Paper presented at the 10th AAvPA Symposium, 19-22 November 2012, Sydney, Australia

The State of the Nation: How mature are HF/NTS programs within the Australian airline industry?

DR GRAHAM EDKINS[1]
Leading Edge Safety Systems Pty Ltd

Introduction

In 2010 Leading Edge Safety Systems was contracted by the Australian Civil Aviation Safety Authority (CASA) to develop a guidance package (Safety Management Systems Civil Aviation Advisory Publication) for industry consultation on human factors program requirements. This package was later formalised in 2011 and released to industry in the form of Civil Aviation Order (CAO) 82.3 (low capacity regular public transport) and 82.5 (high capacity regular public transport). Regular public transport (RPT) operators were required by 1 June 2011 to develop a formal program to train and assess flight operations personnel in human factors and non technical skills (HF/NTS), with the aim of minimising error. From June to December 2011Phase 2 progress assessments were carried out by CASA with airlines across Australia to ensure operators were developing the HF/NTS training programs in accordance with agreed implementation plans.

This paper reports on the results of Phase 3; an independent assessment conducted by Leading Edge Safety Systems to determine the extent to which each Australian RPT operator has complied with its commitment to roll out their program and to assess the degree of compliance of each program against regulatory requirements.

Specifically this paper will provide an overall "state of the nation" assessment of the maturity of the passenger carrying sector of the industry in HF/NTS training and assessment; the first ever comprehensive report conducted on the entire Australian airline sector. The challenges experienced by operators, both large and small, in demonstrating how they are meeting the requirements will be outlined. In addition, data will be presented on the key HF/NTS program strengths found and common knowledge gaps that need more attention. The difficulties experienced by some operators in demonstrating HF/NTS program effectiveness and more specifically its direct relationship to overall safety management system effectiveness, will also be presented. Implications for passenger carrying operators and CASA will be discussed.

HF/NTS program requirements for airlines

ICAO and leading aviation safety organisations have identified 'system' related activities as the greatest contributor to improved aviation safety. This includes Safety Management Systems, Human Factors and 'data-driven oversight' – strongly supported by Flight Data Analysis Programs. (Commonwealth of Australia, 2012; ICAO, 2006).

In Australia, the implementation of CAO 82.3 and CAO 82.5 is representative of a systems approach to human factors and is reflective of the broader Civil Aviation Safety Regulation (CASR) 119 Implementation Project, which specifies safety management systems requirements for industry.

Australian RPT operators have been required to have in place an approved HF/NTS training and assessment program for their businesses since 1 June 2011. HF/NTS program submissions by RPT operators were assessed and approved by CASA during Phase One of the transition to the new regulatory requirements for all Australian airlines.

[1] Author for Correspondence: Dr Graham Edkins, Leading Edge Safety Systems; PO Box 833 Avalon NSW 2107; graham.edkins@leadingedgesafety.com.au; + 61 (0) 410 522 541

This 'approval' was primarily an endorsement of how each RPT was *proposing* to meet the regulatory requirements. The main CASA guidance material that operators utilised to assist with their proposals was CAAP SMS 3(1) (CASA, 2011).

Phase Two was conducted from June to December 2011 and involved non-punitive progress assessments for each RPT operator across Australia to ensure that the operators were developing the HF/NTS training programs in accordance with their agreed implementation plan submissions.

These progress assessments involved assessing the HF/NTS program using a CASA developed 'Human Factors (HF) and Non Technical Skills (NTS) Training Program Assessment Checklist', which details 18 elements aligned to CAO 82.3, CAO 82.5 and CAAP SMS 3(1).

The Phase 2 progress assessment determined the degree to which each element was "present" and "suitable" via:

- Reviewing the Operator's compliance statement (or equivalent);
- Reviewing the submission(s) (including the operator's Implementation Plan); and
- Assessing the content of the submission(s).

This activity determined if the operator's proposed plan or system complied with the legislative requirements. Document evaluation did not seek to establish if the plan or system described in the documents were implemented and/or operating effectively. This activity was reserved for the assessment process described below in Phase 3.

Methodology

In October 2011 CASA issued a Request for Quote (RFQ 11/152) 'Human Factors / Non Technical Skills (HF/NTS) Review' seeking specialist human factors contract resources to evaluate the HF/NTS programs of Australia's RPT airlines in operation. According to the RFQ, the successful contractor was expected to perform the following tasks:

- Determine the extent to which each Operator has complied with its commitment to roll out their program;
- Assess the degree of compliance of each program against the regulatory requirements;
- Liaise as necessary with CASA Regional Offices and subject matter experts;
- Prepare a report on each Operator's compliance; and
- Compile a comprehensive report on the overall performance of the industry to comply with the HF/NTS element of CAO 82.3 or CAO 82.5.

