Safety Regulation Group

Civil Aviation Authority

CAA PAPER 2003/11

Safety Health of Aviation Maintenance Engineering (SHoMe) Tool: User Guide

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Enquiries regarding the content of this publication should be addressed to:
Research Management Department , Safety Regulation Group, Civil Aviation Authority, Aviation House, Gatwick Airport South, West Sussex, RH6 0YR.

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List of Effective Pages

	Page	Date
	iii	25 November 2003
	iv	25 November 2003
	1	25 November 2003
	2	25 November 2003
	3	25 November 2003
	4	25 November 2003
	5	25 November 2003
	6	25 November 2003
	7	25 November 2003
	8	25 November 2003
	9	25 November 2003
	10	25 November 2003
	11	25 November 2003
	12	25 November 2003
	13	25 November 2003
	14	25 November 2003
	15	25 November 2003
	16	25 November 2003
	17	25 November 2003
	18	25 November 2003
Appendix 1	1	25 November 2003
Appendix 1	2	25 November 2003
Appendix 2	1	25 November 2003
Appendix 2	2	25 November 2003
Appendix 2	3	25 November 2003
Appendix 2	4	25 November 2003
Appendix 2	5	25 November 2003
Appendix 2	6	25 November 2003
Appendix 2	7	25 November 2003
Appendix 2	8	25 November 2003
Appendix 2	9	25 November 2003
Appendix 2	10	25 November 2003
Appendix 2	11	25 November 2003
Appendix 2	12	25 November 2003
Appendix 3	1	25 November 2003
Appendix 3	2	25 November 2003
Appendix 3	3	25 November 2003
Appendix 3	4	25 November 2003
Appendix 3	5	25 November 2003
Appendix 3	6	25 November 2003
Appendix 3	7	25 November 2003
Appendix 3	8	25 November 2003
Appendix 3	9	25 November 2003
Appendix 3	10	25 November 2003
Appendix 3	11	25 November 2003
Appendix 3	12	25 November 2003

	Page	Date
Appendix 4	1	25 November 2003
Appendix 4	2	25 November 2003
Appendix 4	3	25 November 2003
Appendix 4	4	25 November 2003
Appendix 4	5	25 November 2003
Appendix 4	6	25 November 2003
Appendix 4	7	25 November 2003
Appendix 5	1	25 November 2003
Appendix 6	1	25 November 2003
Appendix 6	2	25 November 2003
Appendix 7	1	25 November 2003
Appendix 7	2	25 November 2003
Appendix 8	1	25 November 2003
Appendix 8	2	25 November 2003
Appendix 8	3	25 November 2003
Appendix 8	4	25 November 2003
Appendix 8	5	25 November 2003
Appendix 9	1	25 November 2003
Appendix 9	2	25 November 2003

Contents

1 Background to the Basic Software

This report describes a 'safety health' measurement tool that was developed for the CAA to establish the current level of key safety indicators within the aircraft maintenance industry. One outcome of this work is a computer based questionnaire measurement tool that can be used by aircraft maintenance organisations to obtain an objective measure of key safety indicators that could affect the quality, reliability and safety of their maintenance operations. The tool can either be used as a 'one-off' or repeated at intervals to monitor the effects of any safety initiatives or other changes.

This report describes the measurement tool and provides information to help those maintenance organisations wishing to run the tool.

A report detailing the development of the tool is available from the CAA as CAA Paper 2003/10.

1.1 Description of the Tool

Accident statistics, and other direct indicators, can be a poor indicator of an organisation's susceptibility to human error and other human factor problems. Measures of human factors issues that have, or could, impact on attitudes and behaviour of those associated with aircraft maintenance are more relevant, and these form the basis of this tool.

Many of the staff employed by a maintenance organisation could affect the overall quality and reliability of the maintenance work, whether or not they are engaged in 'hands-on' maintenance on the aircraft. For example, errors made in planning and in the supply chain could both affect the work of the front-line engineers.This tool is intended for three distinct categories of staff:

- Technical Certifying Staff – Staff who work directly on aircraft and/or their components and are able to certificate completed work, for example licensed aircraft engineers, JAR 66 B1 and B2 engineers or equivalent.
- Technical Non-Certifying Staff – Staff who work directly on aircraft or their components who may have a delegated authority (sometimes called delegated tradesman) or no authority to clear work cards.
- Management and Technical Support Staff – Staff who work in, or manage, technical areas, for example people involved in planning, stores/supply chain, technical services, defect analysis, maintenance schedules and technical records.

The tool therefore needs to cater for both hands-on engineering staff and technical support staff. Separate variants of the questionnaires have been developed for each group.

The basic tool comprises three sections:

a) A generic version, tailored for each group of staff.

b) A questionnaire concerning job difficulties (for Technical Certifying Staff and Technical Non-Certifying Staff).

c) A questionnaire concerning problems encountered during the last 6 months (for Technical Certifying Staff and Technical Non-Certifying Staff) - referred to as the organisational questionnaire.

Table 1 Structure of the Tool

Function Type	Generic Questionnaire	Job Difficulty Questionnaire	Organisational Questionnaire
Tech Certifying Staff	Version 1	Standard	Standard
Tech Non-Certifying Staff	Version 2	Standard	Standard
Management and Tech Support Staff	Version 3	N/A	N/A

1.2 Generic Questionnaire

The Generic Questionnaire addresses indicators of safety climate that could cause future problems. There are three versions of the Generic questionnaire which reflect a common structure, although the number and nature of the questions vary slightly to reflect the different groups of staff. Staff are asked to state whether they agree or disagree with a number of statements using a conventional '5 point' Likert Scale.

Copies of the generic questionnaires for the three groups of staff are given in Appendix 2 for Technical Certifying Staff, Appendix 3 for Technical Non-Certifying Staff and Appendix 4 for Management and Technical Support Staff.

1.3 Organisational Questionnaire

The Organisational Questionnaire identifies those factors that have actually caused a maintenance operator difficulties. The results complement the Generic Questionnaire, that addresses other indicators of safety climate that could cause future problems.

The organisational questionnaire forms a key part of the tool. The same organisational questionnaire is given to both Technical Certifying and Technical Non-Certifying Staff. It is not given to Management and Technical Support Staff who are not involved directly in hands-on maintenance.

This part of the tool has been developed to provide a detailed insight into how a number of 'organisational factors' are likely to negatively impact on maintenance performance. This part of the tool addresses a wide range of factors ranging from those associated with the basic ergonomics of the aircraft and tools and equipment to aspects of the safety culture of the work group and organisation. Copies of the actual questionnaires are given in Appendices 2 and 3. Technical Certifying Staff and Technical Non-Certifying Staff are simply asked to put a tick against anything which, during the last 6 months or so, has:

- caused them or a colleague to make a mistake;
- caused them or a colleague confusion or uncertainty over a job(s); or
- otherwise affected airworthiness.

1.4 Job Difficulty Questionnaire

The Job Difficulty Questionnaire seeks to identify which parts of the job are causing the maintainers the most difficulties and hence where remedial actions are likely to be best directed. However, some caution is needed with its use, as it cannot be assumed that any of the human factors root issues identified by the other questionnaires necessarily applies to the part of the job with the biggest reported difficulty. For example, a root problem associated with working conditions may not apply to the part of the job dealing with the planning aspect of the job.

Technical Certifying Staff and Technical Non-Certifying Staff are simply asked to place a 'tick' against each of the eight activities they actually performed over the past month or so. Then only for those actually ticked, respondents indicate in additional columns the level of difficulty they generally experienced performing these task parts. This is selected from: 'no problems', 'some problems', and 'major problems'.

Copies of the Job Difficulty Questionnaire may be found in Appendices 2 and 3.

2 Using the Questionnaire

2.1 Sample Population

The rule of thumb is that the more staff who fill in the questionnaire, the more valid the results are likely to be. However, you will need a minimum number of completed questionnaires, both to ensure confidentiality of individual responses and also to ensure that the results are not unfairly biased by the view of a minority.

What is important is to obtain completed questionnaires from a representative sample of staff, i.e. enough Technical Certifying Staff, Technical Non-Certifying Staff, Management and Technical Support Staff, including those who work shifts (if appropriate) and those who don't, those who have been with the company for many years and those who are fairly new joiners, permanent staff and contractors, line/base, etc. It is often possible for specific cultures to exist within companies (e.g. at a particular base, outstation, or even shift) and that can skew the results if the questionnaires are not administered representatively.

If the number of staff within each category is likely to be small, consideration should be given to dispensing with the demographic data collection (but you will still need the Technical Certifying Staff/Technical Non-Certifying Staff/Management and Technical Support Staff distinction) in order to convince staff that individual responses are not identifiable.

The timing can be important, avoiding times of industrial unrest or days when a particular issue is likely to be very topical (e.g. if there has been a recent incident involving someone signing off a task without checking it first).

It may be a good idea to integrate the application of the questionnaires as part of the company human factors training. Once an initial measure has been obtained, it could be repeated when continuation training takes place, as part of the feedback process.

2.2 Administering the Questionnaires

Copies of the questionnaires for the Technical Certifying Staff, Technical Non-Certifying Staff, and Management and Technical Support Staff are available in the Appendices. A non-pdf version of the questionnaires is also included on the CD containing the analysis tool software. The printed versions of the questionnaires should be modified to include your company name on the front covers, prior to distribution.

It is important that the appropriate questionnaire is given to each respondent.

The questionnaires can be administered in a number of ways. However, it is recommended that they are not simply issued to the workforce and collected at the end of the day or week as this tends to result in some people getting together and the questionnaires being completed 'by committee'. This may compromise the validity of any results.

The preferred method is to gather respondents into small groups in a quiet room, explain the purpose of the questionnaire, and to encourage them to fill them in

independently and as honestly as they can before returning them anonymously into a central box/container. This also helps ensure that each respondent is issued with the appropriate type of questionnaire. A short presentation by a manager and union official may also help reassure the staff that the results are to help identify where improvements are needed (and not for any other purpose) and to stress that the results are anonymous.

The time needed for the engineers to complete the questionnaires is not insignificant at about 30 minutes. However, it is hoped that the value of the tool outweighs this time commitment cost. The shortest questionnaire for the non-technicians should take about half this time. Whilst it is not necessary for all staff to complete the questionnaires, the results have greater validity the more staff complete them.

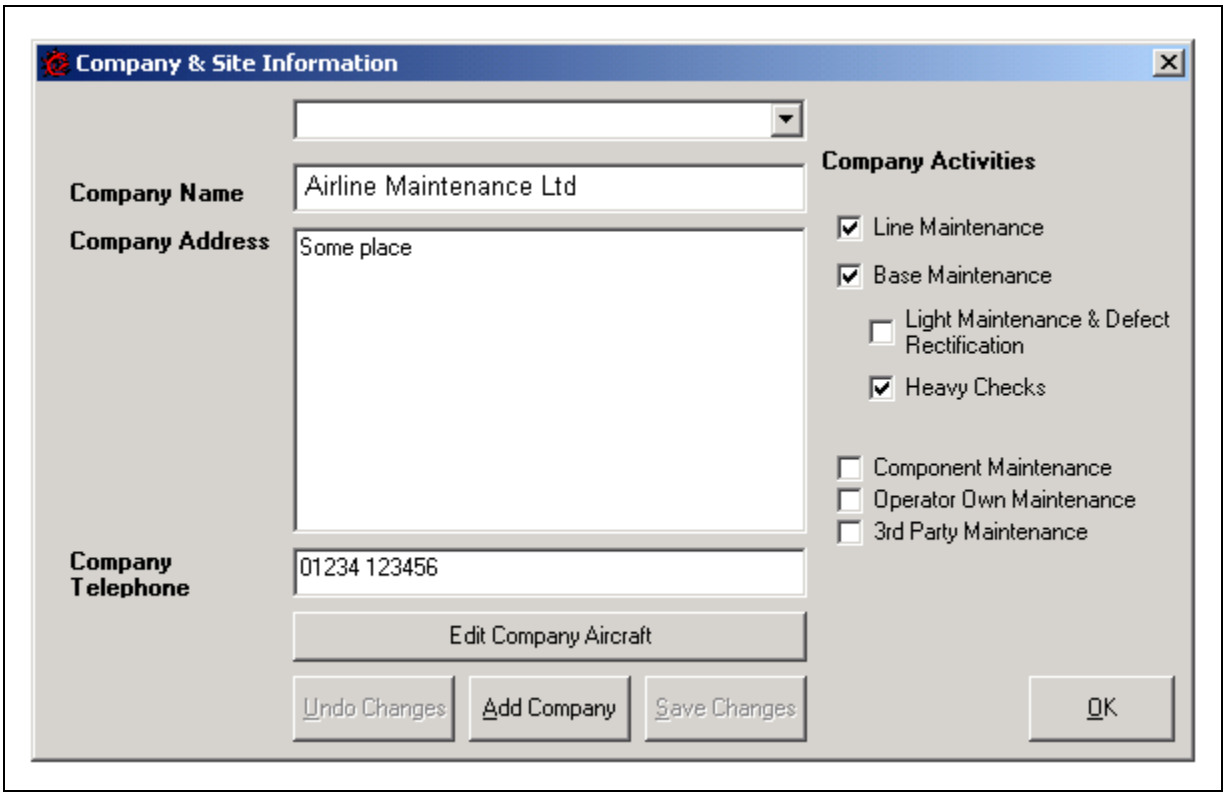
3 Data Entry

It will be necessary to enter all the questionnaire data into the SHoMe tool. This will take about 5 to 10 minutes per questionnaire. The software contains few data validity checks, therefore care should be taken with data entry, especially when selecting the appropriate 'Certifying Staff', 'Non-Certifying Staff', 'Management and Support Staff' options. Partially completed questionnaires may be entered, although fully completed questionnaire sets are preferable.

