Design, Development and Evaluation of a Course Development Quality Assurance System for the ICAO TRAINAIR Programme

A Thesis

In

The Department of Education

Presented in Partial Fulfillment of the Requirements
For the Degree of Master of Arts (Educational Technology) at
Concordia University
Montreal, Quebec, Canada

August 2004

Your file Votre référence
ISBN: 0-494-04303-2
Our file Notre référence
ISBN: 0-494-04303-2

ABSTRACT

Design, Development and Evaluation of a Course Development Quality Assurance System for the ICAO TRAINAIR Programme

Nicole Barrette-Sabourin

The TRAINAIR Programme of the International Civil Aviation Organization (ICAO) is in operation since 1988. The Programme is tasked with establishing and implementing standards for training of civil aviation personnel. In order to achieve training standardization, civil aviation training centres that belong to the programme have to train course developers in a methodology based on instructional systems development.

TRAINAIR members have tasked the ICAO TRAINAIR Central Unit with developing a course development quality assurance system. Members recognized that as the TRAINAIR Programme membership expands, the quality control work required to respond to course development phase reports in a timely manner would eventually exceed the resources available in the Central Unit. The system should also address common difficulties and misconceptions identified in the application of the methodology.

This paper uses a case study approach and presents the analytical work on which the TRAINAIR course development quality assurance system was developed, a description of the process of development of the system, the system itself, and a preliminary report on the implementation of the system within the TRAINAIR Programme.

ACKNOWLEDGEMENTS

This project could not have been undertaken without the support, assistance and encouragement of three groups of wonderful people. The professors, instructors, and fellow students in Educational Technology at Concordia University is the first group. They have guided, challenged and spurred me on. The second group belongs to ICAO's TRAINAIR Programme, and specifically to Mr. Mitchell A. Fox, Chief, TRAINAIR Central Unit. His support as well as that of my Personnel Licensing and Training Section colleagues' and dear friends in the organization has been invaluable. The third group is my family. My love to them always.

DEDICATION

To Gabriel, Francois, and Jean-Pierre

and

In memory of John Brooker

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Tables

Figures

1. Introduction

This paper presents a thesis-equivalent for the partial fulfillment of the requirements for the degree of Master of Arts in Educational Technology at Concordia University. It presents the design, development and preliminary evaluation a Course Development Quality Assurance system for the ICAO TRAINAIR Programme using a case study approach.

1.1 The Research Question

The TRAINAIR Programme and its methodology present a unique situation in that it brings together civil aviation training centers across the world involving a variety of cultural, socio-economic, developmental and policy issues. While all of these issues would warrant investigation in their own right, the focus of this study is on the methodological aspects of course development in the TRAINAIR Programme, a fundamental component of the TRAINAIR system.

Reviewing officers of the Central Unit have found that phase reports submitted by the training centres belonging to the programme usually do not meet TRAINAIR methodological standards when initially submitted and require substantial modifications. (See Appendix 1 - Number of phase reports before found compliant). Additionally, when comparing their analysis of the same phase report, reviewing officers identified different issues to be addressed in order for phase reports to be compliant with methodological standards. These differences in interpretation exist even though course developers and reviewing officers refer to the TRAINAIR Training Developm~nt Guidelines as their source document. How can a shared understanding of the methodology be achieved by course developers and reviewing officers? Which methodological standards prove problematic?

1.2 The Purpose of the Study

In its document entitled Case Study Evaluations (November 1990), the United States General Accounting Office indicates that "the function of exploratory case studies is to develop the evaluation questions, theasures, designs and analytic strategy for the bigger study". Marshall and Rossman (1995), indicate that research with exploratory purposes and addressing questions such as what is happening in a program, the identification of important variables or the generation of hypotheses for further research can use a case study research strategy.

The aim of this study is to design and develop a course development quality assurance system in order to identify which elements in the methodological standards have or do not have a shared understanding. The system should assist in gathering data that will assist in identifying training gaps and allow the generation of tools for the effective implementation of the TRAINAIR methodology. This study should assist in developing measurement constructs, which can later be used in larger scale longitudinal investigation or development projects and streamline the interpretation of methodological standards.

1.3 The Research Strategy

As the purpose of this study is exploratory in nature, a case~study strategy has been used to gather data and design the course development quality assurance system. An extensive body of extant data has been examined to determine the elements in the methodology where shared understanding should be achieved. The extant data consisted of comments provided over several years by a number of reviewing officers, and during technical support mission reports, as well as TRAINAIR documentation explaining methodological standards. The results of this analysis were discussed in depth with reviewing officers presently involved in the review of phase reports

in the Central Unit. Limited feedback has also been obtained from course developers during technical support missions undertaken in late 2003 and the first half of 2004.

In the design and development of this study,' the epistemology underlying the TRAINAIR methodology has not been questioned. The assumption is made that the methodology can be applied effectively cross-culturally and in a variety of socio-economic contexts. The prescriptive nature of the methodology has not been questioned.

The researcher for this study, is a reviewing officer of the Central Unit. As such, the researcher can be considered as a "full participant" in the study as defined by Marshall and Rossman *(1995):* "the full participant, who goes about ordinary life in a role or set of roles constructed in the setting." The researcher's job title within the TRAINAIR Central Unit is "Training Expert". As such, the researcher has been involved in all tasks of reviewing officers related to the review of phase reports. Additionally, the researcher was tasked as a member of the TRAINAIR Central unit to develop the course development quality assurance system and authorized to access all required extant data. Reviewing officers of the Central Unit were requested to fully collaborate and assist in the study. Reviewing officers with their varied background and experience provided useful insights in the study.

The data gathered in this case study was triangulated in line with principles of qualitative research. (cited in Tellis 1997). A large number of phase reports comments were analyzed. These comments covered a wide variety of civil aviation course development topics, were addressed to training centers belonging to a variety of geographical regions and developed in three languages.

While the researcher could be considered as a single observer, bias was alleviated by the review of the analysis by other reviewing officers in the Central Unit.

2. Background information

2.1 ICAO

ICAO is a specialized agency of the United Nations (UN) system. As part of the UN system, the focus of the agency is on global and equitable development of the civil aviation system. It is stated in the preamble of the Chicago convention, which spells out the core mandate of the organization:

> "Whereas the future development of international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples of the world, yet its abuse can become a threat to the general security;. and
>
> Whereas it is desirable to avoid friction and to promote that cooperation between nations and peoples upon which the peace of the world depends;
>
> Therefore, the undersigned governments having agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically;
> Have accordingly concluded this Convention to that end."

The 188 Contracting States that have ratified the Chicago Convention, commit to implementing the standards established by the agency, as these standards ensure safe, efficient and regular air transport. The TRAINAIR Programme is tasked with establishing and

and regular air transport. The TRAINAIR Programme is tasked with establishing and implementing worldwide civil aviation standards as regards training of civil aviation personnel.

2.2 The TRAINAIR Programme

In the 1950s, ICAO issued training manuals that compiled all of the technical knowledge and competencies required for several civil aviation tasks (Flight crew training manual, human factors training manual, Dangerous Goods Training Programme, etc.). These training manuals were aimed at providing a common baseline for instructors in civil aviation training centres in those disciplines, thus ensuring that standards were met in both developing and developed States. Subject matter experts wrote these manuals. These were submitted to a lengthy process of approval. However, the manuals became obsolete as new technologies were introduced. Due to ICAO's limited resources, it was not possible to update and revise these training manuals. Another solution had to be found.

In the early 1970s, ICAO's technical assistance bureau found that updated and detailed materials were urgently needed. This bureau was charged with project implementation of standards, mostly in developing States. (See Appendix 2 for a summarized organigram of ICAO) At that time, the United Nations Development Programme's (UNDP) focus matched ICAO's mission to implement national infrastructures that would assist in economic development. Therefore, through UNDP, funding became available for consultants to write a new series of training documents. These documents called Standardized Training Guidelines (STGs) were submitted to a less rigorous approval process than training manuals. By 1983, 36 STGs had been produced.

However, in the early 1980s, STGs encountered a fate similar to that of training manuals. In order for their use to be continued, it would be necessary to update and revise them. By then, however, UNDP funds were no longer available for this purpose. Once again, a new solution had to be found that would not only address the problem of updating and accuracy of STGs as well as other deficiencies of the STGs. It was found that for many civil aviation training centres (CATCs), especially in developing states, STGs would be implemented "literally", although these were meant to be used in a more flexible manner. The use of non-current STGs became a growing concern because of their potential impact on safety.

STGs, unlike the training manuals of the 1970s, were written by a single expert and were not submitted to the same rigorous, costly and time-consuming review process. Although STGs used a standard format (general information, course schedule, course lesson sheets, and summary of contents) they were of uneven quality across civil aviation disciplines. It was also found that instructors using STGs were usually subject matter experts and had limited background in instructional techniques. Additionally, each instructor in a given discipline would prepare his/her own materials. This represented a considerable duplication of effort by staff in CATCs as well as between CATCs. Finally, in several States STG-based instruction was aimed at complying with the prerequisites for obtaining licenses, rather than exhibiting job competency. A systematic approach to training became critical.

