---|---|
| Primary Industry | 27.4 |
| Mining | 53.5 |
| Manufacturing | 32.2 |
| Utilities | 26.6 |
| Construction | 38.5 |
| Trade | 13.1 |
| Finance & Services | 6.2 |
| Community Services | 15.1 |
| Health | 21.5 |
| Recreation | 17.1 |
| All Industries | 21.3 |

*Source: Worksafe Australia 1993*

CHART 5

# Safety Performance

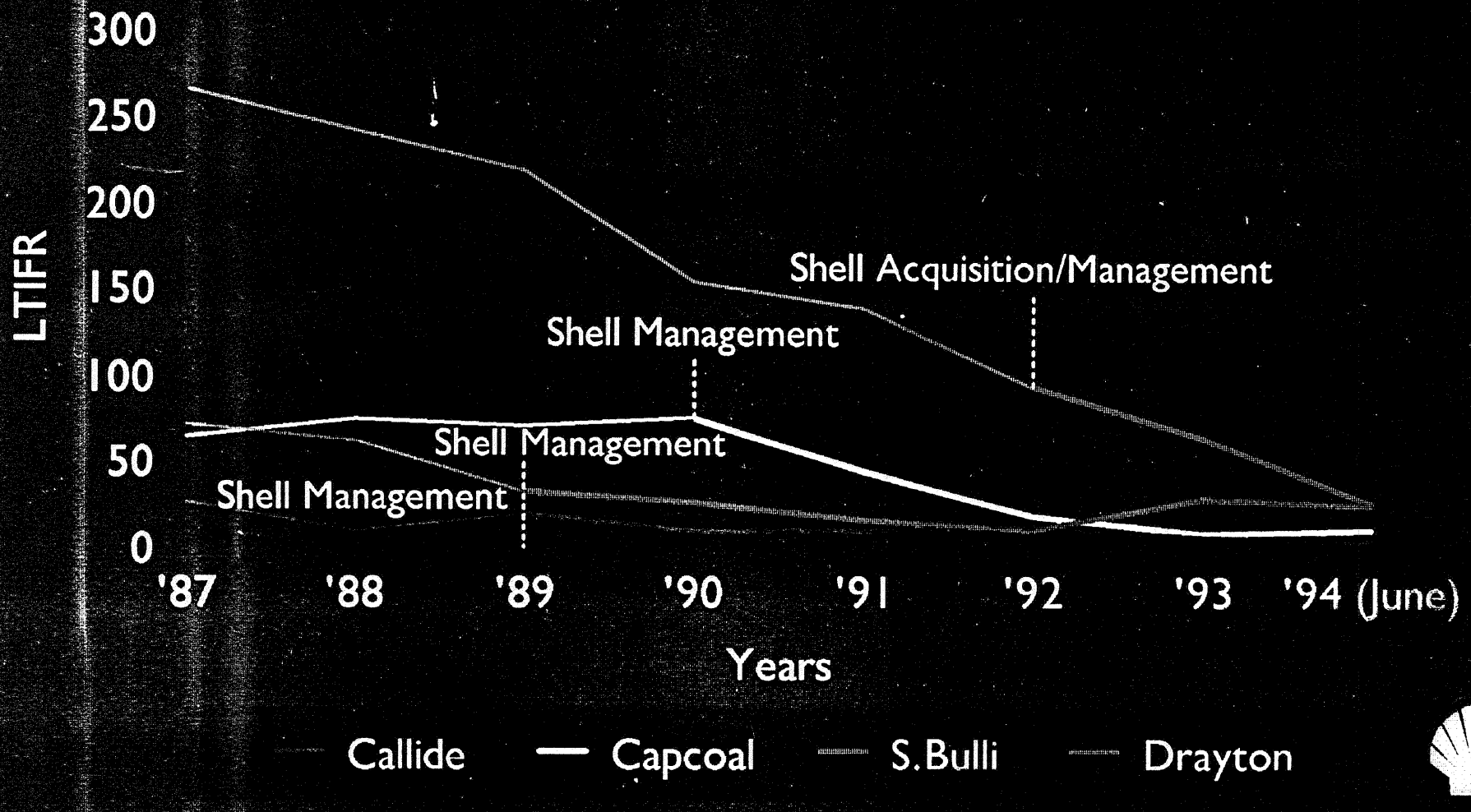


Chart 7

# Accident Investigation Tree

## *Process Example*

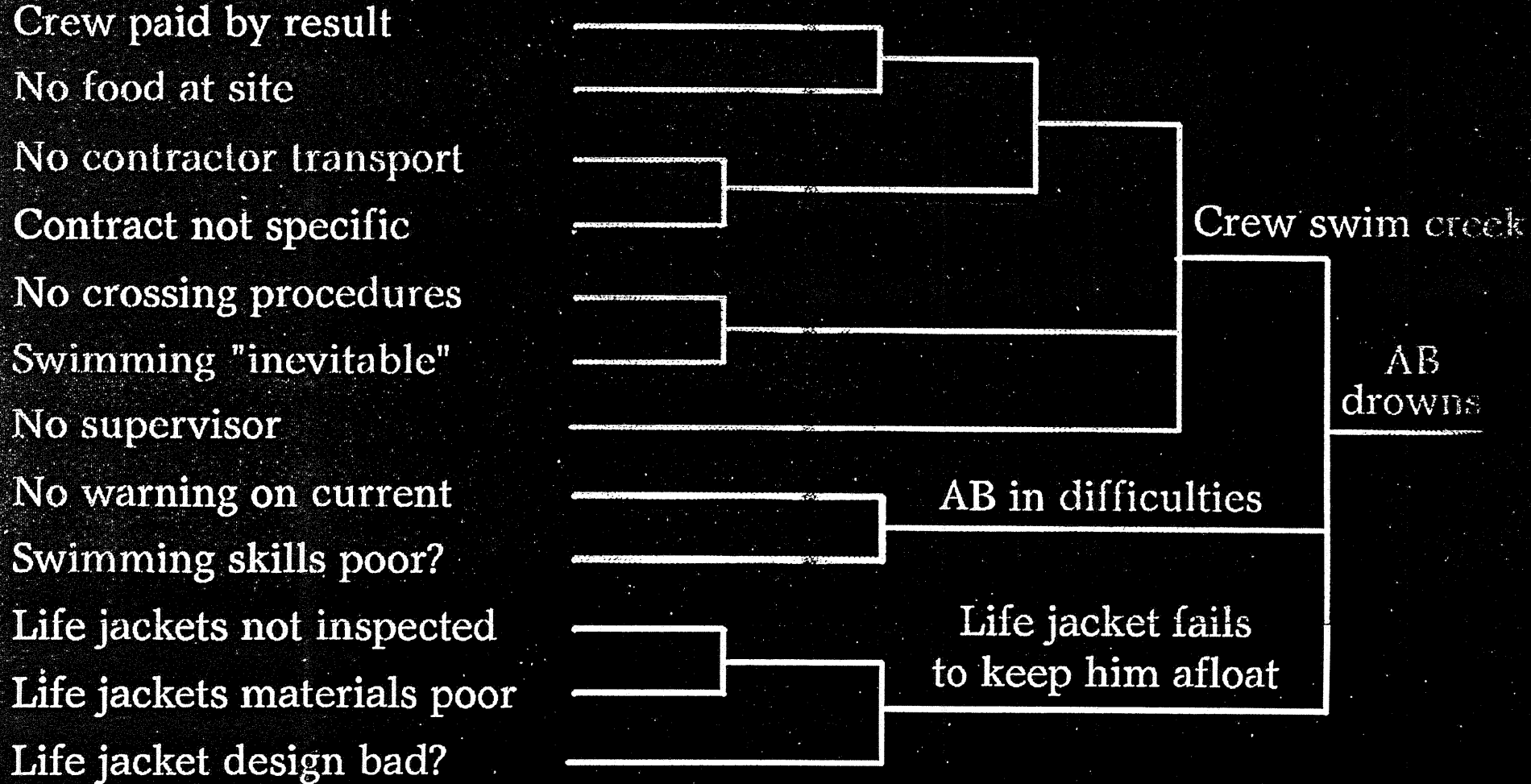


Chart 8

# What Tripod Is All About

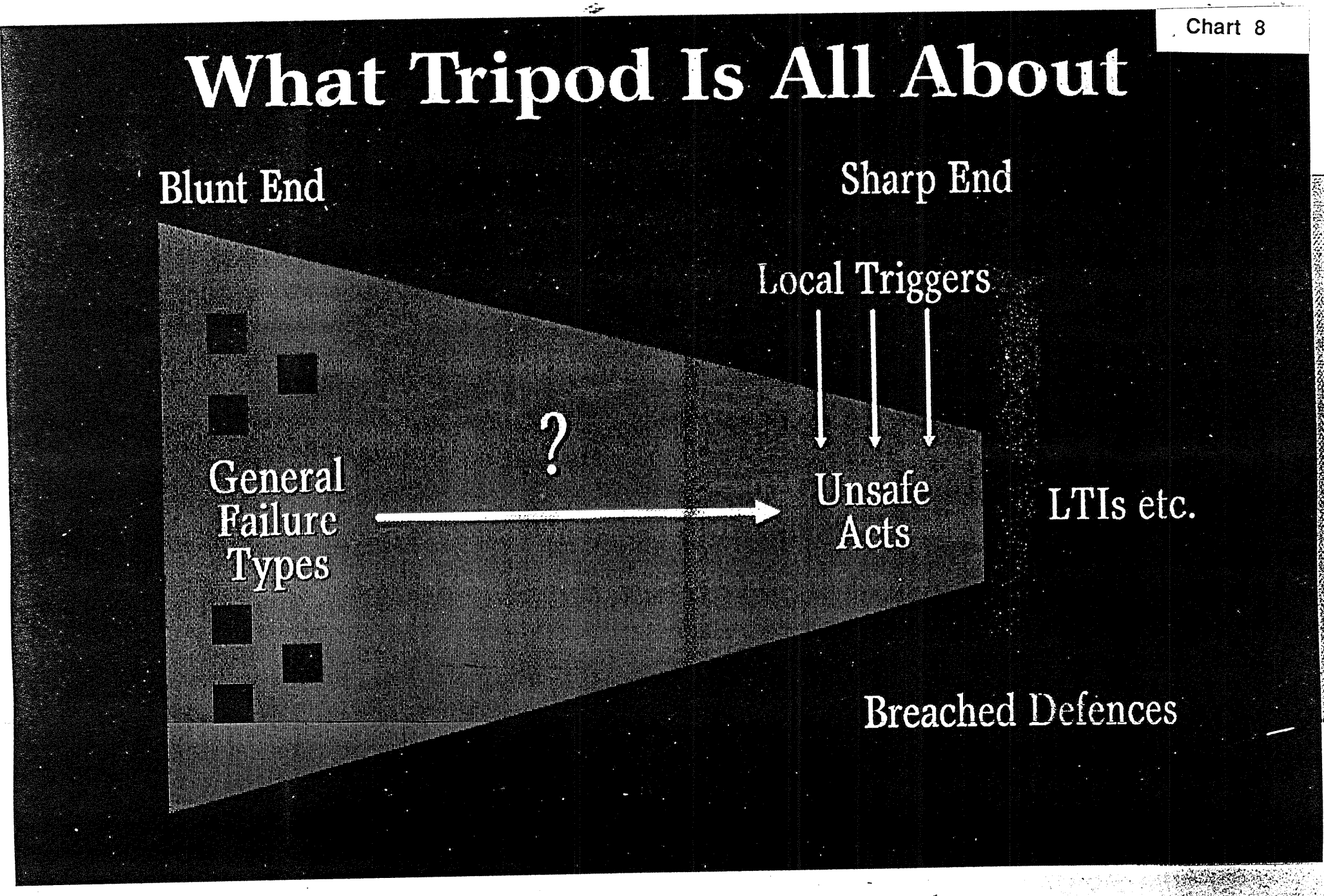


Chart 9

# General Failure Types (GFTs)

| | |
|---|---|
| HD | Hardware (Defects) |
| DF | Design |
| MP | Maintenance (Procedures) |
| OP | Operating Procedures |
| EC | Error-Enforcing Conditions |
| PH | Housekeeping |
| IG | Incompatible Goals |
| OF | Organisation |
| CF | Communications |
| IT | Training |
| ID | Defences |