Leading Edge Safety Systems Pty Ltd, a specialist aviation Human Factors and Safety Management Systems consultancy organisation, was selected by CASA in November 2011. A contract was finalised and issued on 13th February 2012.

Leading Edge Safety Systems proposed a combination of tertiary qualified HF/NTS experts, ex CASA personnel and airline operationally experienced resources, comprising six senior consultants to ensure appropriate backup and the deployment of the best resource based on RPT operator size and location. The six consultants included:

1. Dr. Graham Edkins (Project Manager, Aviation Psychologist and HF/NTS expert);
2. Mr. Mike Nendick (Aviation Psychologist and HF/NTS expert);
3. Dr. Matthew Thomas (HF/NTS expert);
4. Ms. Joanne De Landre (HF/NTS expert);
5. Captain Todd Mickleson (HCRPT Line Captain and HF/NTS Facilitator); and
6. Captain Craig Martin (HCRPT Line Captain and Air Safety Investigator).

A work plan and review schedule was produced on 6th March 2012 for approval by CASA management and outlined three 'trial' assessments to be conducted through late March 2012. These three 'trial' assessments were expected to provide an opportunity for Leading Edge Safety Systems consultants to gain a better working knowledge of the CASA 'Human Factors (HF) and Non Technical Skills (NTS) Training Program Assessment Checklist;, and thereby sort out any application issues. The remainder of the assessment schedule was proposed from April through to the end of June 2012.

The review schedule was endorsed and CASA Regional Managers committed to provide field office inspector resources to accompany the Leading Edge Safety System consultants. The CASA resources included:

- Principal CASA inspector and primary contact; and

- Subject matter experts including Human Factors Specialists and Safety System Inspectors (SSI).

Roles and Responsibilities

A number of policies, procedures and templates were constructed to form the basis for the CAO 82.3 and CAO 82.5 capability assessment. These included an 'inspector toolkit' to assist CASA inspectors and subject matter experts (SME's) to undertake the task and establish consistency in application.

Specifically, the roles and responsibilities of Leading Edge Safety Systems consultants and CASA were clearly established. The role of the Leading Edge Safety Lead Assessor was to:

- Lead the assessment;
- Lead the substantive discussion with the Operator to determine the extent to which it complies with commitments to roll out its program;
- Assess the degree of compliance of each program against the HF/NTS program regulatory requirements; and
- Prepare a report on each Operator's compliance;

The role of the CASA Accompanying Inspector was to:

- Make initial contact with the Operator to explain the assessment process and date(s);
- Schedule (lock in) the assessment dates with the Operator and the contractor;
- Provide necessary operator HF/NTS historical documentation to the contractor
- Upon receipt of the assessment report, review and provide initial comment, provide final report to the operator; and
- Regional Office - take regulatory action(s) and/or arrange an Exit Meeting with the operator as appropriate.

The role of the CASA Human Factors Specialists was to:

- Provide CASA HF/NTS expert support to CASA inspectors before, during and after the assessment(s);
- Support a nationally-consistent CASA HF/NTS standards and assessment approach; and
- Develop CASA corporate knowledge of RPT Operator HF/NTS program status for improved future regional support.

HF/NTS Capability Assessment Tool

To ensure that the assessment for each RPT operator followed a consistent process the CASA developed 'Human Factors (HF) and Non Technical Skills (NTS) Training Program Assessment Checklist' was utilised. The checklist contains 18 elements aligned to CAO 82.3, CAO 82.5 and CAAP SMS 3(1), under four major headings:

1. HF/NTS Policy and Objectives
   a) Management Commitment and Responsibility
   b) Safety Objectives
   c) Just Culture
2. HF/NTS Program Development
   a) Training Needs Analysis
   b) Relevant Third Party Training Relationships and Interactions
   c) Courseware development
   d) NTS assessment process
3. Program Implementation
   a) NTS program implementation
   b) Evaluation of the NTS training program
   c) Maintain and continuously improve the NTS training program
4. NTS Records and Documentation
   a) Training Records and documentation
   b) Incorporation of NTS program requirements into Safety, Training and Ops Manuals.

The Phase 2 progress assessment involved determining the degree to which each element was 'present' and 'suitable'.

For Phase 3, the focus of the assessment was whether the HF/NTS program was 'operating' (how each element was demonstrated to be functioning at the time of the assessment) and 'effective' (whether each element was demonstrated to be functioning effectively).

RPT operators assessed
A total of 27 RPT operators were assessed as per Table 1 (13 HCRPT and 14 LCRPT).

