DISCUSSION PAPER

Associated Non-Technical Skills (ANTS)

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February 2010

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ACKNOWLEDGEMENT

SUMMARY

The NSW mining and extractives industry strives to be World-leading in the area of Occupational Health and Safety (OHS). The NSW mining and extractives industry has already embraced a range of initiatives to underpin the development of a World-leading OHS culture and practice.

The key purpose of this Discussion Paper is to introduce the concepts of Associated Non-Technical Skills (ANTS) to the key stakeholders in the Mining sector in NSW.

International and Australian Standards relating to OHS management systems outline a structure for companies to integrate OHS to their business management models. These OHS management systems are based on a risk management model which requires the development of policies and procedures, in consultation with stakeholders, to eliminate or reduce risks through the implementation of risk control strategies. Significant resources are invested in the development, maintenance, and auditing of the OHS management systems utilizing the technical skills of the stakeholders.

Mining OHS legislation in NSW requires an operator to have a documented health and safety management system (for coal mines) and mine safety management plan (for metalliferous and extractive mines)

It is evident in the research relating to incidents in high risk industry sectors such as aviation, medicine, oil and gas, and mining, that the failure of work systems to produce the desired OHS outcomes often results from inadequacy of ANTS. These incidents are often referred in the literature as "human error" but they predominantly involve basic skills covering:-

ANTS	Elements
1. Situation awareness	• Gathering of information • Interpreting information • Anticipating future states
2. Decision making	• Defining the problem • Considering the options • Selecting and implementing options • Outcome review
3. Communication	• Sending information clearly and concisely • Including the context and the intent during the information exchange • Receiving information, especially by listening • Identifying and addressing barriers to communication
4. Team working	• Supporting of others • Resolving conflicts • Exchanging information • Coordinating activities
5. Leadership	• Using authority • Maintaining standards • Planning and prioritizing • Managing workload and resources

Table 1: Examples of ANTS from "Safety at the Sharp End – a guide to non technical skills", by Flin, et al.2008.

These are skills that relate to the individuals involved as participants in the development of the OHS management systems. They relate across the board to managers, employees, contractors, as well as to external stakeholders such as unions, employer associations, regulators, and members of the community involved in the OHS management systems.

The application of the ANTS in the OHS management systems relates to many core processes that are to be followed. The key ones that are targeted by the NSW Mine Safety Advisory Council (MSAC) relate to:-

- Consultation
- Participation
- Supervision
- Safe behaviour

The cultural change process promoted by MSAC proposes that stakeholders;

- see the need for change.
- foster leadership at all levels.
- create a shared vision that can be simply expressed and communicated.
- enable people at all levels to influence the process and act on the vision.
- celebrate and consolidate improvement that leads to further improvement.

In simple terms, the OHS culture is best seen by "how we do things around here". It can be observed in a work place where "working safely becomes a habit not a procedure to be followed". The safety culture is the shared individual values, beliefs and attitudes regarding OHS and the organisation of the business to eliminate or manage OHS risk.

For change to be successful:

- managers must be perceived as credible, be able to motivate and enable others to progress towards the vision of World-leading OHS culture and provide the structure to direct the effective use of resources to achieve the goal.
- workers must be able constructively and actively to participate in a meaningful consultation process.

The effective use of ANTS at all levels must be seen as a driver for the industry to manage the change process to achieve World-leading OHS culture. This relates to all stakeholders including workers, employers, unions, employer associations, contractors and the regulator.

This discussion paper provides an opportunity for the industry stakeholders, unions and individuals to be better informed and to identify the key ANTS that are relevant to developing strong foundations for future improvements to OHS culture and practice in the NSW mining and extractives industry sector.

1. INTRODUCTION TO THE DISCUSSION PAPER

1(a) Purpose of this discussion paper

To stimulate discussion between the regulator, industry, union, individuals, contractors and interested parties on ANTS to inform an engagement strategy designed to sustain an improvement in safety and performance through implementation of ANTS.

1(b) Objectives of the discussion paper

To engage the regulator, industry, union, individuals, contractor's and interested parties on and identify issues relating to:

- relevant ANTS for the mining and extractives industry and what is good practice;
- why ANTS are useful to improving OHS culture and practice;
- who needs to use ANTS; and
- how the industry can ensure that those who work in the industry are competent in using appropriate ANTS.

To inform appropriate actions that can be used in the implementation of the strategy, through the MSAC partnership, and to foster and promote the usefulness of ANTS at the regulatory, industry, employer, site and individual levels.

1(c) Overview

The Wran Mine Safety Review (2005) identified a range of issues that needed to be addressed in the NSW mining industry which include:

- a disconnect between policy, systems and practice at the mine face;
- meaningful consultation between management and workers;
- worker fatigue; and
- a need to review negative aspects of safety incentive schemes.

The Mine Safety Advisory Council (MSAC) as the peak tripartite Occupational Health and Safety (OHS) body for the NSW mining and extractives industry has conducted research into the issues identified by the Wran Review. MSAC commissioned the Digging Deeper Project to investigate the issues raised by the review and this identified the need to get the basics of OHS management right. More specifically this requires effective consultation and participation to support OHS management systems. The Project found that proactive sites each follow the characteristics of:

- Mindfulness;
- Workgroup cohesion;
- Trust in management;
- Organisational justice;
- Supervisor support; and
- Role clarity.

MSAC is addressing these issues through agreed standards, education, assistance to industry and through driving a "World-leading culture" strategy for the industry. This strategy emerged from the Mining and Extractives Industry CEO OHS Culture Change Summit[1] held on 28 November 2008, which gathered 42 of the most senior opinion leaders from the industry, unions and Government agencies to set an agenda for culture change to improve OHS performance. A vision was established for the industry's OHS culture under the umbrella of MSAC to transition from the current position to a truly World-leading OHS culture. Non-technical and culture issues were identified as the drivers for continuous improvement in the industry's OHS performance.