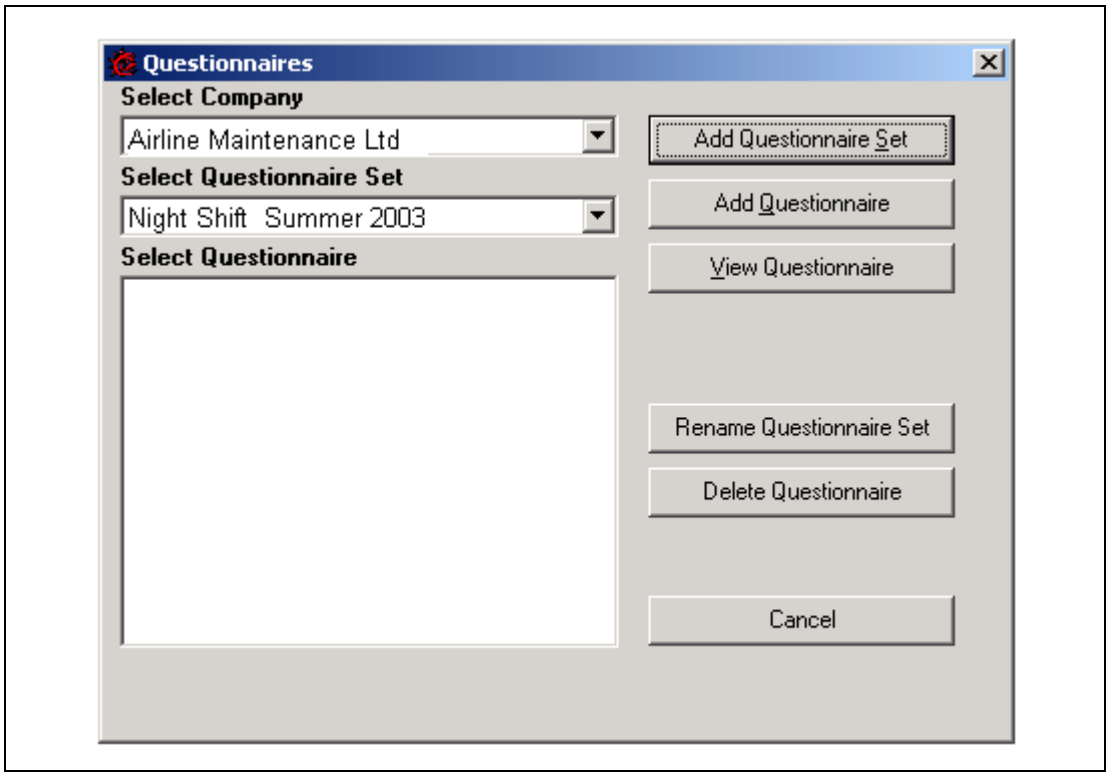
3.1 Inputting Data in SHoMe Tool

To start with, you need to enter some company details. Select "Enter Company/Site Details" button on the opening screen and then select "Add Company". Details of the company can then be entered onto the following screen and then "Save Changes".

If you have already set up your company then use the drop down arrow on the very first blank box to show all the companies already set up.

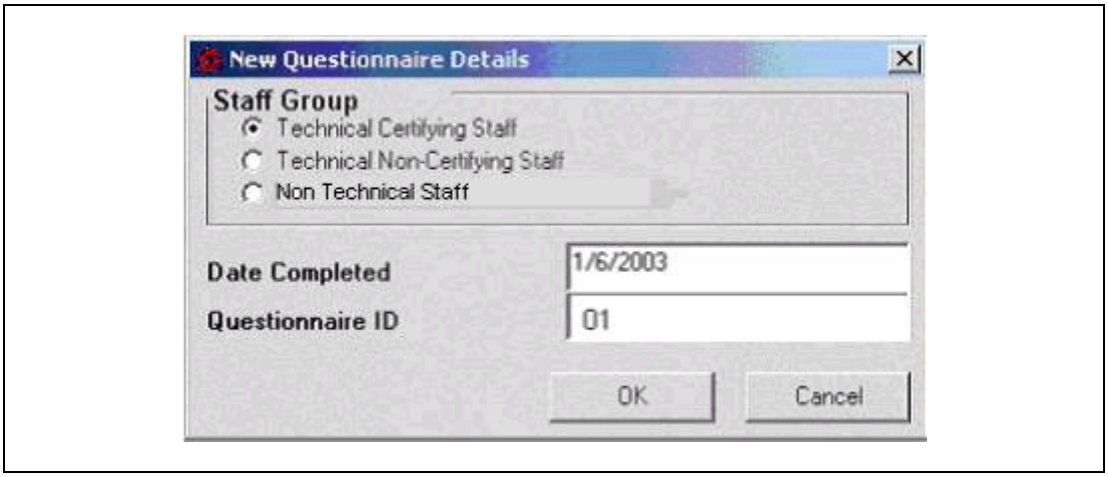


After inputting the company details, the next task is to input the data from the staff who have completed the survey (i.e. the paper questionnaires). Select the "Enter Questionnaire results" button on the front screen. As a company may wish to use this programme for different parts of the organisation, or to repeat the survey at a later date, it is necessary to give each survey a unique name, (for example, Airline Maintenance Ltd - Night Shift Summer 2003). This can be done by selecting the "add questionnaire set" button, then typing in the questionnaire name in this example "Night Shift Summer 2003" as shown below:



Now the questionnaire set has been identified you may add the questionnaire results by selecting "Add Questionnaire" The screen below will appear.

The date the questionnaire was completed and a unique identifier are required; for example you may be adding the 1st questionnaire from the "Night Shift Summer 2003" questionnaire set and use "01" as the identifier. Then select "OK"

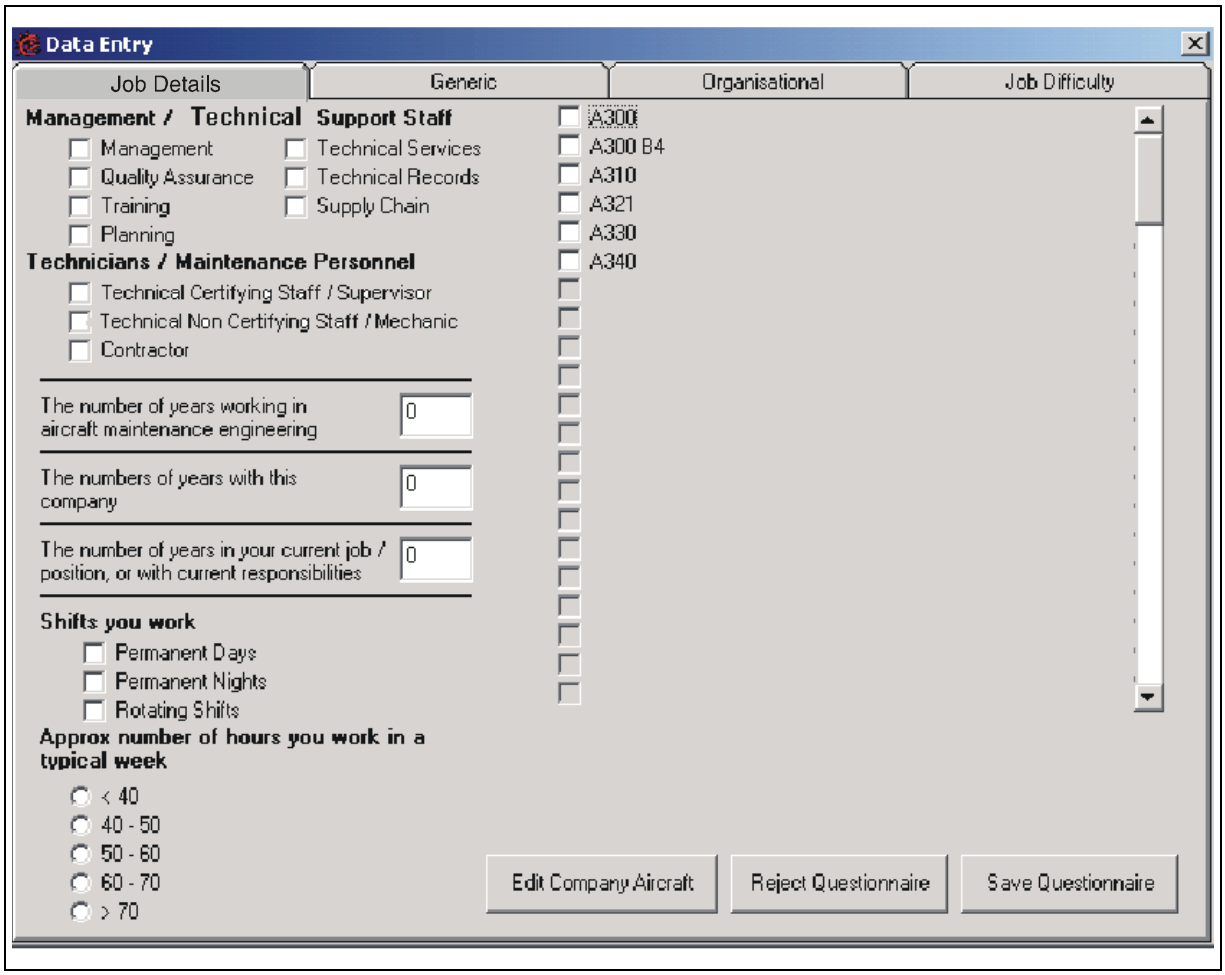


NOTE: The "non-technical staff" classification above was intended to mean staff who are not working "hands on" on the aircraft e.g. Management and Technical Support Staff.

The results from the individual questionnaires can be put into the programme in any order. However, it may be beneficial to sort them initially into the three staff groups: (i) Technical Certifying Staff, (ii) Technical Non-Certifying Staff and (iii) Management and Technical Support Staff, for ease of data entry.

3.2 Entering demographic/job details data

The following screen appears for each questionnaire to be entered, first the demographic information and job details should be added.



For questionnaires completed by Management and Technical Support Staff, information will need to be added to indicate whether they work in a management role, quality assurance role etc. For Technical Certifying Staff/Supervisor and Technical Non-certifying Staff/Mechanic, simply select the appropriate box and also indicate whether or not they are a contractor.

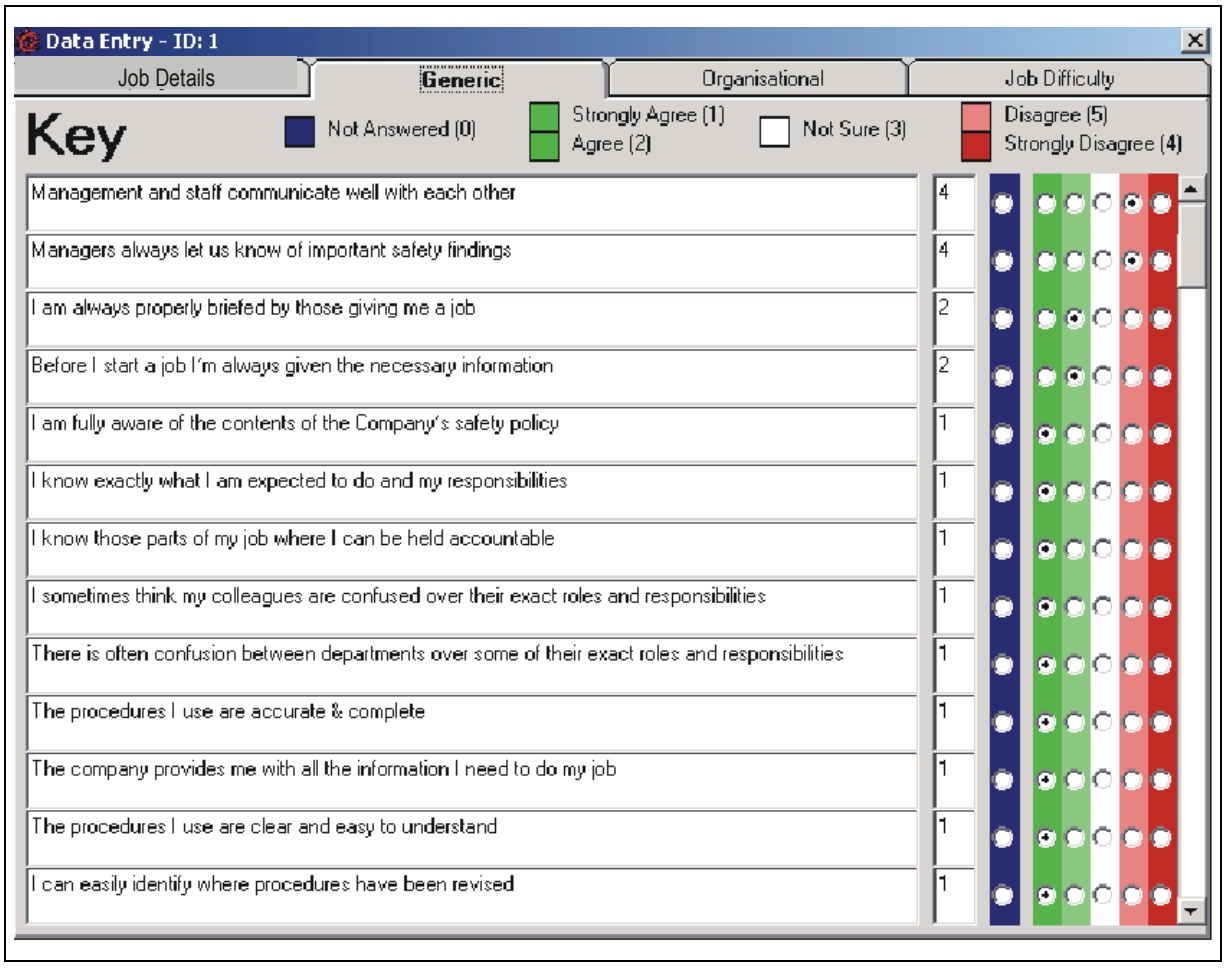
Details of work experience are then copied from the demographic questionnaire, along with details of shift system worked and approximate hours worked each week. (This is all just background information against which the results can be compared, and is optional).

Finally, information on the 'aircraft worked on' is entered by ticking the appropriate boxes. You have the option to add the aircraft types (and variants, if appropriate) that are maintained by the company. This is done by selecting "Edit Company Aircraft"

and ticking the appropriate box against the aircraft types. Further additions can be made at any time by clicking the "add new global aircraft" box. The reason for entering the aircraft types is that later analysis may wish to look at whether a particular problem is associated with a specific aircraft or manufacturer (e.g. poor manuals). Once the the aircraft have been edited click okay to return to the screen below.