Table 1. List of the 27 RPT Operators Assessed

Count	Legal Entity	Permission Type
1	Alliance Airlines Pty Ltd	HCRPT
2	Capiteq Ltd - *Trading as Airnorth*	HCRPT
3	Eastern Australia Airlines Pty Ltd & Sunstate Airlines (QLD) Pty Ltd - *Trading as Qantaslink*	HCRPT
4	Express Freighters Australia Pty Ltd	HCRPT
5	Jetstar Airways Pty Ltd	HCRPT
6	National Jet Express Pty Ltd & National Jet Systems Pty Ltd - *Trading as Cobham Aviation Services Australia*	HCRPT
7	Nauru Air Corporation - *Trading as Our Airline*	HCRPT
8	QANTAS Airways Limited	HCRPT
9	Skippers Aviation Pty Ltd	HCRPT
10	Skytrans Pty Ltd - *Trading as Skytrans Regional & Skytrans*	HCRPT
11	Skywest Airlines Pty Ltd	HCRPT
12	Tiger Airways Australia Pty Ltd	HCRPT
13	Virgin Blue Airlines Pty Ltd & Virgin Blue International Airlines Pty Ltd - *Trading as Virgin Australia Airlines*	HCRPT
14	Air Link Pty Ltd	LCRPT
15	Airlines of Tasmania Pty Ltd - *Trading as Par Avion*	LCRPT
16	Brindabella Airlines Pty Ltd	LCRPT
17	Chartair Pty Ltd	LCRPT
18	Golden Eagle Aviation Pty Ltd	LCRPT
19	Hardy Aviation (N.T.) Pty Ltd	LCRPT
20	Hinterland Aviation Pty Ltd	LCRPT
21	Matakana Nominees Pty Ltd - *Trading as King Island Airlines*	LCRPT
22	Regional Express Pty Ltd	LCRPT
23	Sharp Aviation Pty Ltd - *Trading as Sharp Airlines*	LCRPT
24	Sydney Seaplanes Pty Ltd	LCRPT
25	VEE H Aviation Services	LCRPT
26	Vincent Aviation (Australia) Pty Ltd	LCRPT
27	West Wing Aviation Pty Ltd	LCRPT

Findings

A simple stop light system was used to flag whether each operator was assessed as:

- **Red** - HF/NTS Program 'Non Compliant' (NC);
- **Amber** – HF/NTS Program 'Somewhat' (SW) Compliant - Recommendations for Improvement proposed; and
- **Green** – HF/NTS Program 'Mostly' or 'Fully' Compliant (MFC) – Recommendations for Improvement leading to 'Best Practice' suggested if applicable.

Table 2 provides a summary of the results across all 27 operators as to the spread of red, amber or green categories.

Table 2. Summary Results

Assessment Rating	Results by RPT type	
	HCRPT	LCRPT
Non Compliant (NC)	1	4
Somewhat Compliant (SW)	8	9
Mostly or Fully Complaint (MFC)	4	1
Total = 27	**13**	**14**

General Findings of Non Compliant Operators (NC)

Of the thirteen HCRPT Operators assessed, only one was found to be 'non compliant'. Four of the fourteen LCRPT Operators assessed were found to be non compliant. All these operators had made little progress since the last CASA assessment and were characterises by the following findings:

- Yet to implement their HF/NTS program beyond merely an awareness training initiative;
- Little or no evidence of skill or knowledge based assessment and inadequate human factors facilitator training;
- Generally lip service paid to the program with a minimalist approach adopted with a corresponding view that they 'only have an HF/NTS program because it is a CASA requirement';
- In many instances documentation was not able to be produced to demonstrate compliance;
- There was poor linkage observed between the HF/NTS program and the SMS and an immature understanding of the need for this. The HF/NTS program was largely seen as a 'have to do' training initiative rather than an integral part of the SMS; and
- No clear program objectives or measures in place to determine effectiveness.

Specifically in relation to the LCRPT operators:

- There was common use of Third Party Training Course Providers to provide a non-tailored off the shelf Computer Based Training (CBT) program. However, there was an over-reliance on the perceived expertise of the Third Party Training Course Provider and erroneous belief that the HFTS developed course is CASA 'approved'.

General Findings of Somewhat Compliant Operators (SW)

Nine HCRPT operators and eight LCRPT operators were assessed as 'somewhat' compliant to varying degrees. Operators in this category had yet to fully demonstrate the 'effectiveness' component in all CAO 82.5 or CAO 82.3 element areas as applicable.