As part of the World-leading OHS Culture Action Plan [2,] MSAC will coordinate a number of actions including to issue a discussion paper seeking industry, stakeholder and individuals' views on the usefulness of Associated Non-Technical Skills (ANTS). This discussion paper is designed to begin the dialogue between industry, unions, contractors, individuals and the regulator on ANTS as a component of World-leading OHS in the NSW mining and extractives industry.

1 (d) World-leading OHS Culture Management Working Party

The World-leading OHS Culture Management Working Party has been established by MSAC to act as the Steering Group to implement this World-leading Culture Action Plan.

This plan has three major projects including:

1. Lead indicators and targeted assistance
2. Associated Non-Technical Skills
3. World-leading OHS marketing

This paper supports the Working Party with implementation of part 2 of the plan by circulating a general industry discussion paper on ANTS. The discussion paper will be supported by a number of public sessions and an industry reference group survey.

1(e) Key Terms and Definitions

ANTS - Associated Non-Technical Skills	The cognitive, social and personal resource skills that complement the technical and management skills and contribute to safe and efficient task performance (Flin, O'Connor and Crichton,2008).
Competent person for any task	Means a person who has acquired through training, qualification or experience, or a combination of them, the knowledge and skills to carry out that task.
MSAC – NSW Mine Safety Advisory Council	A tripartite forum made up of representatives of employers, unions and government to improve safety across the mining industry in NSW.
Individual(s)	A person(s) who may be a manager, supervisor, worker, contractor or inspector.

1(f) How to provide feedback

A template is available from the Industry and Investment website at:
http://www.dpi.nsw.gov.au/minerals/safety/world-leading-ohs/ANTS

Responses can be sent to the MSAC Executive Officer by –

Email -   tim.crakanthorp@industry.nsw.gov.au

Facsimile -   (02) 4931 6790

Mail -   Executive Officer
                           MSAC Secretariat
                           Mine Safety Performance Branch
                           Industry & Investment NSW
                           PO Box 344
                           Hunter Region MC NSW 2310

Closing date for submissions is 5 PM Thursday 1 April 2010

2.   ASSOCIATED NON-TECHNICAL SKILLS (ANTS)

What are ANTS?
ANTS are defined as "the cognitive, social and personal resource skills that complement workers' technical skills and contribute to safe and efficient task performance" (Safety at the Sharp End, Flin et al., 2008, page 1). Rhona Flin and her research colleagues define a number of skills. For the purposes of this discussion paper we are focusing on:
- Situation Awareness
- Decision Making
- Communication
- Teamwork
- Leadership

The figure below demonstrates the relationship between Associated Non-Technical Skills and Adverse Events
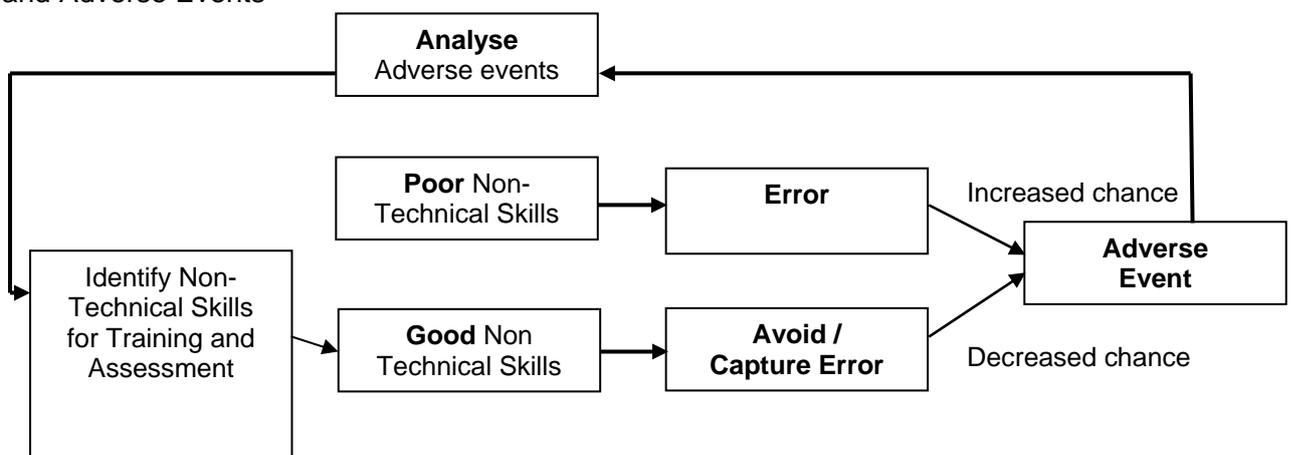

Figure 1:   *Relationship between Non-Technical Skills and Adverse Events, adapted from Flin, et al (2008).*

2.1   Situation awareness

2.1.1 What is it?

Situation awareness refers to the process of gathering information, deciding what it means and anticipating what might happen in the future. Situation awareness requires concentration and attention. It requires an individual to have the capacity for gathering and processing information using a mental model to interpret what is happening now. The mental model or mental picture is comprised of interactions between the work process, plant and equipment, environment and others. This mental picture is also informed by past experience and knowledge. These mental models are influenced not only by training but also by experience in related situations that inform the expectations of the person.

2.1.2   How does it assist OHS performance?

An individual's ability to assess risk uses this skill. It requires the person to think ahead and to plan what they will do and how it should be done safely. Fatigue and stress will have an impact on the processing of information by affecting memory and memory recall. Organisational factors, including perceived organisational priorities like production targets, may lead to managers and workers applying a poor mental model to the situation. The OHS performance is directly impacted if an unsafe situation is not recognized by the individual and their health and safety or that of others are at an increased risk.

2.1.3 Why is it important?

Individuals must be aware of the risks that are identified in their work before they commence the task. If an activity is undertaken without adequate informed preparation then the potential for an incident or injury increases. As work is undertaken it is important to be constantly aware of hazards, what is happening around them and what others are doing through a dynamic risk assessment approach. This involves monitoring the situation and being aware of the circumstances that may result in an increase in risk.