With the consideration of future air navigation systems (FANS) in the early 1990s, the importance of a systematic approach to training became more urgent. As ICAO began considering the impact of a cycle of introduction and implementation of satellite and computer based technologies worldwide, it became clear that the pace at which this would occur was beyond what could be initially envisaged. Furthermore, it became clear that issues had to be addressed in a multidisciplinary, cyclic and iterative fashion. Like the Internet, planes crisscross

the skies in random yet directed paths. Training of personnel to manage, operate and maintain this aviation web had to be included as a critical dimension of this system.

The TRAINAIR Programme was established to respond to the deficiencies identified above in the STGs and the training manuals. In 1988, through UNDP funding, projects were launched to develop this programme. It became part of ICAO's Air Navigation Bureau, Personnel Licensing and Training Section in 1993 (See Appendix 2). It has been adapted from similar programmes in other United Nations agencies (i.e. the CODEVTEL Programme in the International Telecommunications Union, the TRAINMAR Programme in United Nations Conference on Trade and Development (UNCTAD)). The TRAINAIR Programme consists of three interactive elements: a sharing network, a methodology, and a pool of course materials. CATCs become members of the TRAINAIR Programme. To achieve this, they agree to develop training materials called Standardized Training Packages through an adapted Instructional Systems Development (ISD) methodology. This methodology consists of nine phases: phase 1 – preliminary study, phase 2 – Job Analysis, Phase 3 – Population Analysis, Phase 4 – Curriculum Design, Phase 5 – Design of Modules, Phase 6 – Production, Phase 7 – Validation and Revision, Phase 8 – Implementation and Phase 9 – Post-Training Evaluation. The methodology used for the TRAINAIR Programme was adapted from the methodologies used in the CODEVTEL and TRAINMAR Programmes, which were in turn originally adapted from the model used by AT&T. Once a completed STP has been found to comply with the TRAINAIR standards it becomes part of a sharing pool of STPs that members of the TRAINAIR programme can access at will. (The TRAINAIR Programme Rules at Appendix 3). Thus, CATCs develop a limited number of STPs, yet have access to a growing pool of high quality STPs. Quality control of STPs is ensured by the TRAINAIR Central Unit (TCU) based at ICAO Headquarters. Members of the programme transmit reports for each key phase in the development of an STP. These phase reports are reviewed by the Central Unit for Phases 1, 2, 4, 7 and the full STP. (See Appendix 4 for a

flowchart of the methodology). Because of their methodological uniformity, STPs are intended to be easily exportable and importable between member CATCs. The TRAINAIR Programme therefore addresses the deficiencies of training manuals and STGs by dividing the task: CATCs produce training materials and ICAO maintains standards.

The global TRAINAIR membership agreed to a programme development strategy during the Seventh TRAINAIR Coordination Conference and Training Seminar (Cornwall, 1997). Subsequently, members reviewed and amended the strategy during the Eighth Global TRAINAIR Conference and Training Symposium (Madrid, 2000). The strategy was amended to ensure the continued expansion of the TRAINAIR Programme. During the discussions, members emphasized the need to retain the basic programme concepts, including the standardization function of the Central Unit. There are presently 42 training centres from 38 Contracting States that are members of the TRAINAIR Programme. It is envisaged that membership will grow steadily by approximately two to three members per year during the next decade.

3. Background to Course Development Quality Assurance Project

The members recognized that as the TRAINAIR Programme membership expands, the work required to respond to phase reports in a timely manner would eventually exceed the resources available in the Central Unit. It was agreed that a course development quality assurance system, to be implemented by each member training centre, would further standardize the application of the TRAINAIR methodology, thus reducing the average amount of time that the Central Unit would need to review individual reports. This in turn would ensure that ICAO could respond to phase reports in a timely manner, and allow for future expansion of the size and scope of the Programme.

The TRAINAIR Programme Development Strategy was amended by the Eighth Global Conference to include the following:

> "The Central Unit will develop guidance materials concerning course development quality assurance to be used by member training centres. The guidance materials will provide sufficient guidance for course developers and training management to review phase reports before they are forwarded to the Central Unit for final review.

The TRAINAIR Programme as described above, is a cooperative sharing network. Therefore, the training centres of the programme are the owner-operators of this system. In this capacity, the members of the programme meet on a regular basis. Regional coordination conferences are organized in which members make decisions and draw conclusion on issues requiring implementation across the network. These decisions and conclusions are then debated and adopted by all members during global conferences. The Central Unit is then mandated to implement the decisions made by the members of the programme.

During the Second Regional Coordination Conferences in 2002, concern was expressed that implementation of a quality system would place too much of a burden on training managers. It was agreed that the senior most training managers may not have sufficient time to review phase reports and that, depending upon the organizational structure of a training centre, this activity may need to be delegated to other levels of management. It was also suggested that part-time course developers could become involved in the review of phase reports using a quality assurance system. The conference was generally supportive of implementing a quality assurance system. However, in order to commit to the use of the system within the member training centres, it was agreed that the system would need to be reviewed first to ascertain the workload involved.

Decision 4/1: Support for a Course Development Quality Assurance System

That TRAINAIR member training centres within the Region expressed their support, in principle, to implement a course development quality assurance system.

Conclusion 4/1: Implementation of Course Development Quality Assurance System

That a course development quality assurance system be considered for implementation by all TRAINAIR members based upon a draft system to be reviewed by the Ninth Global TRAINAIR Conference and Training Symposium (GTC/9).

In July 2002, the ICAO Office for Programmes Evaluation, Audit, Management Review (EAO) conducted an evaluation of the TRAINAIR Programme in July 2002. Some of the findings of the evaluation are summarized below.

- While Standardized Training Packages (STPs) often represented a small percentage of the courses offered by members, the training centres have, nevertheless, benefited given the influence of the TRAINAIR methodology on non-TRAINAIR training being conducted by members.

- EAO observed that the momentum of the programme in its initial years slowed during the period from 1996 to 1998, in terms of numbers of new members and STPs. However, EAO also observed that over the past three years this trend had been reversed and there was a perceptible increase in membership growth and course development.

- The Central Unit maintains records on the number of STPs that have been finalized and those that are under development or planned for future production. In addition, records are maintained concerning each time an STP is shared between two member training centres. However, the EAO evaluation recommended that additional "operational objectives" and "indicators of success", besides the number of STPs that are finalized and those that are under development or planned for future production, be established for the programme to facilitate ongoing evaluation of the TRAINAIR Programme.

- Member training centres that responded to the EAO questionnaire rated the quality of guidance provided by the Central Unit through responses to phase reports and technical support missions to be above average in terms of usefulness, helpfulness and clarity. Some of the members mentioned that the timeliness of the Central Unit's response to phase reports had been less than satisfactory. Based on data provided by the Central Unit, it was confirmed that there were considerable delays in providing feedback to members.

- TRAINAIR members were asked to rate the effectiveness, frequency and availability of various TRAINAIR workshops, seminars and conferences. The respondents to EAO's questionnaire, on average, rated the effectiveness, the frequency and the availability of course developers workshops and seminars between good and fairly good. Some members suggested that sharing of information through the use of a dedicated Website could enhance the effectiveness of the course developers.

- The Central Unit has organized a two week Training Managers Workshop in Montreal on nearly an annual basis since 1991. The main purposes of the workshop are to give training managers an overview of the methodology and provide them with an opportunity to exchange ideas and views with their peers and ICAO staff. Members as well as prospective members are invited to participate to the workshop. Responses to EAO's questionnaires indicated that the managers workshop is considered to be very useful.

4. Requirement for Quality Assurance

Courses developed using the TRAINAIR methodology are prepared using both process and product standards. The processes include analysis of training needs, design of appropriate training materials, preparation of course materials and ongoing evaluation of their effectiveness.

Quality assurance is mainly aimed at ensuring that the processes or procedures used within an organization are established, documented, followed and updated as needed. The basic steps required to implement a quality system, such as the ISO 9001:2000 standard, are as follows:

a) identify the management, production and evaluation processes that make up the system;
b) describe the quality management processes;
c) develop and maintain quality system ~documents including a quality manual; and
d) maintain quality system records.

While the quality system summarized above could be beneficial when applied to all aspects of operating a training centre, the Central Unit would limit its guidance strictly to course

development. The processes that make up a quality system in course development are already broadly identified in the Training Development Guideline and the Training Management Guidelines. However, more detailed process guidance would be needed in areas related to management, evaluation and record keeping systems to ensure effective implementation. Material developed by the Central Unit would focus on these areas and would include checklists and forms to facilitate implementation of a system.

Effective implementation of any course development quality system requires a commitment by senior management within each member training center. It is essential that the highest levels of management support the system and make appropriate provision for the time and resources required. In particular, training center managers would need to review and approve phase reports using the Central Unit guidance. To the extent possible, the Central Unit would endeavour to streamline the quality assurance system. Furthermore, the materials would be designed so that they could be adapted to various organizational structures. Future TRAINAIR Training Managers Workshops would also include training in the use of the quality system.

Additionally, the implementation of the course development quality assurance system would address some of the findings of the evaluation performance by the ICAO Office for Programmes Evaluation, Audit, Management Review (EAO).

- While the course development quality assurance system would be specifically aimed to the development of Standardized Training Packages, the system could also be adapted for the quality assurance of non-TRAINAIR courses and assist centres in enhancing overall training provided in their institution.

- The course development quality assurance system could provide a useful tool for training centres wishing to implement a quality control system in their institution. Training centres are often required to formalize a quality assurance system, which includes course development, in order to comply with national and international regulations.