3.3 Questionnaire data entry

The software tool provides data entry screens for all three types of questionnaire: generic, job difficulty, and organisational. Enter the data appropriate to the respondent (i.e. data from all three questionnaires for Technical Certifying Staff and Technical Non-Certifying Staff, and data from just the generic questionnaire for Management and Technical Support Staff.



NOTE: after entering the data from each questionnaire, make sure you return to the "job details" page to save the data you have just entered, before moving on to enter another set.

3.4 Generic questionnaire - data entry

Data can be entered in two ways. The first way is to select the appropriate response (from strongly agree to strongly disagree) using the coloured columns on the right against each question. A quicker method is to place the cursor over the scoring window to the left of the coloured columns at the first row and simply enter a number from 0 to 5 where:

0 = question was not answered

1 = strongly agree response

2 = agree

3 = neither agree nor disagree

4 = disagree

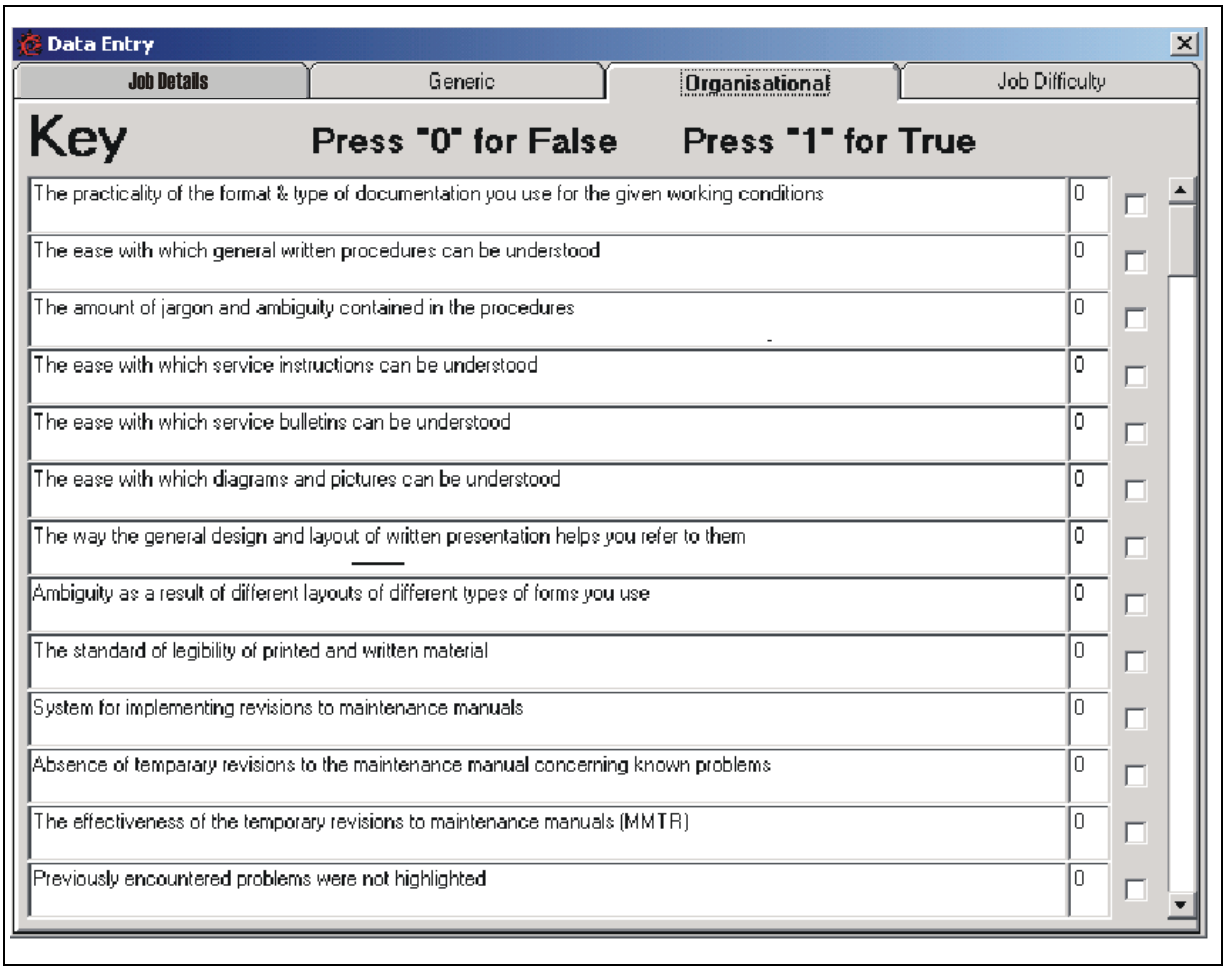
5 = strongly disagree.

For Technical Certifying Staff and Technical Non-certifying Staff, you will also need to enter the data from the organisational and job-difficulty questionnaires, for each respondent, before saving the data 'set' on the "Job Details" page.

Once all the data for each respondent is entered, select "Job Details" at the top of the page, to return to the first page and then select "Save Questionnaire" at the bottom right of the page. A window will ask whether you wish to add another questionnaire. Select "yes" and repeat as required.

3.5 Organisational questionnaire - data entry

Select 'Organisational' at the top of the screen to enter the data from the organisational questionnaire. The following page should show:



Each respondent should have simply ticked those issues that have caused him/her concern during the last 6 months. There are two methods of input. The first method is to place the cursor on the top response cell and key in:

0 = if response is left blank

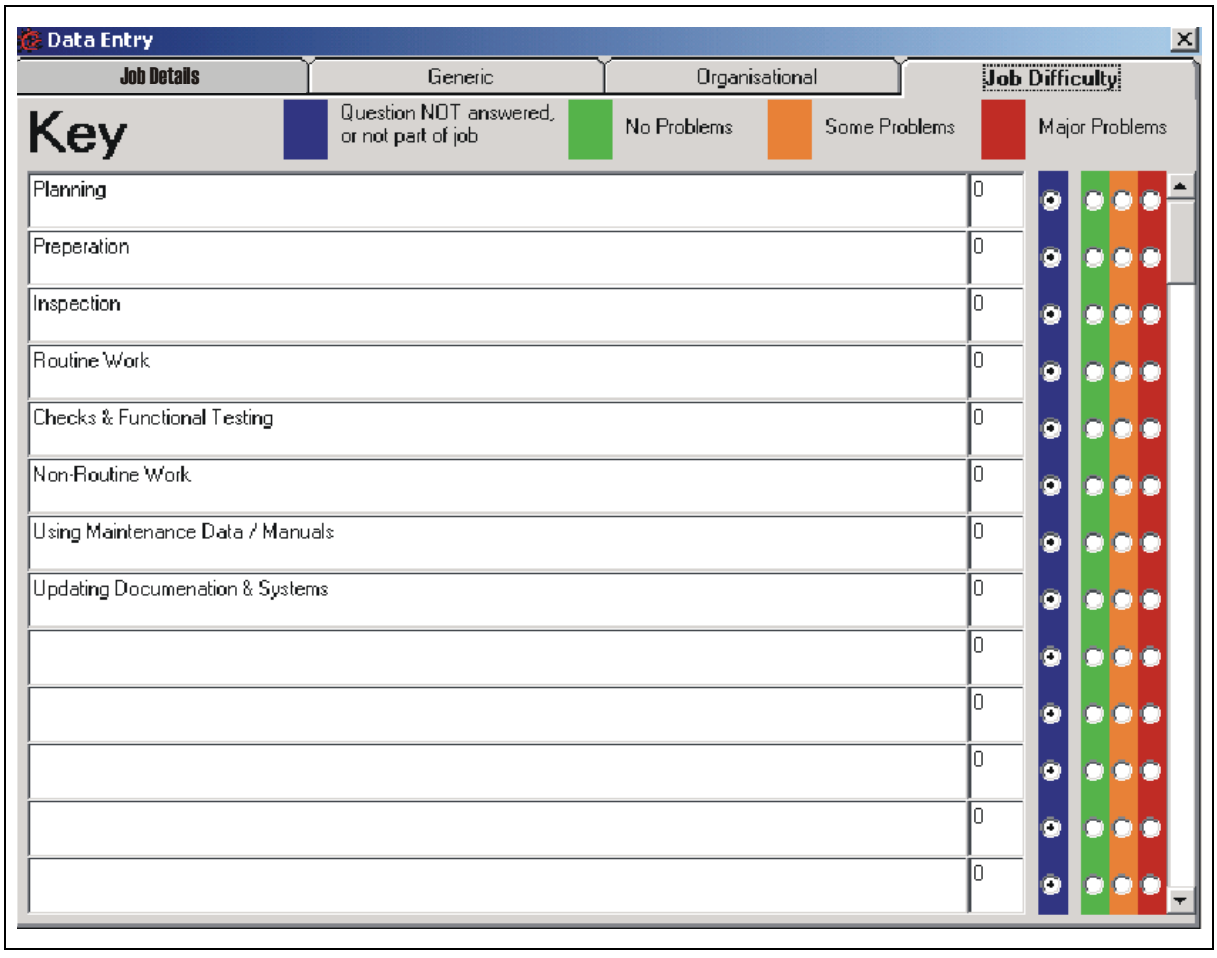
1 = if response is a tick.

The programme then automatically scrolls to the next cell and therefore the results can be inserted by simply inputting a string of '0s' and '1s'.

Alternatively, the page can be scrolled down and the cursor used to select those entries that have been ticked. This is often the better method, where relatively few entries have been selected.

3.6 Job Difficulty questionnaire - data entry

Select the input format "Job Difficulty" at the top of the page and the following input page will be shown.



This part of the Technical Certifying and Non-Certifying Staff questionnaires were separated into 8 job parts ('planning' to 'updating documentation and systems'). The simplest way to input these results is to enter a number, from 0 to 3 in the column to the left of the coloured columns. The input is simply:

0 = if this was not selected as part of the job - i.e. if the first column was NOT ticked

1 = if this part of the job was said to present no problems - i.e. a tick was made in the second column

2 = if this part of the job was said to present few problems - i.e. a tick was made in the third column

3 = if this part of the job was said to present major problems - i.e. a tick was made in the fourth column.

NOTE: Experience has indicated that some respondents (wrongly) place a tick against each of the examples in each job section. If this occurs then you should just input the highest of the scores against each job part.

Alternatively, the appropriate coloured boxes can be selected to reflect the above responses.

4 Presentation of Results

The results are presented around a format that has been developed to assist senior management select the most appropriate initiatives to deal with any safety concerns, particularly human factors problems. For a set of initiatives to be effective they have to target the underlying root causes of any problem and not just the symptoms. Managers also need to avoid simply repeating an initiative that had been effective in another area. The underlying root problems for one group of people can be very different from those of other work groups. It should therefore not come as any surprise that actions that have proved effective in one area can fail in another (e.g. training/retraining, if the root problem is with poor procedures).

Nineteen separate human factors root issues were identified on the basis that different management actions would be appropriate to address each issue. In this way, the structure was intended to be 'solution orientated' and hence form a practical tool for management. Note: it is appreciated that these solutions are not always within control of the management or the maintenance organisation (especially in the case of third party maintenance).

The potential root issues that are most likely to affect safe and reliable maintenance performance are:

- **Design & Maintenance Interface:** Equipment that is not designed to be 'maintenance friendly' can needlessly add difficulty, often making mistakes more likely. In extreme cases, maintaining poorly designed equipment can also cause people to intentionally 'cut corners' to make their job easier or quicker.
- **Provision of Resources:** Maintenance procedures often specify the tools & equipment (and sometimes manpower) that is required to perform a job. Failure to ensure such resources are available may lead to the job either not being done or to the procedures not strictly being followed.
- **Training:** The specific training and refresher training needs of staff will be dependant upon: the value of previous experience; the complexity of the work; and the recent opportunities to practice previously learned skills. Jobs that are rarely performed will obviously require refresher training, more so than jobs performed on a regular basis. Training needs may simply relate to the basic knowledge and skills needed to perform a job or to a much wider understanding of the hazards and

risks that could arise if the maintenance work was not in strict accordance with the procedures (e.g. human factors training).

- **Fatigue:** Long hours or a stressful working environment can lead to fatigue and reduced performance by the maintenance staff, and increased vulnerability to error.
- **Complacency:** Complacency may develop among management and/or staff as a result of few or no incidents. This can lead to reduced performance and relaxed guard against error.
- **Planning:** While it may not always be possible to foresee and plan for every maintenance need, any 'systemic' planning failures will needlessly create difficulties for the maintainers. Such failures could lead to mistakes being made by staff rushing to meet unrealistic deadlines or intentional corner-cutting to save time.
- **Communications:** Ineffective communications within a maintenance team or between shifts is often a cause of maintenance procedure failure. Problems can arise with both verbal and written communications. Poor formal communications can often lead to staff relying on informal methods of communications that may not be as efficient, and likely to be more susceptible to error.
- **Commercial Pressures:** Actual or perceived pressure for aircraft to be released to service by a certain time may encourage staff to take short cuts or rush work and make mistakes. It is sometimes the perception of such pressure by the supervisors and the maintenance staff which is the problem, rather than actual pressure imposed by management.
- **Maintenance Procedures:** Accuracy, Relevance and Practicality: Procedures can only be effective if they are used. Procedures that are perceived as being wrong, inaccurate, or impractical will rarely be relied upon in practice. Unfortunately, some procedures seem to be written in a way that makes them easy to write rather than easy to follow. Updates in procedures may also not effectively be brought to the maintenance staff's attention with the risk that staff will be following out-of-date procedures (possibly in the form of 'black books').
- **Roles and Responsibility:** Staff need to understand their authority, responsibility and accountability in all situations. In some organisations these issues have not been fully considered let alone communicated to the workforce. Furthermore, problems are likely if staff are not adequately trained or capable of working to the assumed levels of responsibilities.
- **Management Attitudes:** There is overwhelming evidence to show that the attitudes and behaviour of the workforce are strongly influenced by their perception of 'management's attitude and commitment to safety'. Genuine management commitment to safety can be lost on the workforce if they perceive it as rhetoric or if management's actions do not always reinforce this belief. It may be that dual standards exist where management or supervisors claim not to condone procedural violations, but in effect condone them by turning a blind eye if it gets the job done.
- **Safety Commitment of the Engineers/Staff:** Any lack of safety commitment in the workforce can be the result of a number of problems. It is included as a separate root failure in this list as it can also be affected by non-work experiences or from experiences in previous jobs and may not be identified by the work-related factors in the questionnaires.