<u>Case Study – Offshore oil drilling predicting the well. (Flin, et al, 2008, p.29)</u>

In offshore oil and gas exploration, especially when working in a new location, drilling teams are constantly reviewing the current conditions and trying to anticipate future conditions. When we were within reservoir, we came upon higher pressures than expected. The solution to our current mud weight calculation might be tied to source of pressure, and if we can understand that, then we might be able to come up with a solution. Plus, we were also trying to predict ahead and see what this might mean e.g. if this is the situation at 2,000m then what might be the implications when we get to 2,500m? Is it back to original plan or a completely new one?

2.2 Decision Making

2.2.1 What is it?

Decision making is about making a judgement or choosing an option. This is closely linked to situation awareness and involves an assessment of the situation, thinking of one or more options, selecting and carrying out the best option and, evaluating the outcome. Like situation awareness, decision making is an individual capacity that requires an individual to search their memory to try and recognise the cues then identify and apply the right set of rules. These rules are influenced by their training but also the work environment and the priority given to safety.

Rundmo (1994) cited by O'Dea and Flin (2001) studied the association between organisational factors and OHS in the Norwegian offshore environment and found that employee perceptions of a greater management commitment to safety and a priority of safety over production goals, were an important predictor of employee satisfaction with safety and contingency measures. Flin (1996) replicated these findings which highlight the critical role of management in shaping the climate and influencing employee behaviour. If behaviour drives culture then the role of individuals as they make decisions which translate into actions and behaviours by the moment will determine the safety culture.

This tenet is supported by the study of Offshore Installation Managers (OIM) by O'Dea and Flin who found that OIMs recognise the need to be proactive when it comes to safety and wish to move towards changing behavioural practices so that "working safely becomes a habit not a procedure to be followed." (O'Dea and Flin, Safety Science 37 (2001) 39-57, page 51. The individual needs to make all behavioural choices underpinned by safety as a core value which characterises culture defined as the way things are done around here.

2.2.2 How does it assist OHS performance?

The quality of decisions that are made will directly impact on OHS performance. The cognitive ability of a person in safe decision making can be impacted by their technical expertise, experience and familiarity with the situation. Decision making can be negatively impacted by fatigue, stress, noise and other distractions. Real or perceived organisational priorities will also influence the decision that is made. For example, if a message that production targets are the only measure of performance is received then decisions to work using unsafe methods may result or be implicitly endorsed by supervisors, managers and workers.

2.2.3 Why is it important?
Safe behaviours will be determined by the decisions that are made about the work methods to be followed and the decisions on how to address OHS risks as they arise. It is necessary to understand what criteria are used by workers when decisions are needed about what is safe. Management and workers need to work together in a participative manner to be sure that accurate and appropriate information is always available to make these decisions safely.

2.3 Communication

2.3.1 What is it?

Communication is the giving and receiving or sharing of information between individuals.

Communication is important for information gathering and then issuing instructions or making decisions. Communication is essential to reduce or to eliminate the risk of misunderstanding.

Analyses in a number of industrial sectors have indicated that up to 80% of accident causes can be attributed to human factors (Helmreich, 2000). These human factors in the medical world of anaesthesia have been identified to include poor communication, failures to cross-check drugs and inadequate monitoring (Anaesthetists' Non-Technical Skills Handbook v1.0, University of Aberdeen). While modern technical systems have become ever more sophisticated, the human contribution to error remains. To minimize this contribution it is necessary to focus on the non-technical skills (Safety at the Sharp End, Flin et al., 2008, page 1).

In his paper to the International Mine Management Conference (2006), Larkin concluded that greater emphasis is required on the non-technical social skills for complex interactions. For effective communication, he suggests that there needs to be an emphasis on the social interactions that are necessary for developing empathy and understanding of complex interactions between groups.

2.3.2 How does it assist OHS performance?

Communication needs to be clear, use standard phraseology, be provided at the right time, and be relevant to assist OHS performance. Both the giver and receiver must be open to and be prepared to question or challenge to ensure that the correct information is received.

The importance of effective communication to minimize human error in the workplace through ANTS can enhance safety and efficiency by reducing the likelihood of error and consequently the risk of adverse events which can be dangerous and expensive. (Adapted from "Safety at the Sharp End" Flin, O' Connor and Crichton, 2008, pages 8-13).

2.3.3 Why is it important?

Inadequate communication and lack of "role clarity" can result in team underperformance.

Good team performance requires effective information exchange and coordination of actions. There are formal and informal communication systems within a team and between individuals. Meetings and forums provide opportunities for formal communication and recording of outcomes. Informal communication such as Tool Box chats and regular and/or impromptu visits by supervisors assist in forming relationships and opportunities to understand what really goes on in the workplace.

Case Study – The importance of tone to US naval aviators (Flin, et al, 2008, p.74)
Landing planes on aircraft carriers, especially at night, is one of the most complex and dangerous tasks carried out by naval aviators. One of the systems in place to help pilots achieve this objective is the landing signal officer (LSO). LSOs are naval aviators who have received special training to control the final approach and landing of aircraft on aircraft carriers. The LSOs watch the aircraft from the flight deck and help to guide the aviators onto the carrier through voice communication with the pilots over the radio.
The LSOs have been trained to use not only words, but also the tone and volume of their voice to provide information to the pilots to help them to land. To illustrate, if a pilot is a little below the glide slope (the prescribed descent of an aircraft coming in to land) the LSO will softly say "a little power". However, if the pilot is well below the glide slope the LSO will loudly say "POWER". The pilots have been trained to add power in accordance with the level of volume with which the LSO gives the command.

2.4 Teamwork

2.4.1 What is it?

Teamwork is about people working together towards a common goal. Good teamwork relies on an open and honest information exchange. This helps to create a shared situation awareness and understanding of the mental models being used by the team member for assessment of risks and for decision making. A team should work toward a common goal which is understood and shared. Each person in the team needs to be clear about their specific assigned role and responsibility.