- A tracking system designed as part of the Course Development Quality Assurance system could assist in maintaining document control of phase reports and their versions; to gather information on the course development teams involved in the development of phase reports; and to gather information on the workplans for the development of STPs. The tracking system could also assist in monitoring the indicators identified for each phase of the TRAINAIR course development methodology. Over time, this would allow the Central Unit to refine the quality assurance system and to develop, amend and enhance guidance materials in order to improve course development. It could also provide rich qualitative data on the application of the methodology throughout membership of the programme.

- It is envisaged that the course development quality assurance system could provide a means to standardize the reviewing process of phase reports by reviewing officers of the TRAINAIR Central Unit. The system could also provide a more effective means of recording and documenting the comments made on subsequent reviews of phase reports and improve the timeliness of the Central Unit comments.

- The course development quality assurance system could easily be introduced on the TRAINAIR Secure website dedicated to the members of the programme where they can easily access the material.

5. Literature Review on Quality and Quality Assurance

5.1 Definitions

There is an overabundance of materials related to Quality. It deals with quality assurance, quality control, quality management systems, ISO certification, quality manuals, total quality management, etc. It might be useful at this point to establish definitions of some key terms that will then set the groundwork for further development. Below are definitions of concepts related to the implementation of quality management.

Quality. Within the ISO context "quality" is defined as: "conformance with requirement, freedom from defects or contamination, or simply a degree of customer satisfaction. Quality is defined as the totality of characteristics of a product or service that bears on its ability to satisfy stated and implied needs" (Institute of Quality Assurance, 2002). Rothery (1993) states that "we can often understand quality by its absence more than its presence. If each day is a struggle, rather than a planned performance, then it is unlikely to be a quality management system. If over and over the product almost conforms – an "it will do" attitude – or there are continual waivers, revisions, deviations, there is poor quality management."

In the context of TRAINAIR, quality would therefore mean that phase reports and STPs meet methodological requirements shared with other training centres members of the programme. Phase report comments also have to meet other quality criteria. The notion of customer satisfaction is key in this understanding of quality. Within the system of STP Development that brings together the Central Unit (TCU) and the training centre, who is the customer and who is the supplier? It is suggested that the TCU and the training centres play both roles at different point of the STP development. Training centres are suppliers when preparing phase reports that

have to meet TCU's (the customer) standards. The products being exchanged in this case are the phase reports. Inversely, when TCU supplies the training centres with comments on phase reports, then roles are reversed: TCU is the supplier and the training centres are customers. In this case however, the product supplied are comments. Therefore, quality in STP development resides in two inter-related sets of product requirements: phase reports and comments on phase reports.

Quality Control. The term "Quality Control" is often used in "industrial processes where an object can be accepted or rejected according to some metric" (CERN, 2003). The TCU exercises quality control of course development. It does so by comparing phase reports to methodological standards (or an interpretation of a methodological standard) to see how they match or not. Requirements for phase reports linked to TRAINAIR methodological standards are detailed, written in a narrative format. Additionally, the documents containing the standards are available
in English, French, Spanish and Russian. Given this multilingual context and the format of the standards, interpretation of the standards vary. This in turn makes effective and consistent quality control difficult.

Quality Assurance. Quality Assurance can be defined as "the procedure to reduce the rate of rejection. To effect this, it is necessary to:

- Install a procedure of production, which will increase the probability of acceptance of the final result.
- Follow the procedure
- Verify (and certify) that the procedure has been followed." (CERN, 2003)

Quality assurance is therefore more strategic, identifying trends and inconsistencies. The purpose of a quality assurance process is to promote and confirm consistency of performance and

to reduce variance in outcomes. Quality assurance serves to demonstrate the degree of attainment of predetermined goals and benchmarks. In the TRAINAIR context, quality assurance would therefore be translated as a means to increase the probability of compliance of phase reports with methodological standards that have been clearly set; a way to document the process of compliance; and finally a record that the procedure has been followed.

Continuous Improvement and Self-evaluation. The implementation of a quality management system (QMS) is a key requirement that can lead an organization to ISO 9000: 2000 certification. To achieve this a QMS needs to be capable of demonstrating continuous improvement and prevention of non-conformity and to assist self-evaluation.

In the above definition, two interrelated concepts are particularly interesting in the context of TRAINAIR. These are "continuous improvement" and "self-evaluation". Because it is a result, improvement can only be detected through measurement. An organization must establish current performance before embarking on any improvement. If it does not, it will have no baseline from which to determine if its efforts have yielded any improvement. The purpose of a quality improvement process is to promote meaningful changes in performance goals. A continuous quality improvement process is characterized by the regular review and revision of performance standards, measurement methods, and program activities based upon performance data. All improvement (breakthrough) is made project by project. In this sense, development of STPs can be considered projects.

Improvements cannot be detected and measured without first establishing performance baseline measures. This baseline can be established through the development of a quality assurance scheme.

As outcomes of STP development are really the result of a process that involves both TCU and the training centres members of the programme, performance indicators for each phase are required in order to measure improvement. Continuous improvement is in accordance with the concept of feedback and evaluation inherent in the TRAINAIR methodology itself including its focus on determining performance objectives that are observable and measurable. Self-evaluation is a key tool of ISO 9000: 2000. Through self-evaluation, an organization takes measurement of its own organization using a set of performance indicators and establishes a programme for continuous improvement. Self-evaluation is an effective tool for training managers committed to producing quality TRAINAIR materials. It provides a benchmarking system through which course development capability within a centre can be enhanced.

Quality Document and Quality Record. Finally there are two other definitions that are useful: quality document and quality record. A quality document "tells you what to do, i.e. work instructions or specifications. It documents the process" (ISO, 2000). In the context of TRAINAIR, this is the Training Development Guideline. A quality record "provides evidence that an organization has fulfilled the actions described in quality documents. It proves that the process was executed and records results" (ISO, 2000). In the context of TRAINAIR, evidence is looked for in phase reports provided by training centres and results are recorded in comments provided by TCU.

5.2 Some Difficulties Encountered in Quality Initiatives

Some difficulties are encountered with the implementation of quality initiatives. In a British survey conducted in the engineering field, and despite efforts in the United Kingdom to build quality and being a user of these initiatives, the following findings were made:

- ISO certification has become a business requirement for marketing rather than a means to improve quality.
- Customers are more demanding in terms of quality, and quality has become a significant issue for most suppliers.
- Price is still the prime purchasing consideration suggesting that "lip service" is often paid to quality.
- Purchasers report that poor delivery and quality make up the largest proportion of problems encountered.
- A significant number of purchasers (28%) still rely on inspection of product, probably the most expensive option, as their method of ensuring quality. Audit, performance measurements and the requirement for ISO 9000 are used to a slightly lesser extent.

The revised version of ISO 9001: 2000 reduced the paperwork requirements, the subject of much criticism, but has added new requirements. These can produce benefits if implemented correctly but will also add to the burden of considerations for many organizations.

There are several parallels that can be drawn from these findings with the TRAINAIR Programme. Quality is very important for TRAINAIR members. For the TRAINAIR Central Unit, however, as a "customer" of phase reports, it is especially significant because of its role as "gatekeeper" of standards. Training centers that are members of the programme are responsible for the production of quality materials. Given a variety of constraints that these centers face, whether in human or material resources, the production of materials that meet the quality standards of TCU can be problematic. Achieving quality (in terms of TRAINAIR standards) can be very challenging in certain civil aviation disciplines. In some of these disciplines, the development of an STP may require extensive resources. The return on investment value may be

perceived as prohibitive. While members of the network would definitely benefit by having access to STPs in these disciplines, at this point in time it is unlikely that a TRAINAIR member would engage in this development. This might explain, why in several instances, it has been found that the TRAJNAIR methodology has been applied in a "cookbook recipe" fashion, with forms being filled out without due consideration to their purpose. Similarly to ISO certification, TRAINAIR membership can be perceived as a very useful marketing tool, rather than a commitment to quality.

In his article Cultural Patterns and Quality Control, J.M. Juran also raises important issues that should be borne in mind in the implementation of quality initiatives. He describes how resistance to change stems from the social aspect involved in the introduction of a new tool. Viewed from the users point of view a new tool raises issues regarding: lack of legitimacy (what is the "authority" of this new system); conflict with specification (how does it fit with the other standards? Does it replace specifications?); conflict with other forms of data collection (What constitutes the appropriate tool for reporting?); and calls for a pattern of operator action that is different from past practice without solving the new problems that it creates.

6. Description of STP Production System

To analyze the system, the process outlined in the Discussion Paper No. 2 for the 2003 Course Developers Seminar was used. Figure 3 below represents the two main sub-systems that are involved in the STP Production Process. The model could be further expanded to include the inputs, processes, outputs and feedback loop for each phase of the TRAINAIR methodology. However, for the sake of this project, it has been limited to two sub-systems: the Course Development Process and the Course Development Quality Control Process. Below is a brief description of the inputs, process, standards, outputs, and feedback of each sub-system.

The inputs to the Course Development sub-system include: human resources (course developers, subject matter experts and support staff); software, hardware, a mandate to develop STPs, comments from the Central Unit, and feedback from trainees, instructors, training managers and operations managers. The process used is based on the training that Course Developers have received in the Course Developers Workshop. The process, as well as its standards, is documented in the Training Development Guidelines. The process is summarized in the Training Managers Workshop. Supplemental information on the methodology is provided in discussion papers prepared for the Course Developers Seminars. Outputs of the Course Development Process include phase reports, revisions to phase reports and full STPs. When a TRATNAIR Expert is in country providing on-the-job training to course developers, feedback is certainly provided. The results of this feedback from the TRAINAIR expert affects the quality of phase reports and STP materials received from the training centre. When there is no TRAINAIR expert in country, it is not clear how internal feedback is provided within a training centre. In principle, course developers should be able to develop STPs without expert support once he or she leaves the country.