General issues included:

- Lack of sophisticated, specific or measurable HF/NTS program objectives;
- Poor linkage between the HF/NTS training program and SMS performance outcomes;
- Little evidence of systematic use of SMS data (investigations) to facilitate HF/NTS training and assessment needs. Specifically, the HF classification system for event based investigations was often immature and surface level;
- Failure to fully implement effective skills-based training and assessment, particularly in cabin crew and flight operations safety sensitive roles;
- Not all Flight Operations Safety Sensitive Personnel have undergone training;
- Immature or non effective mechanisms to assess the behavioural and organisational impacts and effectiveness of the HF/NTS program;

- No LOSA style program in place or no specific plans to measure error management capability;
- No clear evaluation strategy of program effectiveness in place; and
- Management commitment to program observed but not as mature as should be.

In summary, operators at this level had failed to move far beyond the implementation of a simple awareness and knowledge based HF/NTS program. Historical CRM programs had merely been replaced with the label of 'HF/NTS' without any clear strategy or realisation of the potential benefit.

The 'skills' component of the NTS program in many cases was not systematically being trained and assessed to drive error management initiatives across the business. There appeared to be a poor understanding of how an HF/NTS program should be an integrated as an essential component of an SMS.

In regard to the HCRPT operators, key program elements like 'Just Culture' and 'LOSA' were either not implemented or yet to be fully integrated into the SMS. Use of behavioural markers was not always mature and operators at this level have not realised the value of integrating multiple data sources to form a comprehensive picture of the error tolerance capability of their system. For example, utilising a common framework for human factors event based data (investigations), check and training data (BM's) and predictive data (through LOSA like NTS markers).

General Findings of for Mostly or Fully Compliant Operators (MFC)

Four HCRPT operators and 1 LCRPT operator were assessed as mostly or fully compliant and were generally role model HF/NTS programs that should provide CASA with a degree of confidence that full compliance with CAO 82.5 or CAO 82.3 is achievable.

General characteristics of HF/NTS programs at this assessment level were:

- Good management commitment to the program;
- Highly knowledgeable and centralised program coordinators;
- HF/NTS program well integrated within the company SMS;
- Clear accountabilities for the HF/NTS program with good resources, well qualified and experienced key personnel and facilitators committed to ensuring the effective implementation of the program;
- Mature LOSA like programs in place for Flight and Cabin Crew, with behavioural observations implemented or being developed for all safety critical staff;
- Good progress on implementing all HF/NTS requirements including ground based training and assessment;
- Very well prepared for HF/NTS assessment with a mature approach representative of an established program being in place for some time; and
- Able to produce ample documentary evidence as proof of 'implementation' and 'effectiveness';

However, despite the above positive findings, all operators at this level still struggled to articulate how they were using group behaviour or organisational outcome metrics, to measure how the HF/NTS program was contributing to improvements in SMS effectiveness.

This indicates that practical strategies and example guidance material to demonstrate clear linkages between HF/NTS training and assessment and SMS performance are required across the industry.

Challenges and Implication for Industry

Key HF/NTS program strengths

The majority of RPT operators assessed demonstrated well established, and for the most part, mature flight crew HF/NTS programs. This is hardly surprising given the long history of CRM under CAR 217 training organisations.

Some operators had integrated CAO 82.3 or CAO 82.5 HF/NTS training with Part 145 human factors requirements suggesting a future potential direction for legislation. The rationale for this integration was that the human factors issues of these two groups are similar, and integrated training results in improved understanding between potentially disparate functional groups. However, the dissimilarity between CAO 82.3 and CAO 82.5 with the human factors requirements of Part 145 makes this much more challenging than it should be. CASA should consider addressing this difference in the future, to encourage an integrated human factors approach.

In summary, the generally sound awareness based HF/NTS programs observed are symptomatic of the long evolution of CRM programs within the Australian aviation industry since the 1980's. However, awareness based human factors programs will result in only limited effectiveness for improved organisational safety performance. Unless safety critical personnel are provided with more specific skill based training (NTS), and these skills are regularly assessed, the error management capability of the organisation to protect itself against catastrophic events is difficult to determine.

Skill based assessment not typically extended beyond flight crew

While flight crew skills based assessment of HF was generally well established in many organisations, very few operators had extended this beyond flight crew centric programs into the skill based assessment of ground based Flight Operations Safety Sensitive Personnel.

Of concern was the disparity between flight crew and cabin crew programs. Very few operators were assessing or intended to assess cabin crew non technical skills. For the most part, this was due to the CASA CAAP not explicitly requiring cabin crew assessment, consistent with ICAO guidance on this matter.