Good teamwork requires information exchange, co-ordination of actions and team members also need to be respectful and supportive of each other.

Human factors are the direct cause of 75% of aviation accidents (Patient safety at the front line, House of Commons, Health Committee, U K Parliament, December, 2009). The Health Committee notes that while human factors training has become mandatory in the aviation industry, in the healthcare industry progress has been slower. Where human factors training has been implemented with surgeons in a study by Oxford University, the Committee reports that there was an improvement in teamwork and a reduction in technical errors by addressing deficiencies in ANTS – but *strong cultural resistance* to the new way of working meant change *was not sustained*.

There are two observations that can be made based on this report, firstly, improvements in ANTS does reduce errors which we would correlate with improved safety and performance. Secondly, sustained change requires that the culture within which change is being effected needs to act as an enabler.

2.4.2 How does it assist OHS performance?

For a "safe team" to be built there needs to be a shared goal, shared understanding of the situation, a collective orientation, clear communication, competent people and good leadership. An effective team also requires individuals to monitor their own performance.

2.4.3 Why is it important?

Teamwork failures can contribute to incidents when roles and responsibilities are not clearly defined and where there is a lack of co-ordination and miscommunication occurs. A team that is focused on agreed common goals and who have good communication about how to get there will be able to embrace OHS goals and have a positive OHS culture as part of their approach.

Case Study – Team decision-making in the oil and gas industry (Flin, et al, 2008, p.112)

'Technical problems are dealt with pretty straightforwardly. We lay out all the options and engage the "bigger brain", look at it and find the right technical solution, and that means including service suppliers or whoever, and our research people if necessary to derive the best solution we can. With respect to people, we will gather the team leaders and discuss how we can best deal with a particular situation and we will sit down and talk with the individual(s) and try to work through it. We do not let problems linger. That doesn't mean that we don't purposefully park things if we think that it is a much lower priority than other things that need to be dealt with right now, but it is noted, documented, and we will come back to it.' Comments by member of oil and gas drilling team.

2.5. Leadership

2.5.1 What is it?

Leadership is what managers and supervisors do to provide direction, guidance and support to the team members. Leadership is not just about what technical expertise is provided to ensure the OHS integrity of the work systems. It also is about how the leaders behave themselves and how they provide hands-on understanding of the risks and practical controls that are relevant to the work. It includes providing clear expectations of OHS as well as informed feedback to the team on their performance.

Health and safety leadership requires supervisors, managers and team members to reinforce to each other their expectations of safe work practices. Leaders should participate in workforce health and safety activities (e.g. inspections, incident investigations, job safety analysis, OHS committee meetings). Leadership includes being supportive of proactive health and safety initiatives and to establish OHS as a priority pathway to high productivity.

Health and safety climate is considered a lead indicator of OHS performance in terms of accidents/ personal injuries (Flin et al., 2000), Mearns (2009) has focussed on the UK oil and gas industry and reported that several studies have demonstrated a link between safety climate and safety performance. Zohar, (2000) found a link between a health and safety climate at the team level in the manufacturing sector and minor injuries and unsafe behaviour. Wallace et al (2006) conducted a longitudinal study in the transport sector and found a link between climate; good employer/ employee relationships, safety climate and road accidents a year later. Zohar (2000) found a link between safety climate at the group level in the manufacturing sector and minor changes. There is abundant evidence to suggest that the quality of the leadership and relationships in the workplace impact health and safety climate and performance.

2.5.2 How does it assist OHS performance?

Leadership has a direct impact on OHS performance. The health and safety culture within a workplace is a direct reflection of the behaviour of the key participants with the leaders as the persons of greatest influence. If they do not act safely themselves whilst expecting safe work practices from others then the OHS performance can be directly impacted.

"Management commitment to safety is recognised as a fundamental component of an organisation's health and safety culture" (Reason, 1997, Managing the Risks of Organisational Accidents, Ashgate, Aldershot, UK). Several studies have been conducted which endeavour to synthesise managerial behaviours related to good OHS performance and good OHS leadership. These behaviours have been subsumed under the term "participative management" by O'Dea and Flin (2001). They refer to participative management as management involvement in work and safety activities, as well as frequent, informal communications between workers and management.

Participative management has been established as the best predictor of worker health and safety motivation and an important factor in work group cohesion and co-operation (Dwyer and Raftery, 1991; Simard and Marchand,1995).

Case Study – Characteristics of leadership in drilling teams. (Flin, et al, 2008, p.135)

Members of an oil industry drilling team, taking part in a project to identify non-technical skills in the drilling industry, described their team leaders as 'passionate', 'listens open-mindedly', 'engenders a good environment in which to work', and 'very approachable'. He [team leader] was 'honest, very supportive, provides direction, delegates responsibilities and tasks, but doesn't micro-manage – empowers, so team members feel trusted'. (Crichton and Flin, 2004).

2.5.3 Why is it important?

Effective leadership is crucial for maintaining OHS performance.

Leaders set the foundation of the OHS culture in a workplace and they need to understand their roles and responsibilities to provide proactive leadership in OHS. They must be clear in their expectations and personally monitor the performance indicators to ensure that their expectations are being met.

The feedback provided to the team by the leader will reflect their commitment to OHS and their recognition of achievements of the indicators.

Case Study – Example of effective leadership in oil and gas drilling industry. (Flin, et al, 2008, p.131)

An incident management team (IMT) was established to manage a novel incident, namely that the 6,000ft drilling riser (a pipe that connects the drilling rig to the sea bed) parted at approximately 3,200ft. The IMT consisted of the incident manager and a number of team leaders, each of whom took responsibility for one part of the incident. In terms of decision-making, each team leader had to make often difficult and challenging decisions, and accept accountability for those decisions. Team leaders talked through issues, discussed expectations and set deadlines. Team leaders also had to delegate tasks to appropriate members and check that these tasks were appropriately undertaken. Finally, team leaders needed to focus on the major issues involved in managing the incident and were not distracted by other tasks or demands. This involved prioritisation of activities and actions, with shedding of tasks that were not relevant at that particular time. This did not mean that these tasks were overlooked, but were left until a more appropriate period, i.e. when time was available. (Crichton, et. Al., 2005)

3. CORE SKILLS

Core skills from the ANTS work together as elements of the OHS management system. These include:-

- Consultation
- Participation
- Supervision
- Behaviour

3.1   Consultation

Consultation is an integral part of the risk management process. Consultation refers to the mechanism, within the health and safety management system, through which health and safety issues are raised, communicated and resolved in a participative manner. Effective consultation is facilitated by the application of the above Associated Non-Technical Skills, especially communication.