- **Job Pressure:** Jobs can be the source of a variety of pressures, ranging from pressure from fellow workers to pressure from the supervisors or management. The important factor is how an individual perceives such pressure and responds to it. Jobs where staff have no control over methods/resource/staffing levels but are subject to strict time demands often result in the most stressful jobs. Errors are more likely when working under stress.
- **Working Conditions:** Poor workspace, lighting levels, exposure to rain/wind/dust and noise can all cause difficulties for engineers, especially in line maintenance, making errors more likely.
- **Just Culture/Blame Culture:** Staff can be unwilling to inform managers if they have made mistakes that have led to incidents or near misses if they think they will be unfairly treated. The resulting lack of feedback from the staff is often a major drawback to continual safety improvement.
- **Management of Change:** Business demands can change and this can affect staff adversely in two ways: (i) morale and (ii) inability to match technical skills and experience to new tasks. Both of these issues can be problems, potentially resulting in more errors, if not managed properly.
- **Supervisor Effectiveness:** The safety performance of a group of people is often largely dictated by the standard of behaviour that is tolerated by supervision. Where several supervisors are present, this is often that tolerated by one 'worst' supervisor. Ultimately, the staff's behaviour is therefore influenced by how effective supervision is in monitoring and detecting problems and routinely correcting any problems found.
- **Supervisor Attitudes:** This is related to 'supervisor effectiveness', however, whereas this focuses on the behaviour of individual supervisors, the 'supervisor attitudes' root failure section addresses the overall effectiveness of the supervision.
- **Competence:** Although staff are expected to work to written procedures, the successful completion of work will almost always rely on the work being conducted by competent people. Measuring or assessing competence is rarely straightforward as people who have suitable qualifications may not be behaving in a competent manner in practice. Systems that rely solely on equating qualifications to competence may expose the organisation to problems.

The 'safety health tool' uses the results from both the generic questionnaire and the organisational questionnaire to obtain scores for each of the above key human factors root issues that potentially affect aviation safety. The results are then ranked into the order that warrant most management consideration.

4.1 Evidence of Non-Compliance

There will be very few maintenance organisations where nobody has ever made a mistake or where somebody has never knowingly deviated from a rule or procedures – for whatever reason. Both unintentional and intentional actions may therefore have resulted in some 'non-compliance' with procedures. Managers may value an indicator of such 'non-compliance'.

The results presentation begins with selected scores that reflect evidence of actual non-compliance of aircraft maintenance procedures. These results should be studied first. Low non-compliance scores would tend to suggest a generally positive culture where intentional non-compliance is unlikely and also where staff are not making unintentional or 'accidental' errors.

NOTE: Low non-compliance scores might also suggest that the staff are being less than honest when completing the questionnaires, which is why it is very important to ensure anonymity, and convince the staff that their individual responses cannot be identified.

Table 2 Example of Non-Compliance Results

	Tech Cert Staff	Tech Non - Cert Staff	Mngmt/Tech Support Staff	Mean Score
EVIDENCE OF NON-COMPLIANCE				
Supervisor condoning unapproved actions to get an aircraft away	71	78		74
Regular non-compliance by the workforce	38	61	63	60
Direct pressure to deviate from procedures	50	33	36	37
Direct pressure from the supervisor to deviate from procedures	29	33		31
Pride on getting aircraft back on time, even if this needs some non-compliance	29			29

NOTE: For an explanation of how the scores should be interpreted, see paragraph 6.

4.2 Organisational Root Issues

The most effective way of addressing non-compliance is to address the underlying reason for such behaviour rather than addressing the symptom. For example, parts repeatedly being fitted the wrong way round is best addressed through changes to the design (where possible) to physically prevent such occurrences rather than further training, further supervision or further checking.

The HSEC SHoMe tool software automatically presents the potential underlying (root) issues in descending order of importance. Within each of the 19 human factors root issues, a number of questions are relevant to that topic. Root issues are presented in order of importance, those with the higher scores (i.e. likely to be more problematic) being listed first.

An example of such results presentation is shown below in Table 3 for the potential root issue of 'Training', and two aspects of training addressed by this tool. The results from the Generic Questionnaire are shown in normal text. The results from the Organisational Questionnaire are shown inset and in italics.

Table 3 Results (Level 3) - Example Extract

	Tech Cert Staff	Tech. Non-Cert Staff	Mngmt/Tech Support Staff	
TRAINING				57
Appropriate provision of refresher, or continuation, training	68	71	59	66
The planned times between recurrent/ refresher training courses	31	29		30
The amount of recent opportunity you have had to practice these skills	0	24		14
Your past 'on-the-job' experiences of these jobs	0	0		0

Table 3 Results (Level 3) - Example Extract

	Tech Cert Staff	Tech. Non-Cert Staff	Mngmt/Tech Support Staff	
TRAINING				57
Training meeting needs of the job	53	45	46	48
How the content of recent training/ recurrent training met your own needs	31	19		24
Your knowledge of the aircraft systems you recently worked on	19	5		11
Your knowledge of the detailed maintenance task requirements	12	5		8
Your knowledge of the company process procedures	0	10		5

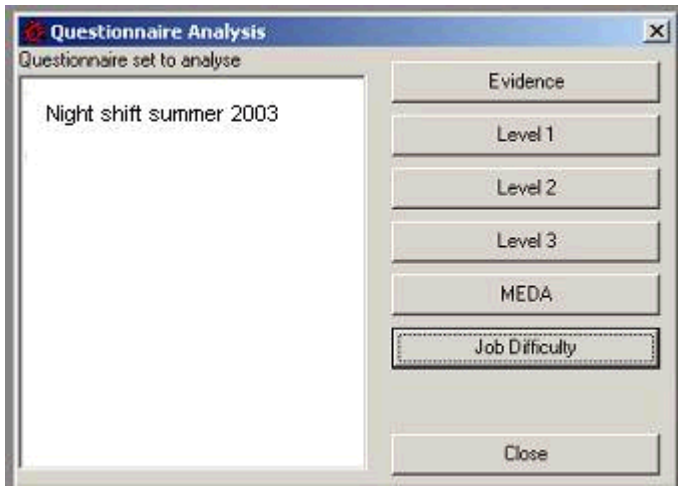
NOTE: For an explanation of how the scores should be interpreted, see paragraph 6.

Combined scores from the questionnaires are shown in the columns marked for the Certifying Engineers, the Non-certifying technicians and the Non-Technicians.

Users may note that some scores for the same questions are different when they are used in different parts of the results presentation. This is intentional and reflects the small number of occasions where a factor has clearly more relevance to one potential root issue than another. By weighting these scores accordingly, the most important issues can still be shown at the top of each list.

5 Analysis of Results on the SHoMe Tool

Select 'analysis view results' from the front screen. Select the questionnaire set to be analysed, using the screen shown below. There are six levels of analysis indicated on the panel - 'Evidence', 'Level 1', 'Level 2', 'Level 3', and 'MEDA' and Job Difficulty.



5.1 Evidence

This provides a short summary of the results from the questionnaire that relate directly to evidence of non compliance with company procedures. It also gives guidance on how to interpret the results which can be used for the level 1, 2 & 3 results also.

5.2 Level 1 Results

The Level 1 presentation gives a summary of the main results and an indication of the extent of any potential problems. It presents the basic results from the "evidence of non-compliance" and the ranked scores for the potential root issues that could reasonably be associated with such non-compliance.

This level of results presentation can be thought of as the executive summary but is often insufficient to rely on when determining new safety initiatives. There may be potential root issues where the overall score, shown in Level 1, does not cause concern. This overall score may, however, be derived from a mix of some individual question scores that are potentially very worrying with the overall score being balanced by others that are very good. It is advisable, therefore, to also look at the Level 2 results to be reasonably certain that there are no issues for concern.

5.3 Level 2 Results

The Level 2 presentation is probably the most suitable for an initial review of the results. Level 1 information is essentially repeated, however, each of the potential root issues is expanded to show the rank order of relevant human factor issues that are associated with that "top level" root issue. These human factor issues are all taken from the generic questionnaire and therefore provide a useful comparison of scores between the Certifying and Non-Certifying Staff and the Management and Technical Support Staff. The Level 2 results will enable any critical root issues to be identified as well as any human factor issues that are potentially problematic within any 'roots' that overall do not indicate any need for concern.

5.4 Level 3 Results

The Level 3 presentation is probably best 'dipped into' to look in more depth at only those issues that are of concern as indicated by the Level 2 results. The Level 3 presentation adds relevant scores from the organisational questionnaire. These are only given to the Technical Certifying and Technical Non-Certifying Staff and therefore this level of presentation has no added value for the Management and Technical Support Staff.

5.5 MEDA Compatible Results

The Level 1-3 results are aimed at showing where the maintenance organisation could have problems in the future as a result of identified potential human factors weaknesses. It is possible that some of these may already have been associated with actual incidents or errors. The Boeing Maintenance Error Decision Aid (MEDA) system is often used to analyse actual incidents and extract relevant human factors issues that were associated with such incidents. One advantage of the MEDA system is that those human factors weaknesses identified tend to have greater management credibility because they have been associated with actual problems as opposed to future potential problems identified as the result of the HSEC SHoMe tool, which may have an element of subjectivity.

Maintenance organisations which have a 'MEDA' system may wish to compare their MEDA results with a similar grouping of results from the HSEC SHoMe tool.

The following points need to be borne in mind:

- The 'MEDA compatible' presentation does not aim to present the same information as would be generated by MEDA, but it does present relevant human factors issues under a similar MEDA structure.
- The MEDA taxonomy does not include all the human factors issues used in the HSEC SHoMe tool.

- The two systems will not fully mirror one another. Potential weaknesses may be identified in the HSEC SHoMe tool that have not been identified by MEDA, since the MEDA database is derived only from the known incidents and not those that could happen tomorrow or problems/errors which have not been reported or investigated.

5.6 Job Difficulty Results

The job difficulty analysis shows both the percentage of respondents that considered a particular work area as part of their job and the degree of difficulty they experienced. This helps identify the work areas where lots of people are having difficulty and in conjunction with the Level 1, 2 or 3 analysis will help focus attention on the correct area of work.

5.7 Print-outs of Results

The results are best printed in colour. The issues in black are those from the generic questionnaire completed by everybody. The issues in italics are the scores from the organisational questionnaire part of the survey that are only completed by the Certifying and Non-Certifying Staff.

Printouts should be obtained for 'Level 1', 'Level 2' and/or 'Level 3'. Organisations using the MEDA incident report system should also print out the 'MEDA compatible' report. Examples of these printouts are shown in Appendices 6 to 9.

These printouts can be saved as documents, or the "Export Data" option may be used to save all the outputs in one go.

6 Interpretation of Results

The three levels of results have been previously described and examples are shown in Appendices 6 to 9. At a first glance the 'Level 2' and 'Level 3' results can seem a little overwhelming, however, the results in all sections are ranked such that only those at the top of the listing of potential root issues need to be examined. Within those root issues, only the issues towards the top of the rankings normally need to be considered. It is therefore not necessary to study the full set of results.

The level of detail produced by this tool can make it initially difficult for the users. It is considered that the tool benefits from this depth of detail and that users will ultimately find it more helpful than a simpler tool that only provides superficial results. Nevertheless, the 'Level 1' print out is intended to give such a simple overview.

6.1 Scoring for the Generic Questionnaire

The scores in the Level 1 and 2 printouts are all taken from the parts of the generic questionnaires that are completed by all respondents. These scores basically reflect a number that would be '0' if everybody strongly agreed with the 'correct' answer (i.e. that reflecting an ideal safety culture and working environment). The number would be '100' if everybody strongly disagreed with the 'correct' answer. If everybody only 'agreed' with the 'correct' answer then the number would be '33' and if everybody only 'disagreed' then the number would increase to '67'.

There are no absolute good/bad scores, however, the following scoring system in Table 4 is a useful start point:

Table 4 Interpretation of Results from the Generic Questionnaire

• Any numbers of about 35 and less can essentially be considered as 'GOOD'.
• Issues scoring about 55 and more can be considered as 'being worthy of ATTENTION'.
• Issues scoring 65 or more should be considered as being 'worthy of CONCERN' and need to be addressed.

The actual scores will develop additional value when comparing these scores against those from future applications to this tool.

6.2 Scoring for the Organisational Questionnaire Results in the Level 3 Analysis

Level 3 repeats the Level 2 presentation but adds the results from the organisational questionnaire that was only given to the certifying and Non-certifying technicians. These results are shown in italics and indented in the print out and the number is simply the percentage of those respondents who indicated that an issue had "caused them or a colleague to have made a mistake, caused confusion or uncertainty or otherwise affected airworthiness". The higher the number the greater the concern. There are no absolute good/bad scores, however, the following scoring system in Table 5 is a useful start point:

Table 5 Interpretation of Results from the Organisational Questionnaire

• Numbers of 15 or less are probably acceptable but may still warrant some attention.
• Numbers around 30% or higher are worthy of receiving attention.
• Numbers of 50% or greater are worthy of concern and need to be addressed.

As before, these scores will have added value when benchmarking against future applications.

6.3 MEDA Compatible Results Presentation

Also available is a 'MEDA equivalent' results format. The same scoring criteria are used as for the Generic and Organisation Questionnaires.

7 Improving Safety Health Indicators

The survey results have been designed, as far as possible, to reflect basic safety management principles with the hope that management would be able to quickly determine a range of actions that are likely to be effective to address any of the identified potential problems. It is acknowledged that users may initially find too much detail in the results, however, this level of detail should ultimately help managers identify the real underlying problems in their organisation and therefore help develop action plans that address the true problems – and not just some of the symptoms. It would be inappropriate to rely on a mechanistic way of interpreting the results as this often precludes subtle issues that can be of immense importance when developing effective action plans.