However, other HCRPT operators clearly saw the benefit of regularly assessing the non technical skills of the cabin 'air crew' team and either had partly implemented cabin crew NTS assessment programs or were in the process of developing them. Indeed some operators had interpreted the CAAP as NTS assessment applying to all roles specified in the requirement, including that of cabin crew. There is a need for both CASA and industry to come to an agreed view on this issue, given the obvious benefit of capturing safety behaviour focused data on cabin crew.

Poorly articulated HF/NTS program objectives

Item 3 in the CASA developed 'Human Factors (HF) and Non Technical Skills (NTS) Training Program Assessment Checklist' specifies the following: *The HF/NTS program objectives state an intended safety outcome in relation to the minimisation of Human Error.*

In the vast majority of operators assessed, there was a poor articulation of how to achieve error minimisation objectives and no specific metrics or strategies implemented to do this. Some operators were just intent on meeting the minimum regulatory requirement and not realising the benefits of reducing consequential errors.

There appeared to be a lack of understanding of the need for clear error management program objectives other than broad statements about human factors training. For example, the objective of the HF/NTS program of one HCRPT operator was to; '...reduce the number of incidents involving human factors'. This is a short sighted and misconceived objective, given that almost all incidents have a human factors component and more incident reports can sometimes be indicative of a better safety culture. Reducing the potential for consequential errors and resultant incidents may be a more desirable objective.

Of concern is the confusing and potentially misleading interpretation of the term 'error minimisation' by industry stakeholders. For example, it is not the number of errors key personnel make, that should be of concern given the well accepted view on 'error normalisation' (Dekker, 2002). In contrast, it is the nature (and type) of errors, and the potential for consequential outcomes, that should be of more concern. Therefore, HF/NTS programs need clear error management objectives, specifically aimed to reduce the potential for consequential errors.

These error management concepts are much better aligned to CASA's philosophy on HF/NTS program integration within the SMS. In other words, in order to reduce the number of consequential errors, the focus of an organisations' SMS is really about developing 'error tolerant systems' (Rouse & Morris, 1987). For example, in practice the development of an error tolerant system goes beyond merely re-training people who commit errors, but designing each component within the organisation to minimize errors; know where errors are most likely to occur and their probable effects; and establish a culture where everyone is on the lookout for errors and is motivated to prevent them from cascading into an accident. There is clearly the need for some more definitive industry guidance to assist in reducing the confusion around error minimisation objectives.

Informal Just Culture Programs

Item 4 in the CASA developed 'Human Factors (HF) and Non Technical Skills (NTS) Training Program Assessment Checklist' specifies the need for Just Culture to be an integral part of the program: *Just culture is referenced and embedded throughout the training program.*

There were a lot of 'motherhood' statements about Just Culture, but little formal or documentary evidence that there was a transparent management review process in place to demonstrate Just Culture in action.

While many operators could produce Just Culture policy statements signed by the CEO or Chief Pilot, very few could demonstrate they had a consistent process in place through a Culpability Decision Matrix or equivalent.

Without a clearly documented Just Culture policy, it is difficult for an organisation to demonstrate (other than a signed management commitment statement) that they have a process that is repeatable and consistent. A formal process also provides a paper trail in the event of disputes about consequence management outcomes. It also makes little sense to discuss Just Culture principles in a training environment, without a formalised process as a reference point.

Of more concern, was that virtually all operators assessed as either 'somewhat compliant' or 'non compliant' appeared to have an immature understanding of the clear difference between errors and violations, and therefore potential consequence management implications. This is illustrated in the Figure 1:

Figure 1: Errors and Violations

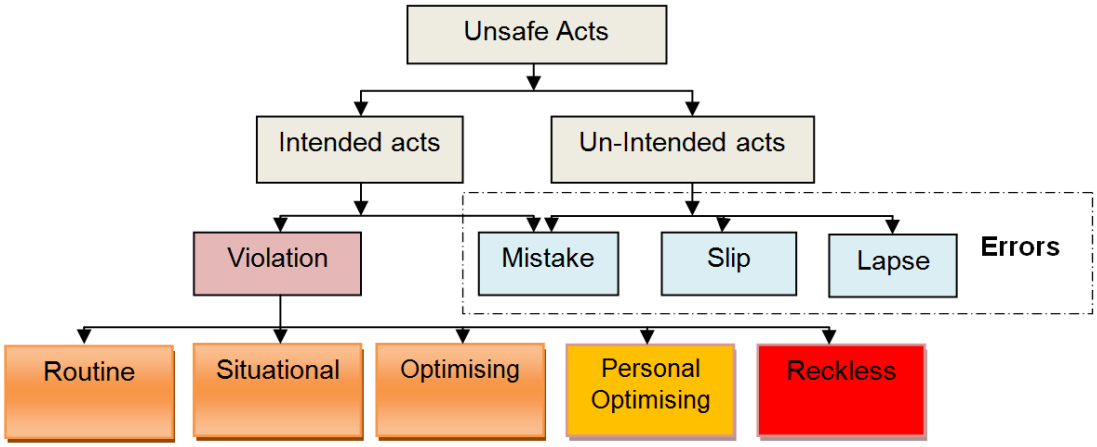

Figure 1 illustrates that there are very different types of violations within an organisation; some of which may result in discipline and others that are indicative of cultural problems (e.g. routine violations) rather than issues with a specific individual (personal optimising or reckless violations). How an organisation deals with this consistently is crucial to an effective Just Culture program and the trust in the system and its processes that this engenders.

During the Phase 3 capability assessment process it was clear that there was often a more simplistic understanding of non-compliance behaviour amongst industry stakeholders with a high potential for Just Culture to be misused as a process.

Training Needs Analysis

There were very few good examples of comprehensive training needs analysis (TNA) being conducted. There appeared to be a poor understanding on what constitutes a TNA or even the need to do one. The conduct of a TNA should not be a one-off activity but a regular process to ensure that training is meeting the needs of the organisation and gaps in knowledge, skills and awareness are being addressed. There was even less comprehension of the need to conduct a Risk Based TNA on a regular basis to inform the focus for recurrent training and assessment.

Poor Integration of HF/NTS Data

Almost without exception, the most common limitation of the HF/NTS programs assessed was the lack of integration of different sources of human factors data. For example, different behavioural marker assessment frameworks were often observed to be in use for flight crew line checks, simulator assessments and normal operations (LOSA) monitoring, making group behaviour comparisons difficult. Additionally, for event based data, human factors causal factors frameworks were different again and not able to be integrated with check and training and safety observational type programs. In summary, very few Operators had managed to develop a sound framework to capture predictive

(LOSA), reactive (event based investigations) and check and training line assessment data within a common framework to analyse emerging HF/NTS issues.

An integrated framework provides a valuable opportunity to identify SMS deficiencies and other needed improvements.

Use of Third Party Training Providers

Nine of the LCRPT operators assessed were using third party training providers to develop their HF/NTS training programs. These programs are predominantly Computer Based Training (CBT) applications to promote HF awareness. The vast majority of these programs were characterised by very little or no skill based component and no assessment of NTS.

The use of these third party training providers has resulted in the following observed issues in these organisations:

- Lack of sophisticated, specific or measurable HF/NTS program objectives;
- Poor linkage between the HF/NTS training program and SMS performance outcomes;
- A significant shift of ownership for the program and delegation of responsibility to the external provider. For example, some Operators have a manual that refers to document control and positions (fleet administration manager or safety manager) that do not exist;
- A misperception that the CBT course provided by HFTS is 'CASA approved';
- The HF/NTS manuals developed by the third party training provider were often not tailored to the operator. For example, some operators have manuals that refer to cabin crew when they do not employ any cabin crew;
- There has been very little tailoring of the program to the operating environment and risk profile of the organisation (for example operating in the tropics);
- There was often confusion over accountabilities and responsibilities for the HF/NTS program between the third party service provider and the operator; and
- It was evident in many cases that there was a minimalistic view adopted by management where a CBT course has largely replaced the need for face-to-face training.

The requirements of CAO 82.3 and CAO 82.5 clearly do not delegate the responsibility for ongoing HF/NTS training and assessment to a third party. While, a third party provider can be used it is still up to the operator to ensure that the provider is providing a service to meet the legislative requirements.

The view by some LCRPT operators that a specific third party HF/NTS course is CASA approved is erroneous. While CASA approves an operator's HF/NTS program based on legislative requirements, it is not in the business of providing approval to a particular course offered by a specific training provider. It is the responsibility of the operator to determine if the training being offered meets their requirements.

Furthermore, there is a need to ensure that operators, particularly at the lower tier of the RPT sector, understand the need to go beyond a mere CBT HF awareness course. A CBT awareness course does not meet the requirements or intent of CAO 82.3 given that the training of skills and assessment of NTS was not observed in the vast majority of LCRPT operators.

Integration of HF/NTS into SMS generally not demonstrated

The integration of the HF/NTS program into an organisations' SMS was often poorly demonstrated. While some operators discussed informal linkages, through meetings and committees, there was typically a poor understanding of how to document and achieve this.

A common view was that an HF/NTS program was simply a training initiative and that this was adequate to meet the regulatory requirements. There was a distinct lack of understanding of the benefits of using HF/NTS initiatives as an indicator of SMS performance.