Consultation is a process of information and opinion exchange. It is a process where affected parties are involved in actively listening to the input from others and extracting key messages for input into the OHS discussion. Effective consultation requires all parties to respect the role and perspective of others and to ensure that their opinions and technical contributions are understood and considered.

3.2   Participation

Participation refers to the engagement in and commitment of individuals to the process of sharing in the activities of a team. Participation is reflected in the Associated Non-Technical skill of "teamwork". Participation may be promoted through building effective teamwork and creating a desire among individuals to work towards a shared common goal. This may be reflected in the health and safety system element of commitment and role clarity.

Successful participation requires parties to feel that their contribution is valued and that they feel that their opinion is important. The process of sharing may have many stages as the group works together. It may be in the evaluation of a new piece of mining machinery or a new system of work such as shift rosters. Participation requires those affected to contribute and evaluate the options as part of a planning and development process.

3.3   Supervision
Supervision refers to the process of directing the information and instructions required to perform work tasks, adherence to instructions and the provision of support required by individuals and teams to carry out their roles effectively. Supervision is reflected in the Associated Non-Technical Skill of leadership and situation awareness. It also requires the demonstration of skills in communication, teamwork and decision making.

Supervision requires effective engagement with the team to understand their needs from a technical and personal perspective. It then requires the development of safe systems of work that reflects the needs of the team members as well as the technical requirements of the task. Inspection and feedback of the work undertaken by the team is an important part of supervision to ensure the Supervisor is fully aware of the OHS risks encountered by the work and to ensure that the OHS systems are being followed.

3.4   Behaviour

Safe behaviour refers to an individual's conformity with agreed safe work practices that reflect the person's commitment and participation in the way in which an organisation behaves. Safe behaviour is a combination of the ANTS above, such as situation awareness, decision making, leadership, teamwork and communication, that are supported by the organisation at all levels.

The behaviour of an individual is a public demonstration of their values and understanding of safety within the context of their work. Behaviour is a more powerful indicator of OHS than technical knowledge and qualifications. For example, if a manager visits a work site which has mandated personal protective equipment to be worn but does not wear it then this behaviour sends a powerful message to the team about their lack of commitment to OHS

Research on human error assists in assessing behaviours that may result in injury particularly in cultures where "short cuts" are taken. These behaviours may include:

- Accidental lapse when correct procedures would normally be followed.
- A purposeful change to the procedure to reduce task time and complexity despite the known increase in injury risk.
- A set of circumstances unfamiliar to the worker who is unsure of how the procedure should be adapted.

There are some cultures where the leadership condones short cuts which increase the injury risks.

In a study of workforces across the globe in the oil and gas industry, Mearns and Yule reported that Asia/Australasia is considered to be the best performing region on lost time injuries (LTI) per million hours worked. They propose that safer behaviours may well lead to a more positive safety culture rather than the reverse because behaviour drives culture. Their study revealed that as senior managers are seen to be more committed to OHS, risk taking behaviour reduces among workers. In their view, the traditional culture of the oil industry as representative of the broader exploration industry has been built on risk taking behaviour which creates a culture of high risk. The focus on the non-technical skills of the individual to reduce risk is strongly supported by this research as a pragmatic solution to risk mitigation.

A European study by North and Friedrich (2007) studied the cognitive complexity of tasks in a range of manufacturing firms involving assembly and packaging of products in Germany and Sweden. They identified that tasks vary in their complexity, and that workers vary in their ability to demonstrate innovative behaviour to resolve risks. They found that workers need the competence to interact with their own colleagues and department as well as other stakeholders to address these risks. A main competence of innovative groups is the ability to cope with and overcome tensions between overall enterprise goals (target orientation) and job related work goals (which are object oriented).

These competence skills need to be learned and developed by "doing, using, interacting".

4. ROLES OF OFF-SITE PARTIES IN THE ANTS INTEGRATION INTO THE MINING AND EXTRACTIVES INDUSTRY

4.1 Contractors

Contractors require the most effective induction into the safety culture. Like workers, their perceptions of site management commitment to OHS will drive their individual OHS behaviour. Lack of familiarity with local practices and cultural norms would suggest greater risks to personal safety and on-the job performance.

4.2 Unions

The vital role of unions in representing the workers cannot be overstated when we consider the research on positive OHS culture. Reason (1997) argues that a good OHS culture emerging is dependent on the willingness and active participation of the workforce. Mearns and Yule (2009) examined the role of national culture in determining safety performance in the global oil and gas industry. They suggest that extremes of either Collectivism or Individualism can be detrimental to OHS. For instance, a strong collectivist culture may limit individuals from offering divergent perspectives which could be critical to OHS decision-making. Unions as representative bodies play a vital role in ensuring that divergent perspectives are heard in the interests of worker safety. Unions play a pivotal role in encouraging individuals to engage in direct communication and speak up about issues, in other words promote ANTS as key antecedents to a positive OHS culture. In NSW employees are represented by the Construction Forest Mining and Energy Union (CFMEU) and the Australian Workers Union (AWU) and other unions.