There will be times when the results are insufficient to assist management develop an action plan. This is likely to be the result of the survey being unable to provide sufficient detailed descriptions of the contexts of a problem. For example, the survey

may indicate there are problems with tools and equipment but it cannot realistically say which tools are causing problems and whether these problems occur for all jobs or only under certain conditions. In these circumstances it is best to form a small discussion group and to use the general findings of the survey to discuss the issues further in order to enable a suitable and cost-effective action plan to be developed.

8 Periodic Review

The results provide both the positive features of 'safety culture' and potential problems warranting further attention. A number of initiatives may be introduced. Invariably, some will prove more effective than others and there is therefore value in reviewing the achievements of key initiatives. The survey can be repeated after a suitable period (perhaps 12 to 24 months) to obtain objective indications of how successful initiatives have been and if, and where, further attention is needed.

Even if the results are generally positive, it should be recognised that attitudes/ expectations and jobs can change over time and that a good result 'today' may not guarantee such good results in the future. A repeat of the survey would provide a useful indicator of any changes or trends that may cause future difficulties if not tackled at an early stage.

9 Confidential Data Base

There may be an option in the future to contribute your company's results, on a strictly non-attributable basis, to a multi-site database to provide a wider understanding of the human factors issues associated with aviation maintenance industry. Companies who volunteer their results could be provided with the average results from the full industry-wide database. This may assist in reviewing their own results and assigning priorities to future initiatives.

Companies interested in supporting this wider database should contact the Research Management Department at the CAA, or osdhfs@srg.caa.co.uk for further details.

Appendix 1 Instructions for running the SHoMe Questionnaire Survey

1 Background

In order to run the HSEC SHoMe tool, you will need (i) copies of the questionnaires, (ii) the SHoMe tool analysis software and (iii) the detailed user guide in order to input and interpret the results.

This tool has been developed for aircraft maintenance companies. If you do not maintain aircraft directly, but your business is connected with aircraft maintenance, you will first need to check the applicability of the questionnaires to your work. If the majority of the questions are applicable, you can still run the tool, just leaving out those questions which are not applicable. Alternatively, it may be possible to modify the questionnaire to fit your company. However, major modification may invalidate the scoring system built into the tool.

The tool can be used to measure safety health across the company as a whole, or at a particular base or outstation. It can even be used to measure safety health on a certain shift, if the shift population is fairly static and large enough to ensure that the opinions of individuals are not going to unduly sway the results.

The tool is based on subjective measurements, rather than objective performance measures. In order to produce valid results, it is important to stress the need for each individual to complete the questionnaires honestly and as thoroughly as possible. Avoid applying the tool during periods of industrial unrest, as this is likely to bias results negatively.

You will need to give the questionnaires to a representative sample of the staff in the company. This means:

a) a large enough sample (the greater the sample size, the more valid the results are likely to be);

b) enough staff within each of the groups to be representative of the company/ base/ outstation;

c) don't forget to include planners, technical services, storemen, senior managers, junior managers, QA, etc;

d) staff with various attitudes - this includes the cynics and grumblers, as well as the upbeat, happy staff! If you run the questionnaire on just those staff you think won't 'rock the boat' you may not get a truthful picture of what is going on;

e) staff across shifts;

f) contract staff, if they have worked there long enough (they will have valuable experience from other companies against which to compare).

Brief staff first on what this is all about - assure them that it is anonymous and that the combined results will be used to improve company processes where possible (if that is your intention). The questionnaires will take some time to complete, so staff need to be assured that the results will be acted upon in some way, otherwise they won't bother.

If possible, pay staff for the time taken to complete the questionnaire, or make provision for it to be completed within work time (but individually).

Stress the importance of completing the questionnaire(s) as an individual - avoid situations whereby a group of staff all get together to discuss the questions and allow their answers to be influenced, or complete the questionnaire(s) by committee.

2 The Questionnaires

The basis of the tool is a set of questionnaires. The questionnaires are available on disc and can be freely copied. Spaces are left blank for companies to add their own company name on the covering pages. There are also spaces for the aircraft types that are maintained to be added to the second 'demographic' pages on each questionnaire. These should be completed before the questionnaires are printed and issued.

There are 3 sets of questionnaires, for:

- Technical Certifying Staff (Typically Licensed engineers, JAR-145 B1/B2 Engineers)
- Technical Non-Certifying Staff (Typically Delegated Tradesman or no certification authority)
- Management and Technical Support Staff - engineering support (this includes all staff who are not involved in 'hands-on' maintenance of aircraft, e.g. managers, QA, stores, planning, tech records, tech services, supply, etc.)

Each category of staff is given a set of questionnaires to complete.

The questionnaire set for Technical Certifying Staff are in Appendix 2.

The questionnaire set for Technical Non-Certifying Staff are in Appendix 3.

The questionnaire set for Management and Technical Support Staff are in Appendix 4.

It is important that each member of staff is issued the version of the questionnaire that is relevant to their job. For example, Technical Non-Certifying Staff should not be issued the version intended for the Technical Certifying Staff.

After questionnaires have been collected from staff, the results need to be entered into the computer. The analysis software can then be run at several levels, increasing in detail, including output organised in line with the MEDA form (in case you wish to compare your MEDA results with those from the HSEC tool).

Appendix 2 Questionnaire Set for Technical Certifying Staff

This questionnaire survey has been specifically developed for use in the aircraft maintenance industry to measure the 'safety health' of a company, and to highlight potential problem areas within the organisation (such as poor procedures). Your company management would not be running this questionnaire if they did not want to know this information, and act upon it. It is appreciated that some of the issues addressed by the questionnaires are outside the remit of the company, but will nevertheless provide useful feedback to the management as to where the problems (if any) lie.

This questionnaire is anonymous so please answer the following questions as honestly as you can. It will not be possible to identify the responses of any individual.

To help us gain the most from the results please also complete the following two pages which provides information on the nature of your job and your experience. If you are in a job where you think you can be identified from this data, then just fill in those parts that you are happy with.

Please complete the questionnaires on your own, without discussing your answers with colleagues. It is your view and experience which is important. Please return the completed questionnaire to the nominated co-ordinator as soon as possible.

The questionnaires will take about 30 minutes to complete, so please be patient! The results will all be analysed and you will be given feedback on the outcomes.

Thank you for your assistance.

Job Details

Date	
Location:	

Your Job:

Tick all those which apply – (Multiple Entries)

Management/management support staff:

• management	
• quality assurance	
• training	
• planning	
• technical services	
• technical records	
• supply chain	

Technicians/maintenance personnel

• certifying staff/supervisor	
• non-certifying staff/mechanic	
• contractor	

The number of years you have worked in aircraft maintenance engineering	
The number of years with this Company	
The number of years in your current job/position, or with current responsibilities	

The shifts you work:

Permanent days	
Permanent nights	
Rotating shifts	

Approx number of hours you work in typical week

<40	
40-50	
50-60	
60-70	
>70	

Please tick if you have worked on any of the following aircraft in the past month:

Only worked on components off the aircraft	

{* this table is modified to include a full list of aircraft that are maintained by the company}

*		*	
*		*	
*		*	
*		*	
*		*	

Others: _____

_____

_____

Generic Questionnaire – (Technical Certifying Staff)

Please indicate the extent to which you agree or disagree with the following statements in relation to your work over the last month or so	strongly agree	agree	not sure	disagree	strongly disagree
Management and staff communicate well with each other					
Managers always let us know of important safety findings					
I am always properly briefed by those giving me a job					
Before I start a job I'm always given the necessary information					
I am fully aware of the contents of the Company's safety policy					
I know exactly what I am expected to do and my responsibilities					
I know those parts of my job where I can be held accountable					
I sometimes think my colleagues are confused over their exact roles and responsibilities					
There is often confusion between departments over some of their exact roles and responsibilities					
The procedures I use are accurate & complete					
The company provides me with all the information I need to do my job					
The procedures I use are clear and easy to understand					
I can easily identify where procedures have been revised					
The procedures I use are practical and easy to use					
The procedures I use always adopt 'best practice'					
We have a good system for reporting problems with maintenance manuals and documentation					
We have a good system for fixing problems with maintenance manuals and documentation					
We have systems in place to ensure that all the resources specified in the procedures are readily available					
I often have to rush jobs due to staff shortages					
Jobs are often delayed due to vital equipment being missing or in the wrong place					
I am often not given enough time to do the job					
We usually manage to complete a job despite the non-availability of the specified equipment/tools					
Jobs are often delayed due to a shortage of spares					
Aircraft are sometimes released even if some work can't be done due to parts shortages					
Some deadlines are unrealistic					

Please indicate the extent to which you agree or disagree with the following statements in relation to your work over the last month or so	strongly agree	agree	not sure	disagree	strongly disagree
We often have to rush jobs due to unrealistic deadlines					
There was pressure placed upon me to work additional hours when I felt that I was not at my best					
There were conflicting commercial & safety demands					
People who are prepared to cut corners seem to always get promoted					
I accept that changes to my job are necessary from time to time					
I am always willing to change the way I work to fit in with the Company requirements					
The training I receive is appropriate for the job I do					
Appropriate refresher, or continuation, training is regularly provided					
I am confident that I have the necessary experience/ qualifications for the work I do					
I am confident that all my colleagues understand the hazards & risks associated with maintaining aircraft					
I have a good knowledge of maintenance rules & procedures					
I would be confident flying in an aircraft on which my colleagues had worked after a maintenance check					
I am confident our managers have the necessary experience/ qualifications for the work they do					
I sometimes go to work when I am ill or feel less than 100%					
During the last month I have made an error in my work due to tiredness					
During the last month some of my colleagues have made errors in their work due to tiredness					
I often have to work long hours or a large amount of overtime					
My job can sometimes be physically tiring					
My working conditions often make it difficult for me to do my work properly					
Some tools could be better designed					
The aircraft could be better designed to allow maintenance					
Anyone who makes an error deserves to be disciplined					
My colleagues fully understand the implications of their actions on airworthiness and aviation safety					
All the people I work with are very safety conscious					

Please indicate the extent to which you agree or disagree with the following statements in relation to your work over the last month or so	strongly agree	agree	not sure	disagree	strongly disagree
People don't care about the job anymore - they just do it for the money					
It is the responsibility of the LAE to check that no one has made any errors - that's what he's paid for					
I find my work boring and unsatisfying					
It doesn't really matter if I make the odd mistake as my work is always checked					
Some procedures are often not fully followed by some people					
Some procedures are only there to protect management's back					
The real risks from us making mistakes are quite small					
My colleagues often do not follow some procedures					
I experience some pressure from my workmates to do things differently to the procedures					
Management regularly demonstrate their strong commitment to safety					
All my colleagues think management are strongly committed to safety					
We never see anyone in management where I work					
The management have no idea of what really goes on					
Management are happy to discuss any of our concerns					
My immediate boss sometimes pressures me not to follow maintenance procedures					
My immediate boss would approve of my actions if I did not follow procedures in order to get an aircraft away					
My immediate boss sometimes take risks in releasing aircraft when the maintenance has not been properly undertaken					
My immediate boss tends to give the best jobs to those who are willing to 'bend' procedures to get aircraft away earlier					
My immediate boss always take seriously any concerns I have over airworthiness					
My immediate boss is always there when I need him/her					
My immediate boss is effective at maintaining safety standards					
My immediate boss is very knowledgeable on maintenance issues					
I often have to complete work without adequate supervision					
My colleagues show a commitment to maintaining high standards of safety					

Please indicate the extent to which you agree or disagree with the following statements in relation to your work over the last month or so	strongly agree	agree	not sure	disagree	strongly disagree
Management continue to seek new ways of improving safety performance					
Management devote sufficient effort to improve safety performance in comparison to commercial improvements					
Management encourage us to report our errors					
If I report an error, I am confident I would be treated in a fair manner					
Management investigate incidents to understand weakness in safety procedures, not to discipline the person					
If I made an error which I didn't think would impact on airworthiness I would own up					
Jobs are often planned allowing insufficient time to do the job properly					
The role of the Quality Dept is vital					
The Quality Assurance process does not prevent errors.					
The company pays lip service to quality					

Job Difficulties Questionnaire – (Technical Certifying Staff)

This part of the tool is intended to identify any specific aspect of your job which is causing you particular difficulty.

You will probably have been involved in a range of tasks and therefore the first stage is to read down the list below and identify those job elements that you have been involved with over the last month (or so). All others are then ignored.

Please place a 'tick' in column 'A' for those activities which YOU ACTUALLY DID over the past month or so. Then ONLY FOR THOSE PARTS TICKED, indicate in columns 'B', 'C' or 'D' the level of difficulty you generally experienced performing these jobs.

For example, if in the last month you were involved in any aspect of 'planning' then you would place a tick in column 'A' on the first row, and:

- if planning your work gave no problems - tick 'B'
- if planning your work gave some problems - tick 'C'
- if planning your work gave you major problems - tick 'D'

However, if your work did not include planning then leave column 'A' blank and move on to the next issue.