CHART 10

# Tripod GFT Profile

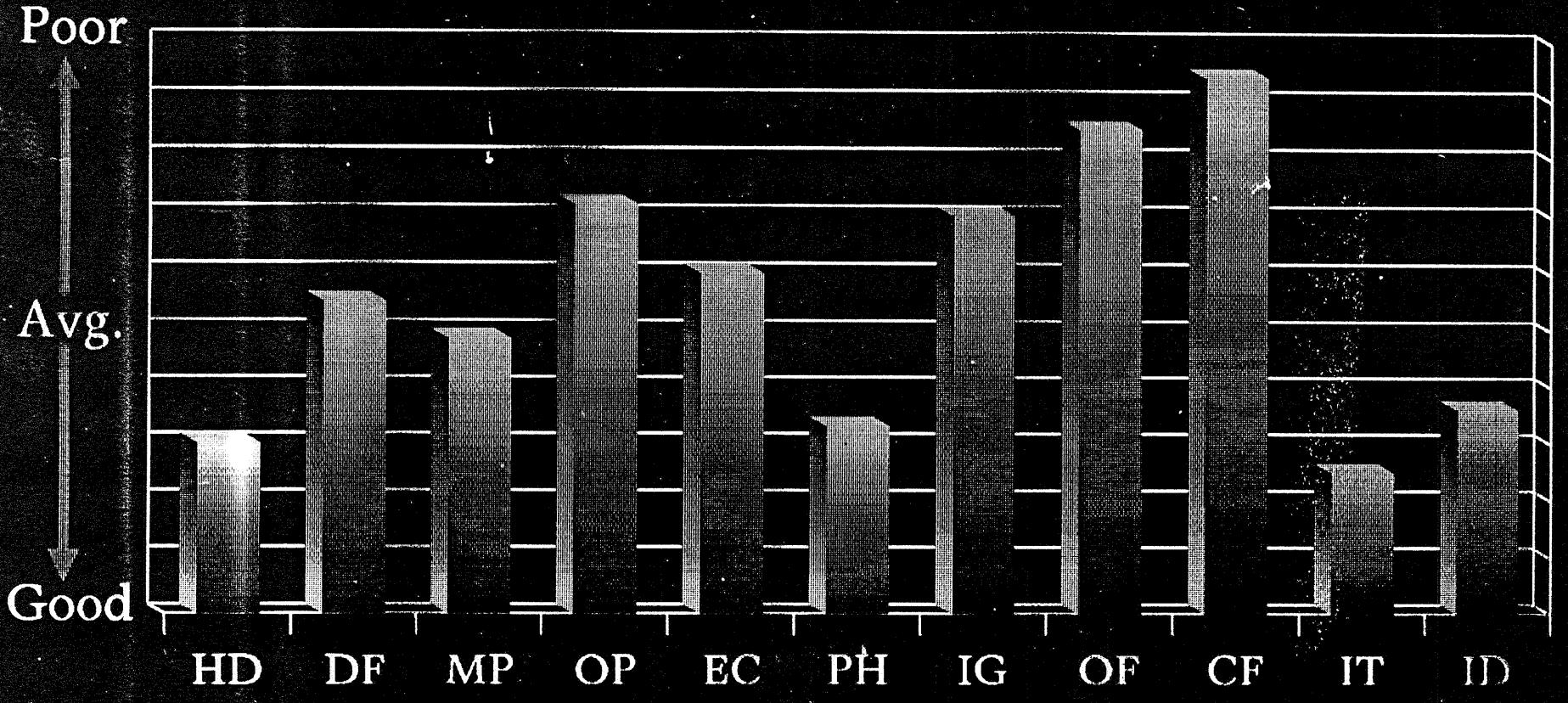


Chart 11