4.3 Employer Groups

Simard and Marchand, 1995 cited by O'Dea and Flin (2001) found that a decentralised approach to safety management was the most effective way in which management facilitates individual motivation to work safely. A number of investigations have explored the safety climate on offshore petroleum installations. O'Dea and Flin (2001) found that there was a contrast between what leaders know to be best practice in leadership and how they prefer to behave. In their study of site managers and safety leadership in the offshore oil and gas industry on the United Kingdom continental shelf, they found that managers are very aware of their role as leaders of OHS and believe that the best way to promote OHS is by establishing good quality participative and open relationships with workers. However, 57% of these managers still adopt a directive approach to leadership and overestimate their ability to influence and motivate the workers.

Employers have a responsibility and challenge to develop leaders who apply their ANTS to increase workforce involvement in OHS and to embed a culture of OHS and performance. In NSW employers are represented by the NSW Minerals Council and the Cement Concrete and Aggregates Australia (CCAA) and other employer groups.

4.4   Regulator

The mining industry is high-risk in nature and encounters challenges to health and safety on a daily basis. A regulator should ensure that the management of health and safety and the environment takes high priority, is appropriately monitored and that World-leading culture is actively pursued. Safety is a universal value and there are human costs associated with all incidents. Given that the commitment of senior managers is a predictor of safe and unsafe behaviours (Mearns and Yule, (2009), the regulator has a role to play in shaping OHS culture by setting expectations of leaders and managers and providing authoritative advice and assistance to enable these expectations to be met.

The culture of the mining and extractive industry is colloquially known as risk-taking whereby in the past it asserted that individuals are prone to taking risks and breaking rules to get the job done.

The regulator can establish the regulatory regime to mitigate likely risk due to the dominant culture, promote education, safe behaviour and management commitment in the high hazard domain of the mining industry. Those who work within the regulator need to use ANTS to develop and implement improvement strategies, communicate expectations and ensuring a balanced approach. In NSW the regulator is Industry & Investment NSW.

In conclusion, all external parties have a part to play in the adoption of ANTS to create a safe and highly performing workplace.

Clear expectations of ANTS for each role, ways to assess ANTS skills and training in ANTS will create an OHS management system to lead the emergence of a world-class safety culture.

5. HOW CAN THE INDUSTRY ENSURE COMPETENCY IN USING APPROPRIATE ANTS?

Competence in ANTS is relevant to all stakeholders involved in the mining industry. The development of competence can be provided as a specific ANTS training program or be integrated into a broader holistic approach to culture change. The best method for developing individual competencies in ANTS needs to be commented on by stakeholders in this Discussion Paper.

5.1 ANTS-specific training

This first option focuses on ANTS training as a specific program for each group of individuals.

Rhona Flin and her colleagues in their ANTS "Safety at the Sharp End" (2008) note that to develop successful specialized ANTS training the first step is to identify the requisite skills for the job in the given operational environment and culture.

They note that in the aviation industry specific behaviours are used to provide details of the relevant non-technical skills. They use an observation based rating system for assessing the contributing behaviours. They call these "Behavioural marker systems". These are established as a useful tool for measuring performance based on observation and rating behaviour in the aviation and in the anaesthesia industry sectors..

These systems enable the skills of the individual or team to be assessed in a real work context or simulation. They create a framework and a common language to discuss behavioural aspects of performance, provide feedback on skills development and ascertain training efficacy. Using behavioural marker systems has enabled effective simulator training for both the anaesthesia and aviation industries.

Developing a behavioural marker system to support ANTS development for the mining and extractives industry is a complex task. Fletcher, Flin et al. (2003) in the "Development of a Prototype Behavioural Marker System for Anaesthetists' Non-Technical Skills" identified five key areas to be considered as follows:

1. Decide if the behavioural markers are for individual or team skills and performance
2. Identify the skills and their associated markers, these maybe specific to particular operational requirements
3. Determine the method of assessment i.e. assessment scale, location, material used for assessments
4. Assessor reliability- the system must be reliable and designed to optimise inter-assessor reliability (where two or more assessors observing the same performance would rate it the same).
5. Provide assessor training to ensure that everyone using the system has the same understanding of skills, performances and assessing behaviour.

Fletcher, et al. (2003) concluded that the process in the development of classifications and behavioural markers is also important. In their study they used a mixed team of psychologists and anaesthetists for the development workshops who brought different knowledge and expertise to the iterative process. A multi-disciplinary approach is recommended as the most effective.

If it is decided that ANTS-specific training is required to develop the ANTS competence levels, then a program would need to be developed relevant to the needs of the different individuals.

One model that outlines the type of training that could be suitable is provided below.

Training Need	Training Strategy
Introduction to ANTS	• Crew Resource Management (CRM)-based course as introduction to ANTS. This is based on the program outlined by Flin et al (2008).
Situation awareness	• Event-based training • Tactical decision games
Decision-making	• Event-based training • Tactical decision games
Teamwork training	• Team process and facilitation training • Role and responsibility review
Clarification of roles when managing unexpected events	• Role and responsibility review • Competency identification • Event-based training • Tactical decision games • Command and control training courses
Communication	• Tactical decision games • Communication exercises

Table 2:   Training model adapted from Flin et al, 2008

5.2 Integrated ANTS training

There is a key role in this area for the regulator, union and employer associations to play. They each have a strong leadership role with their members. By incorporating the basic principles of ANTS in their methods of operation, there should be improved outcomes in OHS performance and industrial relations. Not all parties need the same focus of the ANTS to enhance their roles. There are key competencies for the basic ANTS for all Individuals. There are also greater levels of competence required for specific individuals relevant to their roles in OHS.

The MSAC has developed Fact Sheets on a range of key issues and concepts. There have already been Fact Sheets developed on ANTS which are included in the references. Further information could be provided with more Fact Sheets as well as the web and hard copy materials to promote ANTS and discussion in the workplace.

This second option looks at integrating ANTS into a broader risk management approach to training.

If a holistic approach is taken to develop ANTS, it would be necessary to determine how the competencies could be integrated into general programs on workforce skills in safety critical roles. The range of stakeholders who need to embrace the ANTS processes would need to be defined. They could participate in professional development programs within their own groups or be integrated into specific events to promote networking and discussion on the issues.