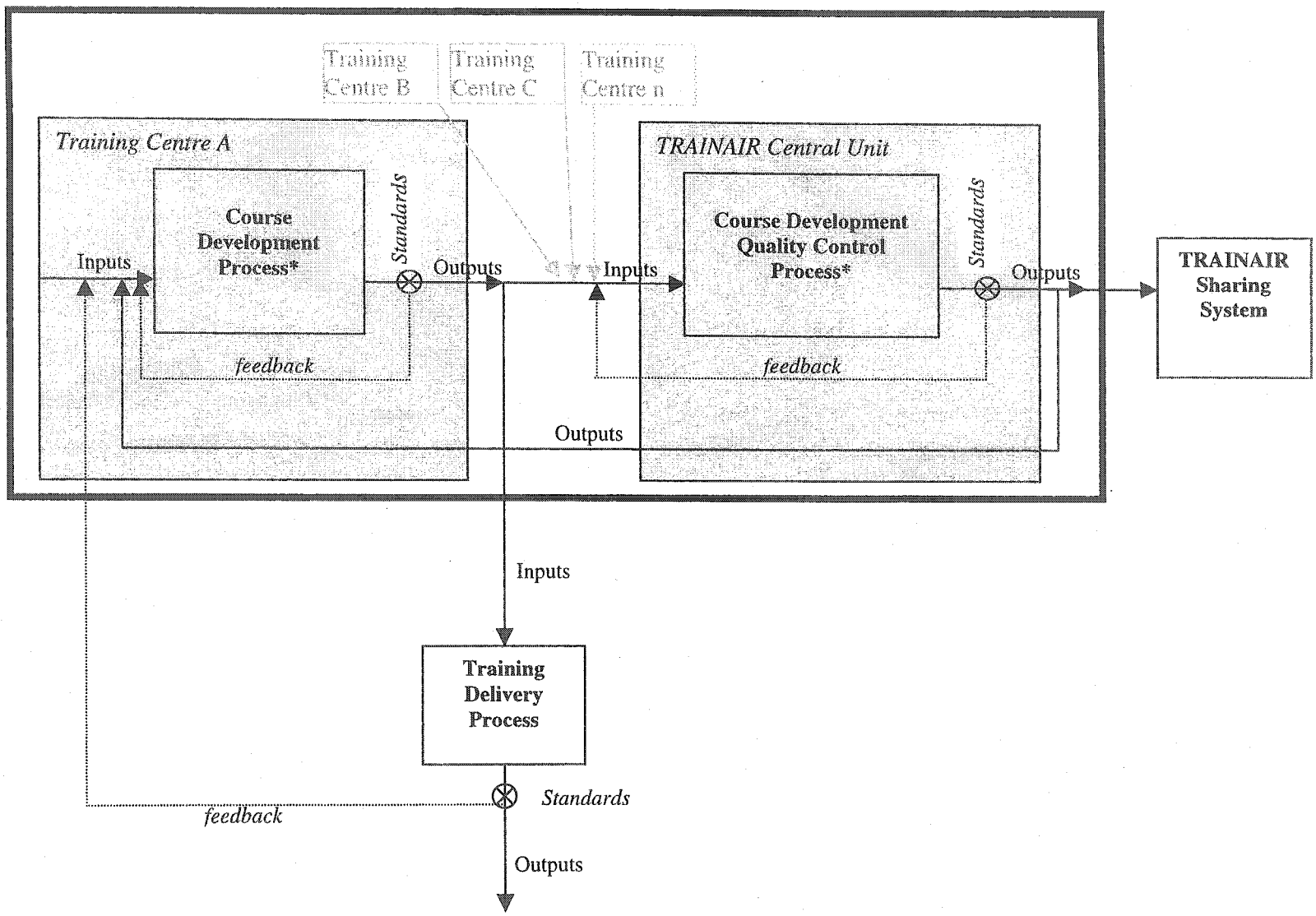
The inputs to the Course Development Quality Control sub-system are the outputs of the sub-system described above; human resources, software, hardware and feedback from training managers and course developers. The process used in the Course Development Quality Control sub-system is based on the Training Development Guidelines (TDG). ICAO Training Officers review phase reports and STPs to determine if they comply with the standards of the TDG. This process involves the comparison of material found in a phase report to TDG process and product standards as training officers interpret it. The outputs of Course Development Quality Control process are comments on phase reports, comments on STPs, approval of phase reports and approval of STPs. These outputs are fed back into the Course Development System of a given

training centre. The standards for the comments on phase reports and STPs are not documented formally. The feedback loop is provided by the review of comments among training officers.

Figure 1

STP Production System

7.´ These processes can be subdivided into sub-systems corresponding to each phase of the methodology.



7. Definitions of Symptoms and Causes

7.1 Symptoms

A problem is defined by its symptoms and consequently our first step is to look for the symptoms of a problem. According to the TDG, "symptoms are differences between desired and actual performance". In order to identify the gap between the desired and actual performance, it is necessary to determine the "desired standard of performance" before a symptom can be meaningfully described. "Desired standard of performance" should be interpreted as the product standard or process standard of a system against which we compare the actual output/process. It follows that a symptom is generated when the users/customers of the outputlprocess of a system, or other interested persons, recognize this difference and send a message of disagreement or alert (feedback component of the system). Therefore, we can conclude that a symptom is a consequence of a performance problem affecting the output/process of the system. Symptoms can be low productivity, poor grade of service, customer's complaints, high absenteeism, staff complaints etc.

7.2 Causes

Causes of performance problems are directly linked to the *inputs* and *processes* of the system under analysis. The causes may be external. Inputs that normally are coming from other systems or sub-systems are not appropriate, for example, inadequate tools, inadequate selection and recruitment procedures. Causes may also be internal, a part of the system affected itself, for example: inadequate organizational structure, poor environment, job procedures and process standards badly designed, inadequate equipment for performing the tasks. Internal causes may be

shortage of qualified staff, lack of job aids and job procedures, badly designed process standards, inadequate shift organization structure and poor staff motivation in the relationship managers-staff and feedback to staff.

Identifying the system affected is key in clearly defining performance problems. Not only does it remove the confusion of what constitutes a symptom or a cause and supports a clear identification of the problem; it also points to what non-training solutions could be applied and where. Usually, the system affected is linked to other systems or sub-systems that have to be considered in the analysis. An incomplete definition of the system affected may result in an inaccurate identification of the primary and secondary target population. This incomplete definition of the system affected may also result in difficulties in quantifying the target population. The primary target population should be the staff working in the system/subsystem affected but the secondary corresponds to other systems/subsystems linked to the system/subsystem affected. A clear identification of the system affected helps to identify problems in those other systems/sub-systems. This systematic analysis therefore allows the identification of non-training solutions for other problems.

7.3 New systems

The systems approach is also very useful when designing a new system. The selection of an appropriate location for the new system in the overall organizational structure is very important in terms of its interrelation with other systems/subsystems. The location of the new system should be selected so that communication problems are avoided through an unimpeded flow of inputs from other systems/subsystems and efficient feedback.

7.4 Symptoms of the Course Development Process

The symptoms associated with the outputs of each sub-system and their potential causes are listed below.

- Symptoms and Causes of Course Development Process within a Training Centre

The outputs of the Course Development process within a training centre are: phase reports, revisions to phase reports and full STPs. In the list of causes provided below, lack of resources in a training centre was not included. It is assumed that limitations in resources will certainly come into play in course development as it affects inputs to the system. However, because of the variety of structures of the training centres members of the programme, this issue has not been considered at this point.

Symptoms	**Potential Causes**
• Similar methodological errors persist in the development of different STPs. • Methodological errors persist after comments from TCU have been provided. • Inconsistencies between different part of a completed STP. • Delay between phase reports revisions.	• Basic principles and objectives of the methodology are not understood. Phase reports are seen as a series of forms to be filled out and the relationship between phases is not clear. • Methodology is perceived as too demanding. • Lack of continuous practice in the methodology. Course Development methodology is not understood by Training Centre (TC) management. • TDG provides in certain cases incomplete information; TDG provides information in disconnected fashion. • Lack of appropriate support from Central Unit. • Lack of motivation of course developers to correct errors. Human error.

Table 1 - Symptoms and Causes of Course Development Process within a Training Centre

- Symptoms and Causes of TCU Course Development Quality Control Process

The outputs of the Central Unit's Course Development Quality Control Process are: comments on phase reports (initial and revised), comments on STPs, approval of phase reports and approval of STPs.

Symptoms	Potential Causes
• Inconsistencies in findings among TO/TCUs for a given phase report. (Inter-rater reliability issue.) • Delay on comments due to tracking of background documentation or missing information related to phase reports • Delay due to editing of comments • First submission of phase reports are rarely approved as compliant • First submission of full STPs are rarely approved as compliant	• Interpretation of standards of methodology varies among TO/TCUs. • Lack of performance indicators for each phase • Human error. • Materials related to a specific STP are not reviewed by the same TO/TCUs. • Inefficient tracking system of phase reports and corresponding comments

Table 2 - Symptoms and Causes of TCU Course Development Quality Control Process

An analysis was made of the number of versions required for phase reports to be found compliant for 31 STPs at different stages of development. It was found that on average each phase report had to be reviewed 1.7 times before it could be considered compliant with TRAINAIR methodological standards.