	A Was this part of your Jobs?	**B** No problems	**C** Some problems	**D** Major problems
PLANNING: e.g. • Planning your work for each shift • Working to a plan developed by somebody else • Checking work previously done by other people	Y/N			
PREPARATION: e.g. • Obtaining parts/tools/equipment - for planned tasks • Obtaining parts/tools/equipment - unplanned tasks • De-panelling/removing parts for access to work areas	Y/N			
INSPECTION: e.g. • Determining the appropriate inspection standards • Physically carrying out inspections • Raising rectification and defect reports	Y/N			
ROUTINE WORK: e.g. • Routine servicing, cleaning and lubrication • Making component changes • Using specialist tools/equipment • Using facilities for working at height	Y/N			

	A Was this part of your Jobs?	**B** No problems	**C** Some problems	**D** Major problems
CHECKS & FUNCTIONAL TESTING: e.g. • Daily routine checks • Checking new parts • Arranging & performing tests to be undertaken • Checking work of non-certifying staff • Housekeeping following completion of job • Checking completed repairs	Y/N			
NON – ROUTINE WORK: e.g. • Diagnosing faults • Carrying out modifications or service bulletins • Carrying out defect rectification	Y/N			
USING MAINTENANCE DATA/MANUALS: e.g. • Using maintenance data • Using work cards • Using maintenance manual • Using company maintenance procedures • Using service bulletins/airworthiness directives • Using "in house" written modifications & inspection documents • Using computer based maintenance information	Y/N			
UPDATING DOCUMENTATION & SYSTEMS: e.g. • Ensuring all work is completed before sign off • Informing others of work completed & sign off • Updating records, data bases etc.	Y/N			

Organisational Questionnaire – (Technical Certifying Staff)

Please read the following list and put a tick against anything which, during the last 6 months or so, has: • caused you or a colleague to make a mistake or • caused you or a colleague confusion or uncertainty over a job(s) or • otherwise affected airworthiness	
The type of documentation you have to use given your working conditions	
The ease with which general written procedures can be understood	
The amount of jargon and ambiguity contained in the procedures	
The ease with which service instructions can be understood	
The ease with which service bulletins can be understood	
The ease with which diagrams and pictures can be understood	
The general design and layout of written procedures	
Ambiguity as a result of different layouts of different types of forms you use	
The standard of legibility of printed and written material	
System for implementing temporary revisions to Maintenance Manuals	
Absence of temporary revisions to the Maintenance Manual concerning known problems	
The effectiveness of the temporary revisions to Maintenance Manuals (MMTR)	
Previously encountered problems were not highlighted	
Distractions and interruptions while you are working	
The general space in and around the aircraft	
Noisy working environments	
Exposure to airborne contaminants	
The temperatures you have to work in	
The general amount of lighting in and around the aircraft	
The presence of glare or dazzling light sources near to your work area	
The potential to be exposed to wind/rain/moisture when working	
The quality and suitability of any protective equipment you use/wear	
The standard of housekeeping adopted by other engineers/technicians	
Systems for prioritising jobs	
The ability of planners to minimise jobs running over other shifts	
The clarity of jobs to which you are assigned	
The system for informing you of any updates to procedures	
The staffing levels allocated to each job	
The financial resource made available to each job	
The general availability of conventional tools & equipment	
The general availability of specialist tools & equipment	
Effectiveness of preparation of tools, parts and data	
The ease with which you obtain necessary spare parts	
The shift systems adopted by your company	

The amount of work scheduled to be completed in your shift	
Any general time pressure to meet deadlines	
Any pressure put on you from the aircraft operators	
Any pressure put on you from your supervisor or management	
The amount of work your immediate boss expects you to achieve in a shift	
Access for inspection & testing	
Access for fitting parts and repairs including space to use tools	
The level of complexity of the aircraft design	
Differences in designs between different aircraft which could cause confusion	
The standard of the labelling of parts	
The legibility of labels under all weather conditions	
Design features which allow/prevent parts being fitted incorrectly	
The postures you need to adopt to conduct the maintenance work	
The suitability of the tools & equipment for the jobs & working conditions	
The general condition & calibration of the tools & equipment you use	
The design of the tools & equipment you use	
The ease with which tools can be used	
The availability of 'quiet room' facilities to allow discussions with your colleagues	
The availability and suitability of personal storage space	
The general design and layout of your hanger/work area	
The manoeuvrability of equipment and access devices	
The ease with which you communicate with other engineers in your team	
The effectiveness of communications with other shifts	
The amount of time devoted to formal handover communication with the next shift	
The effectiveness of communications between you and your supervisor	
The effectiveness of communication between flight crews and maintenance crews	
The quality and ability of the supervisors	
The effectiveness of supervisors in enforcing good working practices	
The presence of supervisors who knowingly permit un-approved working practices	
The presence of supervisors who direct you to adopt 'non-approved' practices	
Lack of trust in your immediate boss	
The competency of newly promoted supervisors	
The quality and ability of management	
The amount of responsibility and authority delegated to you by management	
The presence of any managers who direct you to adopt 'non-approved' practices	
Lack of management support in resolving problems	
The willingness of your workmates or supervisor to discuss your problems	
Your willingness to raise any problems you have with your workmates	
Your knowledge of the company processes or company procedures	
Your knowledge of the aircraft systems you recently worked on	
Your knowledge of the detailed maintenance task requirements	

Your ability to retain information 'in your head'	
Your understanding of what could increase the likelihood of you making an error	
How the content of recent training and recurrent training met your own needs	
The planned times between recurrent/refresher training courses	
Your past 'on-the-job' experiences of these jobs	
Your skills in fault isolation and troubleshooting	
Your skills in testing	
Your skills in fitting parts/making adjustments	
Your skills in using computer based maintenance manuals	
Your ability to correctly use the tools and equipment	
The amount of recent opportunity you have had to practice these skills	
Your ability to deal with very complex tasks	
The numbers of skills you need to posses to do your work	
Your ability to avoid or deal with personal conflicts with others	
Your ability to assert yourself and not allow others to compromise your own standards	
Your strength and/or body size	
Your eyesight and colour vision	
Your ability to maintain good levels of concentration	
Any domestic or other non-work concerns	
Your willingness to be honest with others about any mistakes you may have made	
The clarity of the procedures for reporting safety concerns	
The way management treat individuals who report mistakes or safety concerns	
The extent to which you think senior managers are willing to accept criticism	

Thank you for completing these questionnaires.

Please add any further comments you may wish to make.

Appendix 3 Questionnaire Set for Technical Non-Certifying Staff

This questionnaire survey has been specifically developed for use in the aircraft maintenance industry to measure the 'safety health' of a company, and to highlight potential problem areas within the organisation (such as poor procedures). Your company management would not be running this questionnaire if they did not want to know this information, and act upon it. It is appreciated that some of the issues addressed by the questionnaires are outside the remit of the company, but will nevertheless provide useful feedback to the management as to where the problems (if any) lie.

This questionnaire is anonymous so please answer the following questions as honestly as you can. It will not be possible to identify the responses of any individual.

To help us gain the most from the results please also complete the following two pages which provides information on the nature of your job and your experience. If you are in a job where you think you can be identified from this data, then just fill in those parts that you are happy with.

Please complete the questionnaires on your own, without discussing your answers with colleagues. It is your view and experience which is important. Please return the completed questionnaire to the nominated co-ordinator as soon as possible.

The questionnaires will take about 30 minutes to complete, so please be patient! The results will all be analysed and you will be given feedback on the outcomes.

Thank you for your assistance.

Job Details

Date	
Location:	

Your Job:

Tick all those which apply – (Multiple Entries)

Management/management support staff:

• management	
• quality assurance	
• training	
• planning	
• technical services	
• technical records	
• supply chain	

Technicians/maintenance personnel

• certifying staff/supervisor	
• non-certifying staff/mechanic	
• contractor	

The number of years you have worked in aircraft maintenance engineering	
The number of years with this Company	
The number of years in your current job/position, or with current responsibilities	

The shifts you work:

Permanent days	
Permanent nights	
Rotating shifts	

Approx number of hours you work in typical week

<40	
40-50	
50-60	
60-70	
>70	

Please tick if you have worked on any of the following aircraft in the past month:

Only worked on components off the aircraft	

{* this table is modified to include a full list of aircraft that are maintained by the company}

*		*	
*		*	
*		*	
*		*	
*		*	

Others: _____

_____

_____

Generic Questionnaire – (Technical Non-Certifying Staff)

Please indicate the extent to which you agree or disagree with the following statements in relation to your work **over the last month or so**	strongly agree	agree	not sure	disagree	strongly disagree
Management and staff communicate well with each other					
Managers always let us know of important safety findings					
I am always properly briefed by those giving me a job					
Before I start a job I'm always given the necessary information					
I am fully aware of the contents of the Company's safety policy					
I know exactly what I am expected to do and my responsibilities					
I know those parts of my job where I can be held accountable					
I sometimes think my colleagues are confused over their exact roles and responsibilities					
There is often confusion between departments over some of their exact roles and responsibilities					
The procedures I use are accurate & complete					
The company provides me with all the information I need to do my job					
The procedures I use are clear and easy to understand					
I can easily identify where procedures have been revised					
The procedures I use are practical and easy to use					
The procedures I use always adopt 'best practice'					
We have a good system for reporting problems with maintenance manuals and documentation					
We have a good system for fixing problems with maintenance manuals and documentation					
We have systems in place to ensure that all the resources specified in the procedures are readily available					
I often have to rush jobs due to staff shortages					
Jobs are often delayed due to vital equipment being missing or in the wrong place					
I am often not given enough time to do the job					
We usually manage to complete a job despite the non-availability of the specified equipment/tools					
Jobs are often delayed due to a shortage of spares					

Please indicate the extent to which you agree or disagree with the following statements in relation to your work **over the last month or so**	strongly agree	agree	not sure	disagree	strongly disagree
Aircraft are sometimes released even if some work can't be done due to parts shortages					
Some deadlines are unrealistic					
We often have to rush jobs due to unrealistic deadlines					
There was pressure placed upon me to work additional hours when I felt that I was not at my best					
There were conflicting commercial & safety demands					
People who are prepared to cut corners seem to always get promoted					
I accept that changes to my job are necessary from time to time					
I am always willing to change the way I work to fit in with the Company requirements					
The training I receive is appropriate for the job I do					
Appropriate refresher, or continuation, training is regularly provided					
I am confident that I have the necessary experience/ qualifications for the work I do					
I am confident that all my colleagues understand the hazards & risks associated with maintaining aircraft					
I have a good knowledge of maintenance rules & procedures					
I would be confident flying in an aircraft on which my colleagues had worked after a maintenance check					
I am confident our managers have the necessary experience/qualifications for the work they do					
I sometimes go to work when I am ill or feel less than 100%					
During the last month I have made an error in my work due to tiredness					
During the last month some of my colleagues have made errors in their work due to tiredness					
I often have to work long hours or a large amount of overtime					
My job can sometimes be physically tiring					
My working conditions often make it difficult for me to do my work properly					
Some tools could be better designed					

Please indicate the extent to which you agree or disagree with the following statements in relation to your work **over the last month or so**	strongly agree	agree	not sure	disagree	strongly disagree
The aircraft could be better designed to allow maintenance					
Anyone who makes an error deserves to be disciplined					
My colleagues fully understand the implications of their actions on airworthiness and aviation safety					
All the people I work with are very safety conscious					
People don't care about the job anymore - they just do it for the money					
It is the responsibility of the LAE to check that no one has made any errors - that's what he's paid for					
I find my work boring and unsatisfying					
It doesn't really matter if I make the odd mistake as my work is always checked					
Some procedures are often not fully followed by some people					
Some procedures are only there to protect management's back					
The real risks from us making mistakes are quite small					
My colleagues often do not follow some procedures					
I experience some pressure from my workmates to do things differently to the procedures					
Management regularly demonstrate their strong commitment to safety					
All my colleagues think management are strongly committed to safety					
We never see anyone in management where I work					
The management have no idea of what really goes on					
Management are happy to discuss any of our concerns					
My immediate boss sometimes pressures me not to follow maintenance procedures					
My immediate boss would approve of my actions if I did not follow procedures in order to get an aircraft away					
My immediate boss sometimes take risks in releasing aircraft when the maintenance has not been properly undertaken					
My immediate boss tends to give the best jobs to those who are willing to 'bend' procedures to get aircraft away earlier					

Please indicate the extent to which you agree or disagree with the following statements in relation to your work **over the last month or so**	strongly agree	agree	not sure	disagree	strongly disagree
My immediate boss always take seriously any concerns I have over airworthiness					
My immediate boss is always there when I need him/her					
My immediate boss is effective at maintaining safety standards					
My immediate boss is very knowledgeable on maintenance issues					
I often have to complete work without adequate supervision					
My colleagues show a commitment to maintaining high standards of safety					
Management continue to seek new ways of improving safety performance					
Management devote sufficient effort to improve safety performance in comparison to commercial improvements					
Management encourage us to report our errors					
If I report an error, I am confident I would be treated in a fair manner					
Management investigate incidents to understand weakness in safety procedures, not to discipline the person					
If I made an error which I didn't think would impact on airworthiness I would own up					
Jobs are often planned allowing insufficient time to do the job properly					
The role of the Quality Dept is vital					
The Quality Assurance process does not prevent errors.					
The company pays lip service to quality					

Job Difficulties Questionnaire – (Technical Non-Certifying Staff)

This part of the tool is intended to identify any specific aspect of your job which is causing you particular difficulty.

You will probably have been involved in a range of tasks and therefore the first stage is to read down the list on the next page and identify those job elements that you have been involved with over the last month (or so). All others are then ignored.

Please place a 'tick' in column 'A' for those activities which YOU ACTUALLY DID over the past month or so. Then ONLY FOR THOSE PARTS TICKED, indicate in columns 'B', 'C' or 'D' the level of difficulty you generally experienced performing these jobs.

For example, if in the last month you were involved in any aspect of 'planning' then you would place a tick in column 'A' on the first row, and:

- if planning your work gave no problems - tick 'B'
- if planning your work gave some problems - tick 'C'
- if planning your work gave you major problems - tick 'D'

However, if your work did not include planning then leave column 'A' blank and move on to the next issue.