For example, the Managers would require a focus on "Leadership" ANTS training. A basic level of leadership ANTS training is required by all Individuals due to their respective roles within their work teams. Situation Awareness is a key ANTS for workers who are in a daily operational role with ever changing OHS risks. Supervisors need Decision-Making ANTS to ensure their holistic understanding of risk is reflected in their work instructions to the workers. All Individuals would require ANTS relating to Communication and Teamwork to ensure that the basic risk management processes meet the OHS legislation and functional needs of the workplace.

CRM (Crew Resource Management) training is the most commonly used method for training non-technical skills. CRM training is defined as a management system which makes optimum use of all available resources – equipment, procedures and people – to promote safety and enhance efficiency of flight deck operations (Flin, O'Connor and Crichton, 2008, p.7) Other types of training that can also be displayed are cross-training; team self-correction training; event-based training and team facilitation training.

- Cross-training is a training strategy in which each team members is trained in the duties of his or her team-mates. Salas and Cannon-Bowers (1997) recommend this type of training as being particularly useful where there is a high turnover of personnel.
- Team self-correction training works on the premise that effective teams review events, correct errors, discuss strategies and plan future events (Salas and Cannon-Bowers, 2000). Therefore, the training simply provides direction on processes that typically occur.
- Event-based training is an instructional approach that systematically structures training in an efficient manner by tightly linking learning objectives, exercise design, performance measurement and feedback. (Dwyer, et al, 1999, pg.191).
- Team facilitation training is designed to help team leaders stimulate learning by creating an effective learning environment, supporting more formal training experiences, and facilitating and encouraging team discussions (Tannenbaum, et al, 1998).

A systematic approach to training development will be the most effective and will integrate into the organisational risk management strategy.

Under high risk conditions, team performance has been linked to the team leader's effectiveness (Flin, O'Connor and Crichton, 2008, p. 142).

Leaders need to have the ability to switch styles according to situational demands so their requirements for ANTS training are more specific than for all other workers. The table below depicts the characteristics and competencies for leading under high risk situations. (Flin, 1996, pgs 42-44)

Topic	Description
Leader characteristics	- Willingness to take a leadership role - Emotional stability - Stress resistance - Decisiveness - Controlled risk-taking - Self-confidence - Self-awareness
Leader competencies	- Leadership ability - Communication skills, especially briefing and listening - Delegating - Team management - Decision-making, under time pressure and especially under stress - Evaluating the situation (situation awareness) - Planning and implementing a course of action - Remaining calm and managing stress in self and others - Pre-planning to prepare for possible emergencies

Table 3: Characteristics and competencies.

The inclusion of training as part of an integrated risk management framework is even of greater importance when we consider the vital role of our leaders in safety management.

The UGM report on qualifications for statutory roles in the Coal Industry (NSW Coal Competence Board "*Comparison of Statutory Qualifications with Current Job Function*" 2009) strongly supported the need for ANTS requirements under Clause 162 of the Coal Mines Health and Safety Regulations for Supervisors.

However, there was a range of opinions concerning how and who should be required have specific training in these areas. The main focus in the research related to the importance of ANTS for Supervisors due to their role in "people management, communication and leadership".

Little mention was made of the importance of ANTS for the other stakeholders involved as outlined in this Discussion Paper. This includes Contractors; Unions; Employer groups and Regulators, as well as Managers and Workers from the mining sector.

It is important for the reviewers of this Discussion Paper to give their opinions relating to the respective needs of ANTS for all these other stakeholders.

The question relating to the "how" ANTS competency should be addressed also needs to be resolved.

- It was noted in the UGM research that large multi–mine operations within the NSW Coal industry have developed their own "in–house leadership" programs and have been conducting training for all levels and types of Supervisors in ANTS.

- There is also the option that ANTS is best addressed as part of a broader Risk Management approach with the ANTS competencies integrated into the Risk Management training.

- Another option raised in the UGM research was to see ANTS as part of the Supervisor competencies covered in the Frontline Management programs conducted by RTOs (Registered Training Organizations) or by the companies.

- A further option is to utilise mentoring and "role models" who could provide practical examples for specific stakeholders on how ANTS can be effectively implemented for their role.

It would appear from the research that the integration of the ANTS competencies into existing professional development programs, for each of the stakeholder groups, would provide the most holistic approach.

6. FEEDBACK ABOUT Associated Non-Technical Skills (ANTS)

MSAC is seeking comment on ANTS regarding the following questions that may arise for the various stakeholders and interested parties that would contribute to the development of strategies to promote the usefulness of ANTS to the industry.

1. Do you agree that the five ANTS outlined in this paper are relevant for promotion to the NSW mining and extractives industry?
   a. Which ANTS are relevant (situation awareness; decision making; communication; team work; leadership) and why?
   b. Which ANTS are not and why?
   c. Are there other Associated Non-Technical skills that should be promoted?

2. Will promoting the usefulness of ANTS to improve OHS culture be of benefit to industry stakeholders groups such as operators; contractors, individuals; unions; employer group and the regulator?
   a. If yes, indicate which groups would benefit and how
   b. If no, indicate why not

3. Are ANTS relevant to all who work in the industry, such as managers (including statutory positions); professional; supervisors; workers and inspectors?
   a. If yes, indicate why for the types of workers outlined above?
   b. If no, indicate why not

4. Do you agree that promoting ANTS to improve Consultation; Participation; Supervision and Behaviour will influence OHS culture improvement in the NSW mining and extractives industry?
   a. If yes, indicate why and provide examples
   b. If no, indicate why not

5. How can the mining and extractives industry ensure that those who work in the industry are competent in using ANTS?
   a. Should they be explicitly assessed (Yes/No) and why?
   b. Should they be integrated into risk management competencies (yes/no) and why?

6. Do you have a view on how the usefulness of ANTS can be promoted by MSAC through industry stakeholders such as the regulator; employer groups and unions? For example;
   a. Providing opportunities to network and discuss good practice
   b. Providing fact sheets, publications and information via the web and in hard copy
   c. Providing advice and assistance
   d. Other?