7.5 Potential Solutions for Course Development Process within a Training Centre

From the causes listed above for the two sub-systems, potential solutions have been outlined below.

Potential Causes	Potential Solutions
1. Basic principles and objectives of the methodology are not understood. Phase reports are seen as a series of forms to be filled out and the relationship between phases is not clear. 2. Methodology is perceived as too demanding. 3. Lack of continuous practice in the methodology 4. Course Development methodology is not understood by Training Centre management 5. TDG provides incomplete or inaccurate information; TDG provides information in disconnected fashion 6. Lack of motivation of course developers to correct errors. 7. Lack of appropriate support from Central Unit. 8. Human error	• Develop quality assurance job aids and associated training. These job aids should focus on performance outcome for each phase, clear performance standards and indicators for each phase. The associated training could be included in the existing Training Managers Workshop Materials. This would include a revision of the TMG. • Develop quality assurance job aids that compensate for lack of practice and clarify standards. • Involve Training Managers in methodological process and its outcomes • Acquaint Operations managers with the methodology and their role in it • Revise TDG • Streamline reviewing and approval process of phase reports.

Table 3 - Potential Solutions for Course Development Process within a Training Centre

7.6 Potential Solutions of the Central Unit Course Development Quality Control Process

Potential Causes	Potential Solutions
1. Interpretation of standards of methodology varies among TO/TCUs. 2. Lack of performance indicators for each phase. 3. Human error. 4. Materials related to a specific STP are not reviewed by the same TO/TCUs. 5. Inefficient tracking system of phase reports and corresponding comments.	• Ensure consistency through reaching consensus on the performance outcomes, standards and indicators for each phase. • Develop and document performance outcomes, standards and indicators for each phase. • Develop quality assurance system Ensure continuity through appropriate document tracking system in TCU. • Involve Training Managers and Course Developers in tracking the development of their STPs. • Revise TDG

Table 4 - Potential Solutions of the Central Unit Course Development Quality Control Process

8. Expected Benefits for Solving the Problem

The potential solutions listed above consist of training and non-training solutions. Non-training solutions include the development of a course development quality assurance system consisting of three parts: the development of course development quality assurance job aids, the development of a tracking system, a revision of the TDG and the TMG. The training solution consists in the development of modules that would become part of the existing Training Managers Workshop.

The Course Development quality assurance system would allow training centres to produce better quality phase reports and STPs, would provide baseline performance measures from which improvements could be measured; would serve as self-evaluation tools; would allow training centres to plan, implement and measure continuous improvement; and would form the basis of a tracking system that would allow the evaluation and approval process to be streamlined. This would establish a process that spells out the involvement of training management in the course development process. The successful implementation of this system could also serve as a case study for implementation of other components of a quality management system.

The involvement of managers in the quality assurance of course development would provide an opportunity for course developers to showcase their skills with training managers and operations managers, as well as a means to document some of the challenges they face in their function, such as access to subject-matter expertise, access to Internet and opportunities to participate in TRAINAIR events.

The Course Development quality assurance system would allow the Central Unit to document the reviewing process of phase reports and STPs, improve inter-rater reliability between TO/TCUs by reaching consensus as to what constitutes standards and performance indicators for each phase, expedite the reviewing and approval process, improve seamlessness between reviews of phase reports and STPs, and establish a tracking system by which the progress on a given STP can be monitored. It would also provide a useful diagnostic tool tomeasure how course development capability is progressing in individual centres and throughout the network. This in turn would provide useful information to the Central Unit as to how it can improve its performance. It would therefore address some of the points raised in the EAO evaluation.

Training managers would need to be familiarized with this new system. This can be achieved through training incorporated in the Training Managers Workshop. This training would be aimed at providing the skills, knowledge and attitudes necessary for the implementation of this new system. The new system would also be discussed during other TRAINAIR activities such as the Course Developers Seminars, the Regional Coordination Conferences and the Global Conferences.

This Course Development Quality Assurance system could also prove valuable with the potential involvement of private sector entities in the TRAINAIR Programme presently under consideration in ICAO. Private sector entities are familiar with the ISO 9000 principles. If and when private sector training organizations join the programme, it will be critical to have a tracking system that can clearly demonstrate that government-owned and/or operated centers are benefiting to the same degree than the private sector training organizations, and that both types of organizations are subject to equal standards. Members using the course development quality

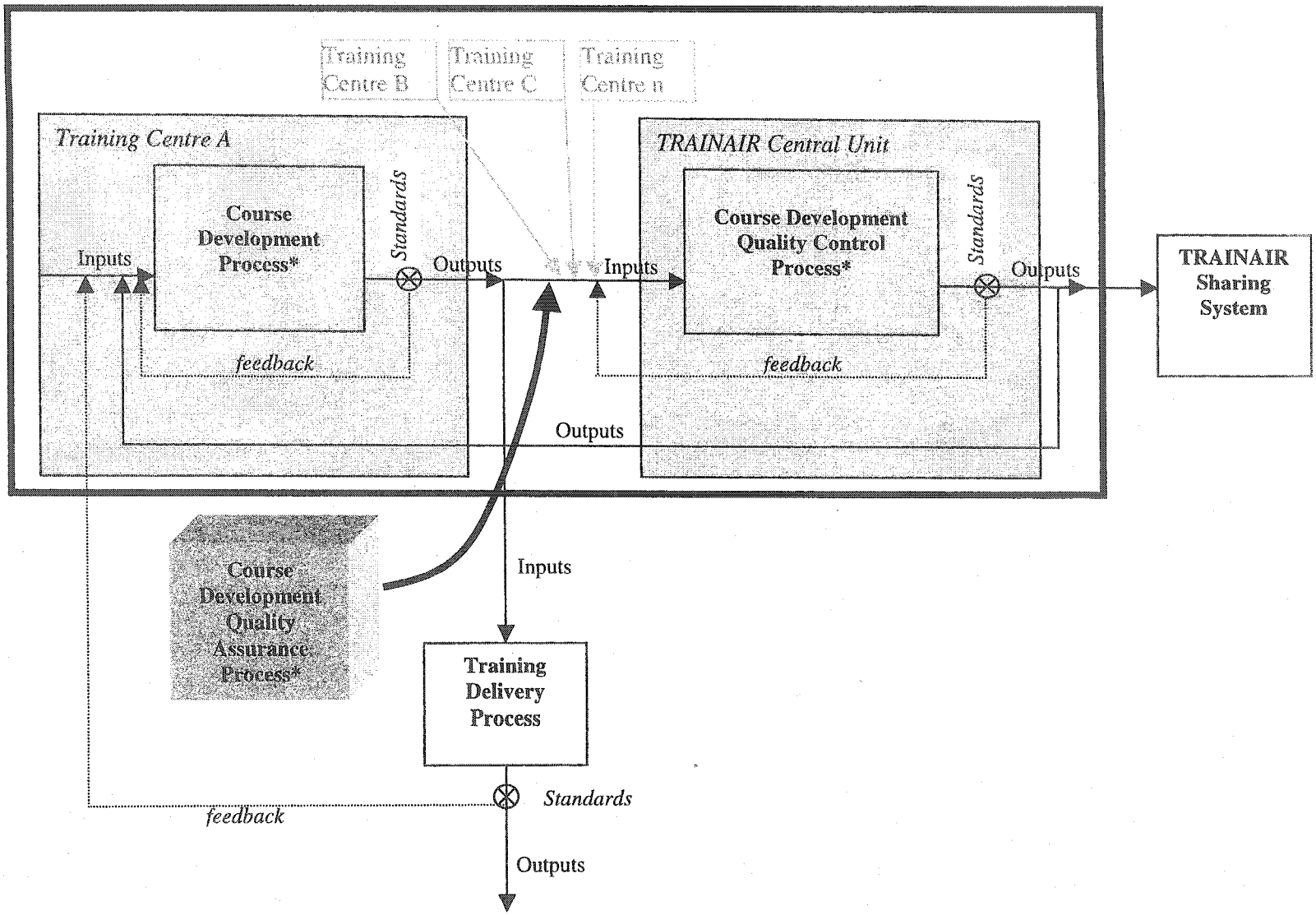
assurance system in the development of their first STP will also provide useful information on the effectiveness of the system.

A course development quality assurance system would create a new sub-system, which would be located between a Training Centre's Course Development system and the Central Unit's Course Development Quality Control system as illustrated in figure 4 below.

Figure 2

Location of Course Development Quality Assurance Process

* These processes can be subdivided into sub-systems corresponding to each phase of the methodology.



9. Challenges and Constraints

The introduction of a new system is likely to meet with resistance as it involves additional tasks as well as tasks that are unfamiliar. The course development quality assurance system may be seen as additional forms to be filled out, rather than an attempt at improving quality. As was indicated above, one of the pitfalls of ISO 9000 process is its heavy dependence on paperwork. It will be important to obtain the support of managers in the use of this tool to ensure that it is not perceived as an additional step in an already paperwork-heavy process. The aim of the course development quality assurance is not to introduce the full process leading to ISO certification, but rather to streamline and adapt the most relevant aspects of the ISO process.