	A Was this part of your Jobs?	**B** No problems	**C** Some problems	**D** Major problems
PLANNING: e.g. • Planning your work for each shift • Working to a plan developed by somebody else • Checking work previously done by other people	Y/N			
PREPARATION: e.g. • Obtaining parts/tools/equipment - for planned tasks • Obtaining parts/tools/equipment - unplanned tasks • De-panelling/removing parts for access to work areas	Y/N			
INSPECTION: e.g. • Determining the appropriate inspection standards • Physically carrying out inspections • Raising rectification and defect reports	Y/N			
ROUTINE WORK: e.g. • Routine servicing, cleaning and lubrication • Making component changes • Using specialist tools/equipment • Using facilities for working at height	Y/N			

	A Was this part of your Jobs?	**B** No problems	**C** Some problems	**D** Major problems
CHECKS & FUNCTIONAL TESTING: e.g. • Daily routine checks • Checking new parts • Arranging & performing tests to be undertaken • Checking work of non-certifying staff • Housekeeping following completion of job • Checking completed repairs	Y/N			
NON – ROUTINE WORK: e.g. • Diagnosing faults • Carrying out modifications or service bulletins • Carrying out defect rectification	Y/N			
USING MAINTENANCE DATA/MANUALS: e.g. • Using maintenance data • Using work cards • Using maintenance manual • Using company maintenance procedures • Using service bulletins/airworthiness directives • Using "in house" written modifications & inspection documents • Using computer based maintenance information	Y/N			
UPDATING DOCUMENTATION & SYSTEMS: e.g. • Ensuring all work is completed before sign off • Informing others of work completed & sign off • Updating records, data bases etc.	Y/N			

Organisational Questionnaire – (Technical Non-Certifying Staff)

Please read the following list and put a tick against anything which, during the last 6 months or so, has: • caused you or a colleague to make a mistake or • caused you or a colleague confusion or uncertainty over a job(s) or • otherwise affected airworthiness	
The type of documentation you have to use given your working conditions	
The ease with which general written procedures can be understood	
The amount of jargon and ambiguity contained in the procedures	
The ease with which service instructions can be understood	
The ease with which service bulletins can be understood	
The ease with which diagrams and pictures can be understood	
The general design and layout of written procedures	
Ambiguity as a result of different layouts of different types of forms you use	
The standard of legibility of printed and written material	
System for implementing temporary revisions to Maintenance Manuals	
Absence of temporary revisions to the Maintenance Manual concerning known problems	
The effectiveness of the temporary revisions to Maintenance Manuals (MMTR)	
Previously encountered problems were not highlighted	
Distractions and interruptions while you are working	
The general space in and around the aircraft	
Noisy working environments	
Exposure to airborne contaminants	
The temperatures you have to work in	
The general amount of lighting in and around the aircraft	
The presence of glare or dazzling light sources near to your work area	
The potential to be exposed to wind/rain/moisture when working	
The quality and suitability of any protective equipment you use/wear	
The standard of housekeeping adopted by other engineers/technicians	
Systems for prioritising jobs	
The ability of planners to minimise jobs running over other shifts	
The clarity of jobs to which you are assigned	
The system for informing you of any updates to procedures	
The staffing levels allocated to each job	
The financial resource made available to each job	
The general availability of conventional tools & equipment	
The general availability of specialist tools & equipment	
Effectiveness of preparation of tools, parts and data	
The ease with which you obtain necessary spare parts	
The shift systems adopted by your company	

The amount of work scheduled to be completed in your shift	
Any general time pressure to meet deadlines	
Any pressure put on you from the aircraft operators	
Any pressure put on you from your supervisor or management	
The amount of work your immediate boss expects you to achieve in a shift	
Access for inspection & testing	
Access for fitting parts and repairs including space to use tools	
The level of complexity of the aircraft design	
Differences in designs between different aircraft which could cause confusion	
The standard of the labelling of parts	
The legibility of labels under all weather conditions	
Design features which allow/prevent parts being fitted incorrectly	
The postures you need to adopt to conduct the maintenance work	
The suitability of the tools & equipment for the jobs & working conditions	
The general condition & calibration of the tools & equipment you use	
The design of the tools & equipment you use	
The ease with which tools can be used	
The availability of 'quiet room' facilities to allow discussions with your colleagues	
The availability and suitability of personal storage space	
The general design and layout of your hanger/work area	
The manoeuvrability of equipment and access devices	
The ease with which you communicate with other engineers in your team	
The effectiveness of communications with other shifts	
The amount of time devoted to formal handover communication with the next shift	
The effectiveness of communications between you and your supervisor	
The effectiveness of communication between flight crews and maintenance crews	
The quality and ability of the supervisors	
The effectiveness of supervisors in enforcing good working practices	
The presence of supervisors who knowingly permit un-approved working practices	
The presence of supervisors who direct you to adopt 'non-approved' practices	
Lack of trust in your immediate boss	
The competency of newly promoted supervisors	
The quality and ability of management	
The amount of responsibility and authority delegated to you by management	
The presence of any managers who direct you to adopt 'non-approved' practices	
Lack of management support in resolving problems	
The willingness of your workmates or supervisor to discuss your problems	
Your willingness to raise any problems you have with your workmates	
Your knowledge of the company processes or company procedures	
Your knowledge of the aircraft systems you recently worked on	
Your knowledge of the detailed maintenance task requirements	

Your ability to retain information 'in your head'	
Your understanding of what could increase the likelihood of you making an error	
How the content of recent training and recurrent training met your own needs	
The planned times between recurrent/refresher training courses	
Your past 'on-the-job' experiences of these jobs	
Your skills in fault isolation and troubleshooting	
Your skills in testing	
Your skills in fitting parts/making adjustments	
Your skills in using computer based maintenance manuals	
Your ability to correctly use the tools and equipment	
The amount of recent opportunity you have had to practice these skills	
Your ability to deal with very complex tasks	
The numbers of skills you need to posses to do your work	
Your ability to avoid or deal with personal conflicts with others	
Your ability to assert yourself and not allow others to compromise your own standards	
Your strength and/or body size	
Your eyesight and colour vision	
Your ability to maintain good levels of concentration	
Any domestic or other non-work concerns	
Your willingness to be honest with others about any mistakes you may have made	
The clarity of the procedures for reporting safety concerns	
The way management treat individuals who report mistakes or safety concerns	
The extent to which you think senior managers are willing to accept criticism	

Thank you for completing these questionnaires.

Please add any further comments you may wish to make.

Appendix 4 Questionnaire Set for Management and Technical Support Staff

This questionnaire survey has been specifically developed for use in the aircraft maintenance industry to measure the 'safety health' of a company, and to highlight potential problem areas within the organisation (such as poor procedures). Your company management would not be running this questionnaire if they did not want to know this information, and act upon it. It is appreciated that some of the issues addressed by the questionnaires are outside the remit of the company, but will nevertheless provide useful feedback to the management as to where the problems (if any) lie.

This questionnaire is anonymous so please answer the following questions as honestly as you can. It will not be possible to identify the responses of any individual.

To help us gain the most from the results please also complete the following two pages which provides information on the nature of your job and your experience. If you are in a job where you think you can be identified from this data, then just fill in those parts that you are happy with.

Please complete the questionnaires on your own, without discussing your answers with colleagues. It is your view and experience which is important. Please return the completed questionnaire to the nominated co-ordinator as soon as possible.

The questionnaires will take about 15 minutes to complete, so please be patient! The results will all be analysed and you will be given feedback on the outcomes.

Thank you for your assistance.

Job Details

Date	
Location:	

Your Job:

Tick all those which apply – (Multiple Entries)

Management/management support staff:

• management	
• quality assurance	
• training	
• planning	
• technical services	
• technical records	
• supply chain	

Technicians/maintenance personnel

• certifying staff/supervisor	
• non-certifying staff/mechanic	
• contractor	

The number of years you have worked in aircraft maintenance engineering	
The number of years with this Company	
The number of years in your current job/position, or with current responsibilities	

The shifts you work:

Permanent days	
Permanent nights	
Rotating shifts	

Approx number of hours you work in typical week

<40	
40-50	
50-60	
60-70	
>70	

Please tick if you have worked on any of the following aircraft in the past month:

Only worked on components off the aircraft	

{* this table is modified to include a full list of aircraft that are maintained by the company}

*		*	
*		*	
*		*	
*		*	
*		*	

Others: _____

_____

_____

Generic Questionnaire – (Management and Technical Support Staff)

Please indicate the extent to which you agree or disagree with the following statements in relation to your work **over the last month or so**	strongly agree	agree	not sure	disagree	strongly disagree
Management and staff communicate well with each other					
Managers always let us know of important safety findings					
I am always properly briefed by those giving me a job					
Before I start a job I'm always given the necessary information					
I am fully aware of the contents of the Company's safety policy					
I know exactly what I am expected to do and my responsibilities					
I know those parts of my job where I can be held accountable					
I sometimes think my colleagues are confused over their exact roles and responsibilities					
There is often confusion between departments over some of their exact roles and responsibilities					
The procedures I use are accurate & complete					
The company provides me with all the information I need to do my job					
The procedures I use are clear and easy to understand					
I can easily identify where procedures have been revised					
The procedures I use are practical and easy to use					
The procedures I use always adopt 'best practice'					
We have a good system for reporting problems with maintenance manuals and documentation					
We have a good system for fixing problems with maintenance manuals and documentation					
We have systems in place to ensure that all the resources specified in the procedures are readily available					
I often have to rush jobs due to staff shortages					
Jobs are often delayed due to vital equipment being missing or in the wrong place					
I am often not given enough time to do the job					
We usually manage to complete a job despite the non-availability of the specified equipment/tools					
Jobs are often delayed due to a shortage of spares					

Please indicate the extent to which you agree or disagree with the following statements in relation to your work **over the last month or so**	strongly agree	agree	not sure	disagree	strongly disagree
Aircraft are sometimes released even if some work can't be done due to parts shortages					
Some deadlines are unrealistic					
We often have to rush jobs due to unrealistic deadlines					
There was pressure placed upon me to work additional hours when I felt that I was not at my best					
There were conflicting commercial & safety demands					
People who are prepared to cut corners seem to always get promoted					
I accept that changes to my job are necessary from time to time					
I am always willing to change the way I work to fit in with the Company requirements					
The training I receive is appropriate for the job I do					
Appropriate refresher, or continuation, training is regularly provided					
I am confident that I have the necessary experience/ qualifications for the work I do					
I am confident that all my colleagues understand the hazards & risks associated with maintaining aircraft					
I have a good knowledge of maintenance rules & procedures					
I would be confident flying in an aircraft on which my colleagues had worked after a maintenance check					
I am confident our managers have the necessary experience/qualifications for the work they do					
I sometimes go to work when I am ill or feel less than 100%					
During the last month I have made an error in my work due to tiredness					
During the last month some of my colleagues have made errors in their work due to tiredness					
I often have to work long hours or a large amount of overtime					
My job can sometimes be physically tiring					
My working conditions often make it difficult for me to do my work properly					
Some tools could be better designed					

Please indicate the extent to which you agree or disagree with the following statements in relation to your work **over the last month or so**	strongly agree	agree	not sure	disagree	strongly disagree
The aircraft could be better designed to allow maintenance					
Anyone who makes an error deserves to be disciplined					
My colleagues fully understand the implications of their actions on airworthiness and aviation safety					
All the people I work with are very safety conscious					
People don't care about the job anymore - they just do it for the money					
It is the responsibility of the LAE to check that no one has made any errors - that's what he's paid for					
I find my work boring and unsatisfying					
It doesn't really matter if I make the odd mistake as my work is always checked					
Some procedures are often not fully followed by some people					
Some procedures are only there to protect management's back					
The real risks from us making mistakes are quite small					
My colleagues often do not follow some procedures					
I experience some pressure from my workmates to do things differently to the procedures					
Management regularly demonstrate their strong commitment to safety					
All my colleagues think management are strongly committed to safety					
We never see anyone in management where I work					
The management have no idea of what really goes on					
Management are happy to discuss any of our concerns					
My immediate boss sometimes pressures me not to follow maintenance procedures					
My immediate boss would approve of my actions if I did not follow procedures in order to get an aircraft away					
My immediate boss sometimes take risks in releasing aircraft when the maintenance has not been properly undertaken					
My immediate boss tends to give the best jobs to those who are willing to 'bend' procedures to get aircraft away earlier					

Please indicate the extent to which you agree or disagree with the following statements in relation to your work **over the last month or so**	strongly agree	agree	not sure	disagree	strongly disagree
My immediate boss always take seriously any concerns I have over airworthiness					
My immediate boss is always there when I need him/her					
My immediate boss is effective at maintaining safety standards					
My immediate boss is very knowledgeable on maintenance issues					
I often have to complete work without adequate supervision					
My colleagues show a commitment to maintaining high standards of safety					
Management continue to seek new ways of improving safety performance					
Management devote sufficient effort to improve safety performance in comparison to commercial improvements					
Management encourage us to report our errors					
If I report an error, I am confident I would be treated in a fair manner					
Management investigate incidents to understand weakness in safety procedures, not to discipline the person					
If I made an error which I didn't think would impact on airworthiness I would own up					
Jobs are often planned allowing insufficient time to do the job properly					
The role of the Quality Dept is vital					
The Quality Assurance process does not prevent errors.					
The company pays lip service to quality					

Thank you for completing these questionnaires.

Please add any further comments you may wish to make.

Appendix 5 Short Guide to Interpretation of Results

1 Results and Analysis

The data from all the questionnaires will need to be entered into the SHoMe tool. Once all the data has been entered, the results may be displayed, either for the company as a whole, or for sub-sections of the company and staff (using the analysis filters available in the tool).

The analysis software in the tool will produce results at 4 levels of detail: Level 1 is the overall picture (the 19 major issues, or potential root causes of problems), Level 2 provides slightly more detail (with each issue broken down into sub-topics); Level 3 provides the most detailed results. In addition, the results can be printed in MEDA format, for those companies who may wish to compare their MEDA data with that from the HSEC SHoMe tool.

The detailed report explains how the tool scores the results of the questionnaires, and how to enter the data. It also explains how to interpret the data. Level 1 and 2 results give scores out of 100 for each issue (or sub issue), where the score would be 0 if everyone strongly agreed with the 'correct' answer and 100 if everyone strongly agreed with the 'incorrect' answer. When interpreting the level 1 and 2 results, scores less than 35 may be interpreted as good, over 55 indicates that an issue is worthy of attention and over 65 indicates that it is worthy of concern. When interpreting the Level 3 results, numbers of 15 or less are probably acceptable but may still warrant some attention; numbers of 30 or higher are worthy of concern.

The tool has particular value when run more than once, with a time interval between times, where comparison of the results can show whether certain problems are getting better or worse.

2 The Software

The software is distributed free of charge to anyone who wishes to use it. No IT support is provided, however, although users are welcome to contact the CAA (osdhf@srg.caa.co.uk) if, after they have read the supporting user manuals distributed with the software, they still have questions concerning its use.