7. Do you have suggestions on future strategies MSAC may be able to put in place to promote the usefulness of ANTS in the NSW mining and extractives sector? For example;
   a. Integration into competencies and supporting operators to develop workforce skills in safety critical roles.
   b. Sponsorship of specific events to support networking and discussion on issues
   c. Providing fact sheets, publications and information via the web and in hard copy
   d. Providing advice and assistance
   e. Other?

7. KEY ISSUES FOR STAKEHOLDER CONSIDERATION

The key purpose of this Discussion Paper is to introduce the concepts of ANTS to the key stakeholders in the mining and extractives industry sector in NSW. These concepts are an essential foundation to a set of skills for all stakeholders involved in the management and operation of the mining and extractives industry sector in NSW.

Whilst there are formal processes to manage and audit OHS performance in the mining and extractives industry sector in NSW, the vision to achieve World-leading OHS practice is dependent on the individuals involved to be able to effectively work together to achieve this common goal.

ANTS provide us with the basic skills that underpin the success of these formal processes.

We are interested in your views on how the usefulness of ANTS can be promoted by MSAC through the industry stakeholders. This includes the Unions, Employer Groups and the Regulator.

- MSAC could develop opportunities for the stakeholder groups to network together to discuss good practice for each of the relevant ANTS and to then imbed these into the respective integrated training programs. These could be targeted to develop workforce skills in safety critical roles.

- MSAC could also develop and provide a range of fact sheets, publications and information via the web and in hard copy to enable each of the companies and stakeholder groups to select the information for internal discussions.

- Alternatively, the MSAC could set up an expert access service for the provision of technical and practical advice and assistance to the stakeholders.

- MSAC may also be able to support the usefulness of ANTS through sponsorship of specific events to enable greater networking and discussion of the issues and their impact on the mining industry in NSW.

We would welcome suggestions for innovative, leading-edge engagement methodologies. We are also seeking feedback which guides future strategies MSAC may be able to put in place to promote the usefulness of ANTS.

The purpose of this discussion paper is to seek views from stakeholders in relation to how the NSW mining sector will embrace ANTS into our OHS programs and work processes and to define who should participate in embracing the ANTS as part of their specific roles.

While the MSAC and the industry wish to develop an engagement strategy designed to sustain an improvement in safety and performance through implementation of ANTS, it is acknowledged that each stakeholder may identify different issues of varying importance, according to their situation.

The MSAC is interested in receiving comments from as many stakeholders as possible across the NSW mining and extractives industry.

The Public Comment Template (Appendix A) is designed to assist individuals and organisations to provide feedback on the background and elements for the proposed implementation of ANTS.

It is planned that by using the template, the various responses can be analysed and suggestions highlighted. This will enable the World-leading OHS Culture Management Working Party to better use the feedback, through the MSAC partnership, to assess how to promote the usefulness of ANTS at the industry, employer, site and individual levels to foster sustained improvement in OHS before a final strategy is determined.

Further consultation may then take place with key stakeholders in the NSW industry to finalise implementation details of the strategy proposed and to gain support for its introduction.

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APPENDICES

Public Comment Template (Appendix A)

The proposed implementation of the ANTS program in the NSW Mining Industry

TO:		FROM:	
Name:	Executive Officer	Position title & Company:	
	MSAC Secretariat	☐ Comments not for publication – "tick if applicable".	
Mail:	Mine Safety Performance Branch PO Box 344 Hunter Region Mail Centre NSW 2310	**Postal Address:**	
Fax:	(02) 4931 6790	**Phone:**	**Fax:**
Email:	tim.crakanthorp@industry.nsw.gov.au	**Email:**	
Closing date:	**1 April 2010**	Date of submission:	

SPECIFIC COMMENTS (Please tick "Yes" or "No" boxes)

Question 1.

Do you agree that the five ANTS outlined in this paper are relevant for promotion to the NSW mining and extractives industry?

       YES ☐   NO ☐

Comments

     a. Which ANTS are relevant (situation awareness; decision making; communication; team work; leadership) and why?

     b. Which ANTS are not relevant and why?

     c. Are there other ANTS that should be promoted?

Question 2.
Will promoting the usefulness of ANTS to improve OHS culture be of benefit to industry stakeholder groups such as operators; contractors; individuals; unions; employer groups and the regulator?

YES ☐   NO ☐

Comment

a. If yes, indicate which groups would benefit and how?

b. If no, indicate why not

Question 3.
Are ANTS relevant to all who work in the industry, such as managers (including statutory positions); professionals; supervisors; workers and inspectors?

YES ☐   NO ☐

Comment

    a. If yes, indicate why for the types of workers outlined above?

    b. If no, indicate why not

Question 4.
Do you agree that promoting ANTS to improve consultation; participation; supervision and behaviour will influence OHS culture improvement in the NSW mining and extractives industry?

YES ☐   NO ☐

Comment

    a. If yes, indicate why and provide examples

    b. If no, indicate why not

Question 5.
How can the mining and extractives industry ensure that those who work in the industry are competent in using ANTS?

Comment

    a. Should they be explicitly assessed (yes/no) and why?

    b. Should they be integrated into risk management competencies (yes/no) and why?

Question 6.

Do you have a view on how the usefulness of ANTS can be promoted by MSAC through industry stakeholders such as the regulator, employer groups and unions? For example:

      a. Providing opportunities to network and discuss good practice

      b. Providing fact sheets, publications and information via the web and in hard copy

      c. Providing advice and assistance

      d. Other?

Comment

Question 7.

Do you have suggestions on future strategies MSAC may be able to put in place to promote the usefulness of ANTS in the NSW mining and extractives sector? For example:

      a. Integration into competencies and supporting operators to develop workforce skills in safety critical roles

      b. Sponsorship of specific events to support networking and discussion on issues

      c. Providing fact sheets, publications and information via the web and in hard copy

      d. Providing advice and assistance

Comment