The way the issue of legitimacy of the course development quality assurance (CDQA) system is addressed will be key to its successful implementation. The status of the CDQA should be clearly defined in relation to the TDG and the TMG. Training Managers and course developers have been trained to consider the TDG as the holder of course development standards. It will be important that the information provided in the CDQA system, especially as it relates to standards, is consistent with the TDG. In the cases when it cannot be, because of inconsistencies in the TDG itself or new interpretation of standards, it will be important to spell out in the CDQA system when this is so. Additionally, the statOs of the CDQA system will probably require clarification. Initially the system will stand alone and may be incorporated in the TRAINAIR Operations Manual. However, it will be important to determine early on how the CDQA system will be embedded in the structure of the programme.

Besides the issue of legitimacy, other factors are impacting the implementation process of the CDQA system. One factor is the target audience of the CDQA system.

Three target population were identified: training managers who have participated in the Training Managers Workshop (TMW) in its present format; training managers who have not participated in the Training Managers Workshop and Course Development Unit Team leaders. Training managers who have already participated in the TMW are unlikely to participate a second time. Additionally, not all training managers or Course Development Unit team leaders are likely to participate in a TMW. Another factor that impacts the CDQA system implementation is that member training centres should have this system implemented during 2004.

The dissemination of information concerning the CDQA system will also be critical in its successful implementation. Advance information to members on this subject and frequent discussions (face to face and on line) will be necessary to gain the support of the different stakeholders of the system, mainly training managers and course developers. It will also be necessary to brief stakeholders and clarify the status of the CDQA framework as regards standards. The Internet should be used to this end. However, for several members of the Programme, it is still difficult to access the Internet. It will be important to establish a system that is equally effective electronically and on paper.

A creative approach will need to be used to introduce the CDQA system to the different target audiences it needs to reach and meeting the tight schedule for its implementation in all TRAINAIR training centers, while taking into account the resources of training centers. This implies that the training strategy to introduce the CDQA system could potentially use different media.

With the introduction of the CDQA system, it may be necessary to amend certain TRAINAIR key documents such as the TRAINAIR Programme Rules, the Course Developers

Sample Job Description, the STP Assembly Guideline and Checklist, and the Non-TRAINAIR Programme Course Acceptance Criteria. It may also be necessary to reconsider the purpose of forms such as the Course Developers OJT Training Checklist and the Monthly Contact Sheet.

Another constraint will be that of languages. Presently, three languages are used in the TRAINAIR Programme: English, Spanish and French. Translation and interpretation of documentation will be especially critical in this case in order to ensure consistency not only between the TDG, the TMG and the CDQA system within a given language, but also between languages.

10. Design and Development of Course Development Quality Assurance System

10.1 Course Development Quality Assurance Performance Indicators

A four-step approach was used to design the course development quality assurance job aids containing the performance indicators for each phase. The first step consisted in reviewing Central Unit comments for all phases of the TRAINAIR methodology to identify common issues within each phase. A total of 119 comments covering all phases and dating from 1996 to 2003 were analyzed. At Appendix 5 is a sample of the coding scheme that was used to review the comments for phase 1. The second step consisted of reviewing the existing guidance material (the TDG, the TMG, the TOM, the Course Developers Seminar Discussion Papers, etc.) to identify the key issues required for each phase. The third step consisted in formulating performance indicators for each phase. Performance indicators can be defined as a means to monitor whether key results for a phase report have been achieved. It was decided to formulate these performance indicators as questions that could be answered by yes or no. The performance indicators were

developed based on the standards found in the existing guidance material and formulated to take into account the most common misconceptions or difficulties identified in the coding of the comments on phase reports. Central Unit Officers reviewed the formulation of the performance indicator to ensure their accuracy and their comprehensiveness. The fourth step consisted in identifying the reference material available for each performance indicator. This final step assisted in identifying the areas within the existing guidance and reference materials that require modifications, enhancement, clarification and correction.

10.2 Course Development Quality Assurance Tracking System

A tracking system has been designed for the Course Development Quality Assurance Job aids. The aim of the tracking system is twofold. First, the tracking system was designed to maintain document control of phase reports and their versions; to gather information on the course development teams involved in the development of phase reports; and to gather information on the workplans for the development of STPs.. The second aim of the tracking system is to monitor the performance indicators. Over time, this will allow the Central Unit to refine the quality assurance system and to develop, amend and enhance guidance materials in order to improve course development.

In order to maintain document control, the tracking system contains the following components: tracking of the phase report version, course development team information, workplan for STP development, signature by the accountable manager and additional comments. Accountable managers would complete this part of the tracking system whenever a phase report is transmitted to the Central Unit.

Additionally, each performance indicators has a unique identifying number. This will provide the basic information required to develop a database. While quantitative data is already available concerning course development, the proposed performance indicator database will provide a qualitative means for the Central Unit to monitor course development.

Much of the information required in the course development quality assurance tracking system can be found in a different format in the Course Development Unit Monthly Contact Sheet (TRAINAIR Operations Manual, Part IV-Section 1). However, few members consistently use the monthly contact sheet. While course development work is carried out between the transmittal of phase reports, the information provided on a monthly basis is not as useful. Additionally, it is not tied to the course development process itself. It is therefore proposed to withdraw the Course Development Unit Monthly Contact Sheet from the TRAINAIR Operations Manual.

10.3 Specifications of Job Aids

The Course Development Quality Assurance (CDQA) Job Aids were designed to meet the following objectives:

Given a job aid and a completed phase report, the accountable manager and the Central Unit reviewing officer will :

- compare the content of the phase report to performance indicators for that phase;
- evaluate if the content of the phase report meets criteria of performance indicators; and
- evaluate if the content of phase report responds to previous TCU comments for that phase.

In addition, given ajob aid and a completed phase report, the accountable manager will:

- provide an explanation when the phase report does not comply with criteria of performance indicators;
- ensure that the tracking component of CDQA job aid is accurate and complete; and
- sign off and transmit the completed CDQA job aid to TCU along with the phase report.

Given a completed job aid for a phase report and using the established standards for comments, a Central Unit reviewing officer will:

- evaluate explanations provided for instances when the phase report does not comply with criteria of performance indicators;
- ensure that the tracking component of the CDQA job aid is complete and entered in database; and
- for each performance indicator for which the phase report is not found compliant, provide a detailed explanation.

The Course Development Quality Assurance Job Aids contain the following information:

- Performance indicators specific to each phase
- Reference Standards for each performance indicator
- A field where it is indicated whether a performance indicator has been complied with or not
- Explanation field for non-compliance with performance indicators
- Tracking information including:
    - Discrete tracking number

- STP Reference Number
- Version of Phase report
- Reference to last comments provided on the previous version of the phase
- report
- Information concerning personnel involved in development of the phase
- report (i.e. name of course developers, their status (qualified or undergoing
- OJT), date and location of CDW attended)
- Information concerning workplan for STP development

Copies of the course development quality assurance checklist and tracking form can be found in the Appendix 6.

11. Action taken and Evaluation

It was initially planned to present the system in detail to members of the programme during the Ninth Global TRAINAIR Training Symposium and Conference in Marrakech, Morocco in September 2003. Given the scope of the system and the limited time available, it was decided to present the system in a general manner during this event and to transmit the draft system to the members of the programme for their comment and feedback. The system was well received by the conference and the members agreed to implement the system on a trial basis. Copies of the course development quality assurance system were transmitted to all members with a request for their initial feedback by 17 December 2003.

Members provided limited feedback on the course development quality assurance checklists and tracking system. After minor revisions, the system was uploaded on the

TRAINAIR Secure Website. This secure website is restricted to members of the programe and allows them to download the quality assurance materials as well as other course materials. Starting 1 February 2004, the TRAINAIR Central Unit has been providing comments on phase reports using the course development quality assurance checklists. Initial reports indicate that the system is useful in achieving consistency between reviews. To date, members of the programme have not transmitted phase reports using the system. However, given the recent implementation of the system and the members' lack of familiarity with it, it is envisaged that the implementation of the system will require some time. Instruction concerning the system is planned during the upcoming Training Managers Workshop. This should allow participants to gain first hand experience with the material and assist them in implementing the system within their respective training centers.

The system has also been presented to training centers during technical support missions undertaken since September 2003. In some centers, training managers, course developers and Central Unit officers used the system in reviewing phase reports and course materials. Training center personnel advised that they found the performance indicators very useful in terms of guidance for the development of course material and criteria to be met.

The course development quality assurance system was also presented in detail during a Course Developers Seminar conducted in March 2004. The material was well received by course developers who particularly appreciated the self-evaluation made by the Central Unit on its reviewing process. The standardization of the reviewing process and the further involvement of training managers in the course development process was seen as an effective means to further decentralization from ICAO and promote self-reliance within each training center. This in turn

was seen as an effective way of addressing the expansion of the programme and the limited resources of the Central Unit to address this expansion.

12. Future work

The trial implementation of the course development quality assurance system is ongoing. The progress of its implementation and analysis from the data gathered during the implementation will be reviewed during the next Global TRAINAIR Conference in 2006.

As mentioned above, training material will be developed for the training managers workshop that will be conducted in late 2004. This training material will allow participant managers to use and apply the course development quality assurance system. Validation data for the training material itself will be gathered but it is also expected that additional data will be gathered on the course development quality assurance itself during the workshop.