This is clearly an area that both CASA and industry leaders needs to drive harder, given that human performance issues dominate data on aviation safety.

CASA have taken a world leading approach with CAO 82.3 and CAO 82.5 in that there is a requirement to demonstrate linkages between the HF/NTS program and the organisations SMS. But there is a clear knowledge gap on how best to achieve this.

CASA CAAP Design and Content

The design and content of the CAAP could be improved. An indication of needed improvement is the misinterpretation for the need to assess cabin crew NTS. Some parts of industry have interpreted

that cabin crew only need to be trained and assessed for knowledge and awareness. Other operators have interpreted the requirements differently.

It is suggested that CASA consider redesigning the CAAP to better reflect the structure of the 'Human Factors (HF) and Non Technical Skills (NTS) Training Program Assessment Checklist'.

The utilisation of the checklist by Leading Edge Safety Systems across 27 RPT operators has demonstrated a degree of utility. This checklist provides a far better and more transparent indication of the key elements of an HF/NTS program than is obvious within the current CAAP structure and content.

The CAAP in itself is very outcome based and while this may have been CASA's intention it has resulted in an inability of operators to demonstrate specific ways in which they are complying. For example, the CAAP is not prescriptive regarding the time period and duration of HF/NTS recurrent training. For example, one HCRPT operator merely provide a one-hour training session as part of their annual Emergency Procedures training while others provide a full day on human factors every year. Another HCRPT operator have proposed a recurrent program every 18 months as opposed to the industry 'standard' of annually.

While outcome based regulation effectively places the onus on the operator to make a case to CASA that its proposed program meets the intent of the legislation, there needs to be better guidance material on specific ways to comply. The current 'one size fits all' approach is less effective for less mature operators. A mixture of prescriptive minimum requirements for the less sophisticated and complex operators, and outcome based requirements to encourage continuous improvement towards the attainment of 'best practice' may be a better approach for the regulatory guidance material.

Scalability

The requirements of CAO 82.3 do not have scalability for smaller operators and has been poorly interpreted by lower-tier RPT operators particularly as simply replacing CRM training for HF/NTS awareness. This is perhaps reflective of the non-specific nature of the CAAP and the need for more practical examples of how a smaller operator could comply.

For example, in the assessment of one LCRPT operator it was clear that they have adopted a simple Threat and Error Management (TEM) framework to collect data about safety risks as well as train their flight crew in specific TEM skills for their operating environment. This is a scaled example of an HF/NTS training program clearly linked to the SMS, appropriate for the size and scale of the operator (2 LCRPT aircraft and eight pilots).

HF/NTS Program Assessment Checklist

While the CASA 'Human Factors (HF) and Non Technical Skills (NTS) Training Program Assessment Checklist' provides some guidance on what constitutes an HF/NTS program, the checklist needs to contain more definitive examples of what to look for within small, medium, and large operators. If the checklist is to be continued to be used by CASA inspectors, as well as provided in advance to operators to ensure that they are fully prepared for a CASA assessment, additional information needs to be inserted against each element. For example, what should a Just Culture Policy consist of and how would an assessor seek evidence to validate that it is effective?

The experience of Leading Edge Safety Systems was that the CASA checklist formed a useful and transparent document to send ahead of time to RPT operators to do their own 'self assessment' prior to the CASA formal assessment. Of note several operators were very well prepared for the Phase 3 Capability Assessment, as they had self completed the checklist ahead of time.

It is recommended that the CASA checklist be reviewed for two reasons:

- To reduce overlap and repetition in the high level descriptive statements for the main elements, versus the descriptive statements for the sub-elements, and to ensure a more logical order and grouping of the sub-elements.
- To insert specific examples for CASA inspectors about what to look for when assessing whether an Operator complies, 'somewhat' complies, or does not comply with the requirements of each element.

Inspector expertise

Throughout the Phase 3 Capability Assessment process, feedback from the vast majority of accompanying CASA team members was that they were not comfortable with their own knowledge

and understanding of HF/NTS. This is not a criticism of CASA inspector expertise but a reflection of the specialist nature of the subject matter.

According to the majority of inspector feedback, the half-day internal CASA awareness training received on HF/NTS was inadequate to equip them with the knowledge and skills necessary to conduct this kind of assessment. Some CASA staff had not yet received any HF/NTS training prior to observing the assessments. While the author of this report has not had the opportunity to review the Human Factors and Non Technical Skills Training and Assessment Course offered through the CASA Safety Education Section, it appears that this course may not adequately meet the needs of the inspectors.