# Tripod

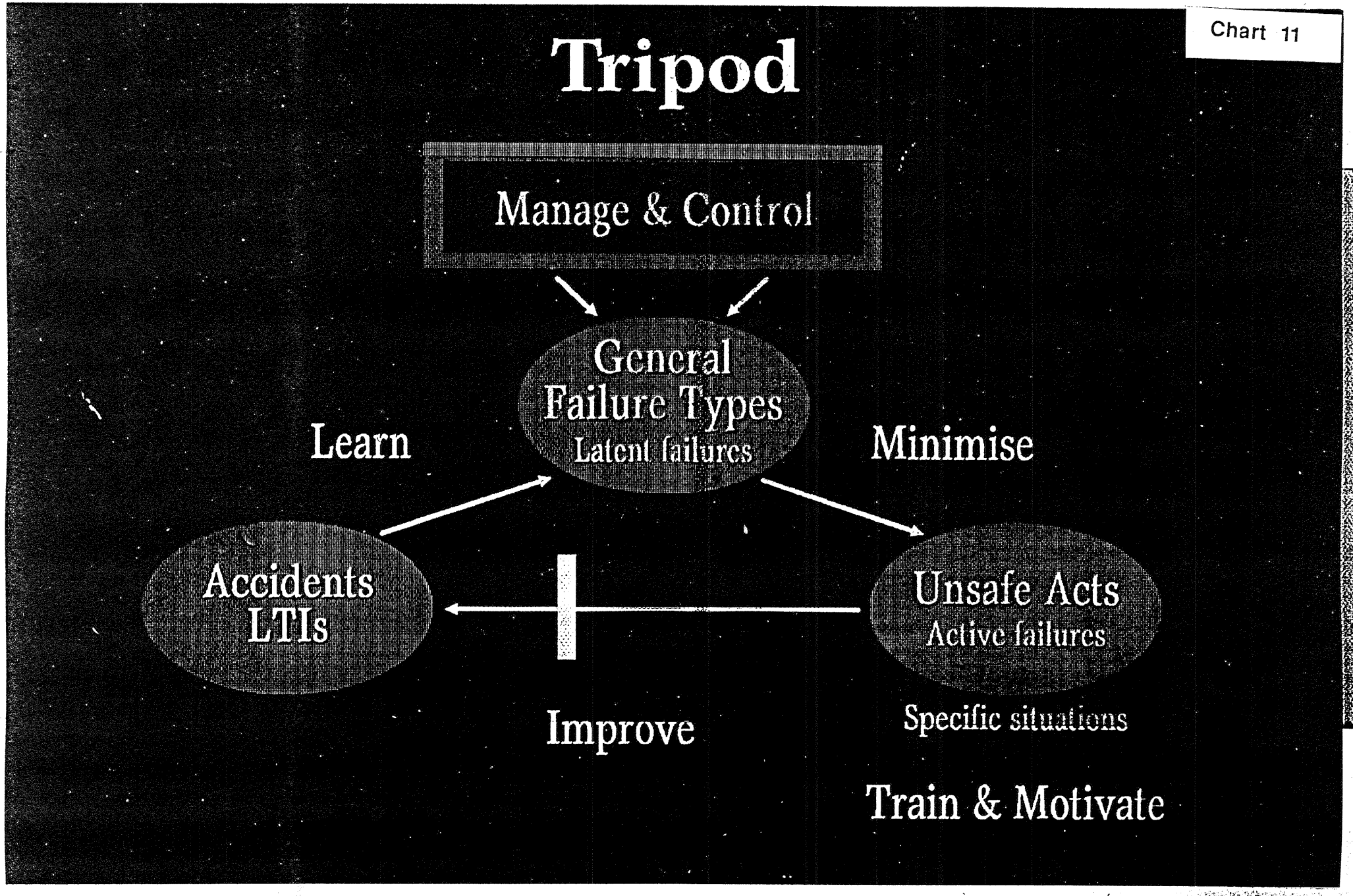


Chart 12

# Quantitative Risk Assessment