During the design of the course development quality assurance system, it became clear that a more effective organization of the guidance material containing the standards by which the quality of course development is assessed is required. Beyond identification of discrepancies, a larger issue may be the identification of the approach required to organize all guidance material. This approach should provide course developers with a transparent interface to the standards. As the programme expands and evolves to a more decentralized modus operandi, the adoption of a more user-centered design to the guidance material might be necessary. A more user-centered design could be helpful to training center personnel who are resuming course development activities after an extended period of time. A first step towards a user-centered design may be to

use the performance indicators of the course development quality assurance system as the organizing principles of the guidance material.

A more user-centered approach to course development may also require a more flexible approach in the delivery of training in course development. The guidance material should be available on demand and accessible at any time or any location. The Internet is already being used in disseminating information on the course development methodology, the course development quality assurance, and the sharing of Standardized Training Packages. The effectiveness of the outreach of these tools is still to be evaluated.

Still to be explored in the programme are the potential contribution that distance education technologies can make in supporting quality in course development. The value of bringing together participants in training workshops from a variety of States is undeniable. However, the travel and living expenses for these types of activities can be prohibitive. A possible alternative may be to adopt a blended learning approach to diversify the means to disseminate and support training.

The performance indicators will also be useful in building a database that will allow the Central Unit toidentify trends in the application of the methodology, and diagnose common difficulties and misconceptions that course development teams encounter when developing Standardized Training Packages. This database will also provide useful information on the evolution of individual training centers in their understanding of the course development methodology. This tool will assist the Central Unit in prioritizing and developing solutions and guidance when warranted, and assist in managing more effectively the limited resources of the Central Unit.

13. Conclusion

The design and development of the Course Development Quality Assurance System provided an opportunity to address some of the difficulties experienced by course developers and reviewing officers in the TRAINAIR Programme. While it is still early in its implementation, the system is proving beneficial as a job aid to course developers: the checklists are proving useful in organizing and referencing the material containing the standards. It is also proving useful as a job aid for reviewing officers who ensure that their comments and suggestion are documented and cover all the elements listed in the checklist. This use of the checklists further enhances the transparency of the reviewing process. It is hoped that it will deepen the members' sense of ownership of the programme.

Bibliography

Bornstein, Thada, *Quality Improvement and Performance Improvement: Different Means to the Same End?,* QA Brief, Spring 2001, Retrieved in March 2003, from http://www.reproline.jhu.edu/english/6read/6pi/pi ~iJpdf/qiandpi.pdf

CERN – European Laboratory for Particle Physics, *Atlas Software – Quality Assurance,* Retrieved on 7 March 2003, http://atlas.web.com.ch/Atlas/Groups/Software/00/Development/qa/general/assurance.html

Chua, Richard C.H., *What you need to know about six sigma,* Productivity Digest, December 2001, Retrieved in March 2003, from http://www.juran.com/research/back articles.html

Dubin, Cindy H., *Quality is cheap,* Excerpted from Food Quality Magazine, July/August 2002 issue, Retrieved in March 2003, from http://www.juran.comlresearch/articles/OualReprint2.pdf

Engineering Quality Forum, *The True Effectiveness of Quality Related Initiatives in the UK,* February 2002, Retrieved on 7 March 2003, from http://www.iqa.org/information/eqf impact report.html

Geisler, David, How to Translate Quality Management Principles and Practices into Employee Performance Change and Improvement, retrieved March 2003, from http://deming.ces.clemson.edu/pub/psci/psn/newsletter.htm, Newsletter of the Government Division, Summer 2001, Volume 6, No. 4

Getting it Together, A Guide to Quality Schemes and the Delivery of Public Services, Modernizing Government Programme, Cabinet Office, United Kingdom, 2001, Retrieved in March 2003, from http://www.servicefirst.gov.uk/2001/taskforce/gettingittogether/gettingittogether.pdf

Guide to Quality Assurance and Quality Improvement, Mental Health and Developmental Disability Services Division, Retrieved in March 2003, from http://bluebook.state.or.us/state/executive/Mental Health/mental health subdiv.htm

Harvey, Lee, *Quality in Higher Education,* Paper presented at the Swedish Quality Conference, Goteborg, Sweden, November 1999

Institute of Quality Assurance, *Total Quality Management, Continual Improvement, Introduction to Quality,* IQA Quality Information Centre, Retrieved on 7 March 2003, from http://www.iqa.org/information

International Civil Aviation Organization, *Course Development Quality Assurance,* Working Paper RTCC/2 .WP/6 presented during the Second Regional TRAINAIR Coordination Conference in October 2002.

International Civil Aviation Organization, Report of the Eighth Global TRAINAIR Conference and Training Symposium, September 2000, Madrid, Spain

International Civil Aviation Organization, TRAINAIR Training Development Guidelines, Montreal, June 1991

International Civil Aviation Organization, TRAINAIR Training Management Guidelines, Second edition, Montreal, July 1994

International Civil Aviation Organization, TRAINAIR Operations Manual, Montreal, September 2003

International Civil Aviation Organization, Discussion Paper No. 1 .Design of Modules and Production and Developmental Testing, presented at the 2001 Course Developers Seminar, New Delhi, India, May 2001

International Civil Aviation Organization, Discussion Paper No. 2 -Validation and Revision, presented at the 2001 Course Developers Seminar, New Delhi, India, May 2001

International Civil Aviation Organization, Discussion Paper No. 2 -Phase 1 -Preliminary Study, presented at the 2003 Course Developers Seminar, Amman, Jordan, March 2003

International Civil Aviation Organization, Discussion Paper No. 4 -Design of Mastery Tests: the Pass or Fail Concept, presented at the 2003 Course Developers Seminar, Amman, Jordan, March 2003

International Civil Aviation Organization, GTC9 -WP/7 -Evaluation Report Findings, Working Paper presented during the Ninth Global TRAINAIR Training Symposium and Conference, Marrakech, Morocco, September 2003

International Civil Aviation Organization, GTC9 -WP/8 .TRAINAIR' s Use of the Internet, Working Paper presented during the Ninth Global TRAINAIR Training Symposium and Conference, Marrakech, Morocco, September 2003

International Civil Aviation Organization, GTC9 -WP/8 -Course Development Quality Assurance, Working Paper presented during the Ninth Global TRAINAIR Training Symposium and Conference, Marrakech, Morocco, September 2003

International Civil Aviation Organization, Report of the Ninth Global TRAINAIR Training Symposium and Conference, Marrakech, Morocco, September 2003

International Standard, ISO 9004, *Quality management systems — Guidelines for performance improvements,* Reference Number ISO 9004:2000 (E), ISO 2000, International Standard Organization, Geneva, Switzerland

International Standard, ISO 10015, *Quality management — Guidelines for training,* Reference number ISO 10015:1999(E), ISO 1999, International Standard Organization, Geneva, Switzerland

International Standard, ISO 10013, *Guidelines for developing quality manuals,* Reference number ISO 10013: 1995 (E), International Standard Organization, Geneva, Switzerland

International Standard, ISO 9001, *Quality management systems — Requirements,* Reference number ISO 9001: 2000(E), ISO 2000, International Standard Organization, Geneva, Switzerland

International Standard Organization, ISO/CD 10006 Quality Management systems- Guidelines for quality management in projects, Document ISO/TC 176/SC 2/N *577-1,* 16 November 2001

International Standard Organization, ISO 9000 Introduction and Support Package: Guidance on the Process Approach to quality management system, Document ISO/TC 176/SC 2/N 544R, 17 May 2001

International Standard Organization, Quality Management Principles, retrieved on 7 March 2003, from http://isotc_I_76sc2.elysium-ltd.net

International Trade Centre, UNCTAD/WTO, *Sample questions and answers,* retrieved in March 2003, from http://193.194.138.121 /ec/welcome3.htm?http&&& 193.194.138.121/ec/guides/eqm/

Joyce, John P., Total Quality Management, July/August 1994, retrieved on 26 March 2003, from http://www.lib.niu.edu/ipo/ip940734.html

Juran, J.M., That Uninterested Top Management, Retrieved 11 March 2003, from http://www.juran.com/research/articles/SP7720.html, Selected Papers No. 20, 1977

Juran, J.M., Product Quality -A Prescription for the West, Retrieved 11 March 2003, from http://www.juran.com/research/articles/SP8126.html, Selected Papers No. 28, 1981

Juran, J.M., Cultural Patterns and Quality Control, Retrieved 11 March 2003, from http://www.juran.com/research/articles/SP574.html

Marshall, C. & Rossman, G.B., Designing qualitative research, Chapter 2 - The substance of the study - Framing the Research Question and Chapter 3 - How to conduct the Study - Designing the Research, Second edition, 1995, Thousand Oaks, California, Sage Publications

Massoud, Rashad F., *Advances in Quality Improvement: Principles and Framework,* QA Brief, Spring 2001, Retrieved in March 2003, from http://www.reproline.jhu.edu/english/6read/6pi/pi advances/piadvances1.htm

Merrill, Peter, *ISO 9000 — On the Road to Total Quality,* CMA Magazine, May 1995, Copy of the ICAO Library

New Zealand Qualifications Authority, *Quality Assurance Standard for Course Owners — Requirements for Course Approval and Audit,* Version 1.0, November 2002, Retrieved in March 2003, from http ://www.nzga.govt.nz/providers/qualas.html