More specifically, many expressed a view that they would not feel comfortable assessing an operator on HF/NTS program requirements without the assistance of an SME. There is strong recognition that expertise is required to revisit this assessment process in the future.

There is no doubt a sound knowledge of HF/NTS is a crucial pre-requisite in conducting a comprehensive assessment of an operators program. It was evident to the specialist Leading Edge Safety Systems assessors that the quality of the previous 'Phase 2' assessment was not thorough enough in some cases. For example, some of the ratings that were assessed as fully 'present' and 'suitable' in the Phase 2 CASA assessment were not even 'present', let alone 'operating' and 'effective' when examined in Phase 3.

Such non-representative ratings are indicative of a previously superficial assessment process and assessors not always knowing what specifically to look for. Confirmation of this view was expressed by comments from accompanying CASA inspectors to the Leading Edge Safety Systems assessors that they had learned a lot about HF/NTS from observing how the Phase 3 Capability Assessment process was conducted.

In future, CASA should consider how best to continue to assess and monitor the maturity of the industry's compliance with CAO 82.3 and CAO 82.5. However, to do this CASA needs to further develop its own HF/NTS capability.

The CASA Human Factors Specialists (SME's) have a crucial role to play in whatever direction is chosen. Throughout the Phase 3 Capability Assessment process the three SME's involved added significant value to the process.

CASA needs to consider how best to utilise its own internal human factors SME's to champion the ongoing assessment and monitoring of industry maturity with CAO 82.3 and CAO 82.5. While utilising external human factors contractor expertise for assessments is one option, this does not necessarily help to facilitate improvements in CASA's internal capability.

Challenges and Implication for Industry

This review has clearly indicated that the maturity of both airline operators and CASA in regard to HF/NTS program knowledge and effectiveness is a work in progress. The following strategies are proposed:

- CASA should produce a clear position on their expectations regarding cabin crew NTS programs and skills assessment, and communicate this to industry to provide clear interpretation of requirements;
- CASA should reiterate to industry that awareness CBT initiatives do not fulfil the requirements for skills based training and assessment;
- CASA should provide a clear statement about its position on 'approving' HF/NTS training programs to ensure that there is no confusion about 'CASA approved' HF/NTS training courses offered by third party training providers;
- CASA should work with industry stakeholders and subject matter experts to provide more definitive industry guidance material on the following:
    - How to better integrate a HF/NTS program into an Operator's SMS?
    - More practical examples of what constitutes a Training Needs Analysis (TNA) and Risk Based Training Needs Analysis (RBTNA) for both large and small RPT operators;
    - More practical examples of how HF/NTS program data can be integrated to better drive SMS outcomes;
    - More practical guidance material on how smaller RPT operators can better demonstrate compliance by including example program initiatives; and

  - Misleading error minimisation HF/NTS program objectives should be replaced with more practical information about error management objectives as a means of improving SMS effectiveness.

- CASA should provide an example Just Culture Policy to industry to improve the level of understanding and encourage more consistent and transparent processes;
- CASA should consider reframing the CAAP so that it is better aligned with the elements of the 'Human Factors (HF) and Non Technical Skills (NTS) Training Program Assessment Checklist';
- CASA should review the HF/NTS Assessment Checklist to better structure the content, reduce repetition, and provide more definitive examples of what constitutes full and partial compliance with the regulations;
- CASA should review its internal human factors capability to determine how best to conduct ongoing industry HF/NTS program assessments in the future to an appropriate and thorough standard;
- CASA should provide feedback and commend all HCRPT and LCRPT operators assessed as "mostly or fully compliant" for their efforts to date and their 'industry leading' HF/NTS programs.

In conclusion, this report provides a valuable summary of the current level of HF/NTS program maturity across all Australian RPT operators. However, the information contained in this report needs to be used by both CASA and passenger carrying operators to ensure that there is not a minimalist approach to HF/NTS program implementation and that continuous improvements are being achieved for the benefits of fare paying passengers having implicit trust in the safety of the Australian airline industry.

References

CASA. (2011). *Non Technical skills training and assessment for regular public transport operations*. (CAAP SMS 3-1). Canberra: Civil Aviation Safety Authority.

Commonwealth of Australia. (2012). *Australia's State Aviation Safety Program*. Canberra: Department of Infrastructure and Transport.

Dekker, S. (2002). *The re-invention of human error*. Technical Report 2002-01. Lund University.

ICAO. (2006). *Safety oversight manual*. (First Edition) Montreal: International Civil Aviation Organisation.

Rouse, W.B. & Morris, N.M. (1987). Conceptual design of a human error tolerant interface for complex engineering systems. *Automatica*, 23(2): 231-235.