Appendix 6 Example of 'Level 1' Print Out

	Tech Cert Staff	Tech Non - Cert Staff	Mngmt/Tech Support Staff	Mean Score
EVIDENCE OF NON-COMPLIANCE				45
Supervisor condoning unapproved actions to get an aircraft away	72	77		74
Completion of job despite the non-availability of equipment/tools	71	54		63
Regular non-compliance by the workforce	38	61	60	59
Aircraft released with work not done due to parts shortage	42	56		48
Reports of colleagues making errors due to tiredness within last month	38	38	38	38
Self-reports of errors due to tiredness within last month	33	33	43	40
Direct pressure to deviate from procedures	50	32	36	37
Direct pressure from the supervisor to deviate from procedures	29	35		32
Pride on getting aircraft back on time, even if this needs some non-compliance	29			29
Supervisor taking risks in releasing aircraft when maintenance incomplete	29	21		26

LEVEL 1				
Potential Root Issues Affecting Reliable Maintenance Performance				**Mean Score**
DESIGN & MAINTENANCE INTERFACE				58
PROVISION OF RESOURCES				46
TRAINING				46
FATIGUE				45
COMPLACENCY				42
PLANNING				42
COMMUNICATIONS				41
COMMERCIAL PRESSURES				40
MAINTENANCE PROCEDURES: ACCURACY, RELEVANCE & PRACTICALITY				40

LEVEL 1				
ROLES & RESPONSIBILITY				40
MANAGEMENT ATTITUDES				35
SAFETY COMMITMENT OF THE ENGINEERS/STAFF				35
JOB PRESSURE				35
WORKING CONDITIONS				34
JUST CULTURE/BLAME CULTURE				34
MANAGEMENT OF CHANGE				31
SUPERVISOR EFFECTIVENESS				31
COMPETENCE				29
SUPERVISOR ATTITUDES				28

Appendix 7 Example of 'Level 2' Print Out – Extract only

	Tech Cert Staff	Tech Non - Cert Staff	Mngmt/Tech Support Staff	Mean Score
EVIDENCE OF NON-COMPLIANCE				**46**
Aircraft released with work not done due to parts shortage	60	64		62
Supervisor condoning unapproved actions to get an aircraft away	54	72		58
Completion of job despite the non-availability of equipment/tools	54	60		55
Regular non-compliance by the workforce	50	36	59	53
Pride on getting aircraft back on time, even if this needs some non-compliance	44			44
Reports of colleagues making errors due to tiredness within last month	42	36	45	43
Direct pressure to deviate from procedures	47	24	39	41
Direct pressure from the supervisor to deviate from procedures	43	15		36
Self-reports of errors due to tiredness within last month	31	34	40	36
Supervisor taking risks in releasing aircraft when maintenance incomplete	34	24		32

LEVEL 2				
Potential Root Issues Affecting Reliable Maintenance Performance	**Tech Cert Staff**	**Tech Non - Cert Staff**	**Mngmt/ Tech Support Staff**	**Mean Score**
DESIGN & MAINTENANCE INTERFACE				65
Aircraft Features				
Problems with the design of aircraft to facilitate maintenance	69	53		65
Tools & Equipment				
Problems with the design of tools	66	60		65
Other aspects of interface				
PROVISION OF RESOURCES				50
Spares Issue				
Delays due to shortage of spares	78	71		76
Aircraft released with work not done due to parts shortages	57	64		60

LEVEL 2				
Potential Root Issues Affecting Reliable Maintenance Performance	**Tech Cert Staff**	**Tech Non - Cert Staff**	**Mngmt/ Tech Support Staff**	**Mean Score**
Equipment Resource				
Delays due to equipment unavailability	75	71	52	65
Completion of job despite the non-availability of equipment/tools	54	60		56
System Issues				
Systems to ensure specified resources are readily available	54	45	54	53
Time Resource				
Insufficient time given to do a job	52	40	40	45
Staff Resource				
Non-certifying staff often have to rush jobs due to staff shortages	49			49
Rushing jobs due to staff shortages	38	27	31	33
Being given the necessary information before starting a job	47	33	40	43
Working without adequate supervision	33	17	31	30
Financial Resources				
TRAINING				51
Appropriate provision of refresher, or continuation, training	57	47	50	54
Training meeting needs of the job	48	36	49	48
Middle Scoring Sections Not Shown in this Example				
COMPETENCE				30
Perceptions of management's understanding of actual work practices	49	38	44	46
Confidence in manager's experience and/or qualifications to do the job	49	36	35	41
Boss's knowledge on maintenance issues	48	24	32	39
Knowledge of maintenance rules & procedures	24	28		26
Necessary experience/qualifications	21	24	29	25
Confidence to deal with unexpected aircraft faults	25			25
Confidence flying in aircraft released by another certifying engineer after a D check	23			23
Confidence flying in aircraft on which colleagues had worked after checks	23	19	22	22

Appendix 8 Example of 'Level 3' Print Out – Extract only

	Tech Cert Staff	Tech Non Cert Staff	Mngmt/Tech Support Staff	Mean Score
EVIDENCE OF NON-COMPLIANCE				51
Completion of job despite the non-availability of equipment/tools	69	67		68
Aircraft released with work not done due to parts shortage	65	69		67
Supervisor condoning unapproved actions to get an aircraft away	68	62		64
The effectiveness of supervisors in enforcing good working practices	31	20		25
Regular non-compliance by the workforce	63	62	55	60
Pride on getting aircraft back on time, even if this needs some non-compliance	52			52
Direct pressure to deviate from procedures	54	49	40	48
Reports of colleagues making errors due to tiredness within last month	38	51	39	43
Direct pressure from the supervisor to deviate from procedures	30	32		31
Presence of supervisors who direct you to adopt 'non-approved' practices	12	14		14
Presence of any managers who direct you to adopt 'non-approved' practices	0	4		2
Supervisor taking risks in releasing aircraft when maintenance incomplete	26	37		32
Self-reports of errors due to tiredness within last month	26	26	34	28

LEVEL 3				
Potential Root Issues Affecting Reliable Maintenance Performance	**Tech Cert Staff**	**Tech Non Cert Staff**	**Mngmt/Tech Support Staff**	**Mean Score**
DESIGN & MAINTENANCE INTERFACE				68
Tools & Equipment				
Problems with the design of tools	66	71		69
The manoeuvrability of equipment and access devices	50	43		46
The suitability of the tools & equipment for the jobs & working conditions	30	34		32
The general condition & calibration of the tools & equipment you use	12	24		19
The ease with which tools can be used	7	18		14
The design of the tools & equipment you use	0	21		12
Aircraft Features				
Problems with the design of aircraft to facilitate maintenance	70	64		67
The postures you need to adopt to conduct the maintenance work	56	62		59
The legibility of labels under all weather conditions	25	41		34
Design differences between different aircraft which could cause confusion	31	19		24
Access for inspection & testing	38	11		22
Access for fitting parts and repairs including space to use tools	9	29		21
The level of complexity of the aircraft design	6	14		11
The standard of the labelling of parts	6	14		11
Design features which allow/prevent parts being fitted incorrectly	8	10		9
Other aspects of interface				
The general design and layout of your hanger/ work area	25	44		35
Quiet room facilities to allow discussions with your colleagues	24	30		27
The availability and suitability of personal storage space	19	14		16
WORKING CONDITIONS				60
Working conditions making effective working difficult	59	75	40	58
The general amount of lighting in and around the aircraft	75	68		71

LEVEL 3				
Potential Root Issues Affecting Reliable Maintenance Performance	**Tech Cert Staff**	**Tech Non Cert Staff**	**Mngmt/Tech Support Staff**	**Mean Score**
The potential to be exposed to wind/rain/ moisture when working	50	71		62
The quality and suitability of any protective equipment you use/wear	56	64		60
The temperatures you have to work in	44	67		57
Standard of housekeeping adopted by other engineers/technicians	70	43		54
The amount of distractions and interruptions while you are working	44	38		41
The potential to be exposed to airborne contamination	30	43		38
The legibility of labels under all weather conditions	25	44		35
The noise levels you have to work in	38	33		35
The presence of glare or dazzling light sources near to your work area	30	38		35
The amount of general workspace in and around the aircraft	38	33		35
The suitability of the tools & equipment for the jobs & working conditions	27	33		30
Your eyesight and colour vision	1	0		1
TRAINING				57
Appropriate provision of refresher, or continuation, training	68	71	59	66
The planned times between recurrent/refresher training courses	31	29		30
The amount of recent opportunity you have had to practice these skills	1	20		10
Your past 'on-the-job' experiences of these jobs	0	0		0
Training meeting needs of the job	54	45	46	48
How the content of recent training/recurrent training met your own needs	31	19		24
Your knowledge of the aircraft systems you recently worked on	20	5		10
Your knowledge of the detailed maintenance task requirements	12	6		8
Your knowledge of the company process procedures	0	10		5

LEVEL 3				
Potential Root Issues Affecting Reliable Maintenance Performance	**Tech Cert Staff**	**Tech Non Cert Staff**	**Mngmt/Tech Support Staff**	**Mean Score**
PROVISION OF RESOURCES				57
Spares Issue				
Delays due to shortage of spares	78	77		77
Aircraft released with work not done due to parts shortages	61	69		66
The ease with which you obtain necessary spare parts	56	50		53
Equipment Resource				
Completion of job despite the non-availability of equipment/tools	69	67		68
The general availability of specialist tools & equipment	51	52		51
The general availability of conventional tools & equipment	25	48		38
Delays due to equipment unavailability	70	73	51	64
Time Resource				
Insufficient time given to do a job	60	63	60	61
System Issues				
Systems to ensure specified resources are readily available	58	50	55	55
Staff Resource				
Non-certifying staff often have to rush jobs due to staff shortages	65			65
The staffing levels allocated to each job	50	58		54
Rushing jobs due to staff shortages	41	45	31	39
Being given the necessary information before starting a job	51	51	48	51
Working without adequate supervision	28	40	27	33
Financial Resources				
The financial resource made available to each job	25	50		39
Middle Sections Not Shown in this Example				
SUPERVISOR ATTITUDES				32
Direct pressures from the supervisor to deviate from procedures	36	32	45	38
Any general time pressure to meet deadlines	50	30		40
Any pressure put on you from your supervisor or management	38	40		39

LEVEL 3				
Potential Root Issues Affecting Reliable Maintenance Performance	**Tech Cert Staff**	**Tech Non Cert Staff**	**Mngmt/Tech Support Staff**	**Mean Score**
The amount of work your immediate boss expects you to achieve in a shift	12	24		19
Presence of supervisors who direct you to adopt 'non-approved' practices	13	14		14
Ability to assert yourself and not allow others to compromise your standards	12	11		11
Supervisor's attitude to workforce's concerns over airworthiness	34	38		36
The extent to which senior managers accept advice and criticism	38	38		38
How management treat individuals who report mistakes or safety concerns	26	37		32
The willingness of your workmates or supervisor to discuss your problems	12	7		9
Lack of trust in your immediate boss	6	10		8
Supervisor condoning unapproved actions to get an aircraft away	32	38		36
The effectiveness of supervisors in enforcing good working practices	32	17		24
Presence of supervisors who permit un-approved working practices	12	19		16
Supervisor taking risks in releasing aircraft when the maintenance incomplete	26	35		30
Perceptions of best jobs going to those who are willing to 'bend' procedures	19	26	26	24
MANAGEMENT OF CHANGE				32
Willing to change to meet Company requirements	35	36	33	34
Individual acceptance of periodic changes to own job	31	25	32	29

Appendix 9 Example of 'MEDA' Print Out – Extract only

MEDA				
	Tech Cert Staff	**Tech Non Cert Staff**	**Mngmt/Tech Support Staff**	
A INFORMATION (e.g. work cards, maintenance manuals, service bulletins, etc.				44
MEDA A: **1 "Not Understandable"**				
Procedures - clarity and ease of understanding	56	52	54	54
amount of jargon & ambiguity in procedures	45	39		42
easy to understand written procedures	38	35		37
easy to understand diagrams and pictures	32	32		32
clarity of jobs to which you are assigned	28	24		26
easy to understand service instructions	11	12		11
easy to understand service bulletins	5	4		5
poor legibility of printed and/or written material	5	6		5
MEDA A: **2 "Unavailable/Inaccessible"**				
Being given the necessary information before starting a job	63	54	55	59
Provision of information required to do job	61	65	50	57
MEDA A: **3 "Incorrect"**				
Accuracy of procedures	50	50	54	52
MEDA A: **4 "Too Much/Confusing Information"**				
Procedures - practicality and ease of use	50	50	48	49
practicality/user friendly layout	53	52		53
user friendly layout	42	47		45
amount of jargon & ambiguity in procedures	42	52		47
ability to retain information 'in your head'	26	20		23
ambiguity resulting from different layouts for different forms used	21	10		15
MEDA A: **5 "Updated process is too long/complicated"**				
Identification of revisions to procedures	47	47	48	48

MEDA				
	Tech Cert Staff	**Tech Non Cert Staff**	**Mngmt/Tech Support Staff**	
A INFORMATION (e.g. work cards, maintenance manuals, service bulletins, etc.				44
Systems for reporting problems with maintenance manuals and documentation	38	38		38
Systems for fixing problems with maintenance manuals and documentation	34	30		32
system for informing staff of any upgrades to procedures	26	20		23
systems for implementing temporary revisions to maintenance manuals	11	10		11
MEDA A: 6 "Incorrectly modified manufacturer's MM/SB"				
previously encountered problems not highlighted	58	40		49
no temporary revisions to maintenance manuals concerning known problems	32	32		32
the effectiveness of temporary revisions to maintenance manuals (MMTR)	16	10		13
MEDA A: 7 "Information not used"				
not addressed				-
MEDA A: 8 Other				
Communications between management and staff	68	60	68	65
Quality of briefing by others passing on a job	54	50	56	54
Managers informing staff of important safety findings	46	46	53	49
Similar Information Provided for Other MEDA Categories of:				
B EQUIPMENT/TOOLS				21
C AIRCRAFT DESIGN/CONFIGURATION/PARTS				53
D JOB/TASK				30
E TECHNICAL KNOWLEDGE/SKILLS				41
F INDIVIDUAL FACTORS				38
G ENVIRONMENT/FACILITIES				28
H ORGANISATIONAL FACTORS				35
I LEADERSHIP/SUPERVISION				49
J COMMUNICATION				0