New Zealand Qualifications Authority, *Criteria for Course Approval,* Version 1.0, November 2002, Retrieved in March 2003, from http://www.nzqa.govt.nz/providers/qualas.html

New Zealand Qualifications Authority, Quality Assurance Standard 1.2.4, *1.2.5,* 1.2.6, 1.2.7, and 1.3 -Area for self-evaluation, Retrieved in March 2003, from http ://www.nzga.govt.nz/providers/qualas.html

Paradis, André and Allen, John R., Performance Indicators for Government -Part I, Public Sector Network News, A Division of the American Society for Quality, Spring/Summer 2000, vol. 5, No. 3

Rothery, Brian (1993). ISO 9000, Second Edition, *The Background to the Standard.* Gower Press, Ashgate Publishing Group, United Kingdom

Selection and use of ISO 9000, Retrieved in March 2003, from http://www.isoeasy.org/selusee.pdf, International Standard Organization, Geneva, Switzerland, 1998

Tellis, W, Application of a Case Study Methodology, The Qualitative Report, Volume 3, Number 3, September 1997, Retrieved in August 2004 from http://www.nova.edu/ssss/ORIQR3-3/tellis2.html

The ISO 9000 Guide, Interleaf Inc., Retrieved in October 1996, from http://www.ileaf.com/isoguide.html

Tricker, Ray, *Where do we go now?! The history of quality standards,* Compliance Journal, retrieved in March 2003 from http://www.compliance-Club.com/archi ye 1/010418

United States General Accounting Office, Program Evaluation and Methodology Division, Case Studies Evaluations, GAO/pemd-91-10.1.9, November 1990, Retrieved in August 2004 from www.gao.gov/policy/ 10_1_9.pdf

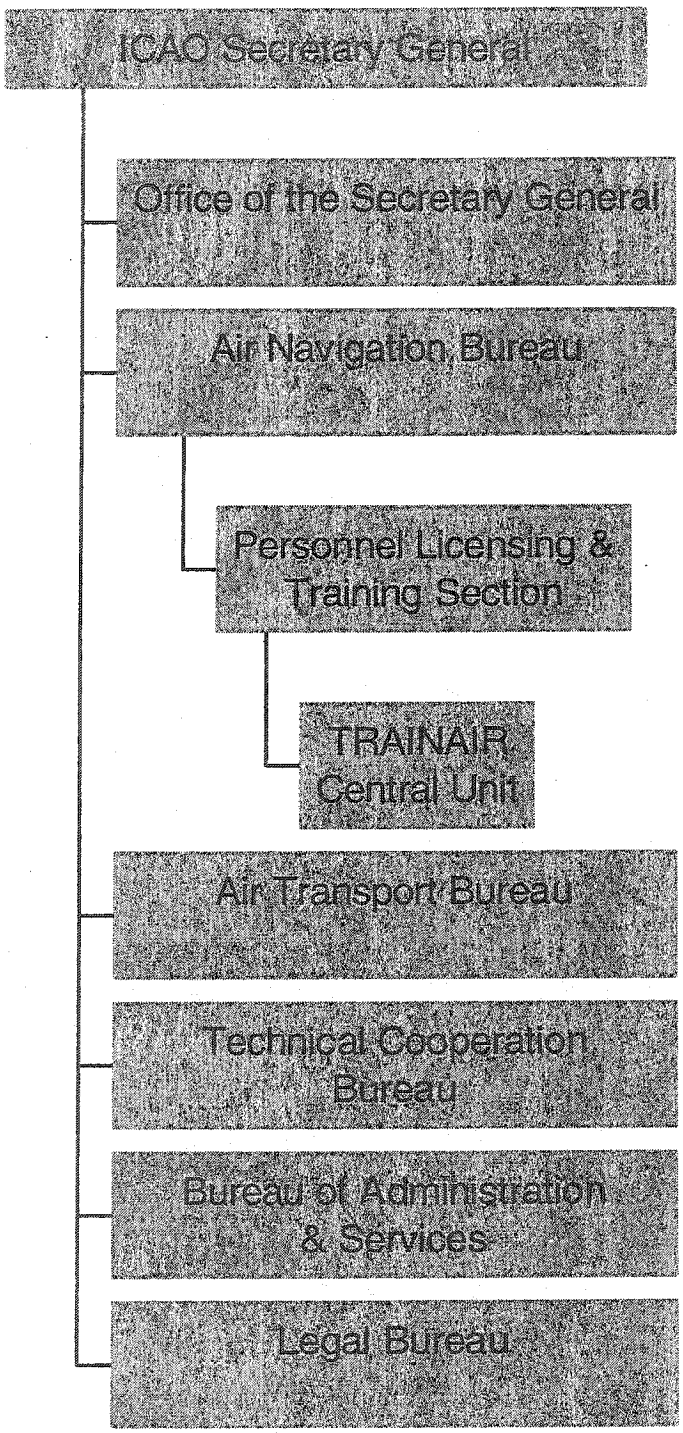
Appendix 1

Number of Versions of Phase Reports Before Found Compliant

	STP	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7
Argentina	X-Ray	1						
Bahrain	Hazmat	3	2	1	2	1		
Barbados	133	1	1	1	3			
Cuba	77							3
Egypt	42		4			1		
	131	2	4					
Ethiopia	32							3
	44							3
France	RVSM	2						
India	100		2		2			
Indonesia	45				1			
Iran	97				1	1		
Jordan	106		2	1	2			
Kenya	120	3						
Korea	123		1	1	1	1		
Netherlands	129		3	2				
New Zealand	132	1	1					
Pakistan	111		2	3	3			
	102	1	1	1				2
Paraguay	81		3		4			
Philippines	114					2		
	128		2	2	2	1		1
	124	1	2					2
Saudi Arabia	107		1	1	1			2
Singapore	119		2	1				
South Africa	122	1	2	2	2	1		
Thailand	QA	2						
United States	Surveillance		2					
	OPS						1	
Vietnam	127	2	3	1				
Average No. of versions/phase reports		1.67	2.11	1.42	2.00	1.14	1.00	2.29
Average No. of versions all phase reports	1.66							

Appendix 2

ICAO Organizational Chart



Appendix 3

TRAINAIR Programme Rules
(as of September 2003)

1. INTRODUCTION

1.1 Goal of the TRAINAIR Programme

> To improve the safety and efficiency of air transport through the establishment and maintenance of high standards of training and competency for aviation personnel on a worldwide basis and in a cost-effective manner.

1.1.1 To achieve this goal, ICAO promotes the use of a standardized methodology to develop courses in civil aviation disciplines as well as a system by which participating Civil Aviation Training Centres can share standardized course materials.

1.1.2 ICAO, through the TRAINAIR Central Unit, is responsible for the co-ordination of the TRAINAIR Programme, in accordance with the standing policies of the Organization as contained in Assembly Resolutions and other policies established by the executive bodies of ICAO.

1.2 Principles of Membership

1.2.1 The TRAINAIR Programme is a cooperative system open to all government- - operated Civil Aviation Training Centres throughout the world, provided they have the capability to prepare or adapt course materials to TRAINAIR standards.

1.2.2 Centres wishing to join the Programme must be prepared to share Standardized Training Packages (STPs). In turn, they will have access to copies of the STPs prepared by other Centres. Centres, which are both producers and users of STPs, qualify as ***Full Members*** of the TRAINAIR Programme and are entitled to participate in the setting of policies for its operation.

1.2.3 The Members of the TRAINAIR Programme recognized that some developing States may have limited civil aviation training resources. To enable such States to have an Opportunity to improve their civil aviation training programmes, the level of ***Associate Member*** was introduced. Associates Members have the capability to adapt and use STPs only, and not produce new or upgraded STPs. The Central Unit is required to verify that such Training Centres are qualified to become Associate Members.

1.2.4 It is also recognized that some training centres may not wish or may not be able to become full or associate TRAINAIR members, but could contribute to the Programme by sharing non-STP course materials and participating in TRAINAIR events and cooperative activities. The category of ***Contributing Participant*** was established and is intended to provide additional benefits to TRAINAIR members and, at the same time, benefit Contributing Participants.

1.3 Benefits of Membership

1.3.1 Through the TRAINAIR Programme, Members will have established an active Course Development Unit (CDU), with Course Developers trained to TRAINAIR standards. The CDU will prepare STPs with support and guidance from the Central Unit. The Central Unit's guidance includes: keeping members advised of available STPs, monitoring the standards of STP materials under preparation and assisting Course Development Units in maintaining the required standards.

1.3.2 Although the preparation of each STP takes considerable time, all Members of the TRAINAIR Programme will have access to any of the other STPs being prepared (to the same standards) by other participating Centres. Course Developers are also trained in the techniques of adapting STPs (prepared at other locations) to meet local conditions. Members also have access to non-STP materials that are made available to the Programme by Contributing Participants.

1.3.3 Members of the TRAINAIR Programme will, therefore, be able to progressively upgrade their training programmes by conducting material-dependent civil aviation courses based on the continually expanding pool of high-quality course material, in the form of STPs as well as non-STP course materials, available through the Programme. The TRAINAIR Programme will also provide a forum for further cooperation between States on training issues.

2. MEMBERSHIP RULES

2.1 TRAINAIR Programme Membership

2.1.1 The TRAINAIR Programme shall provide for three levels of membership:

a) Full Member;
b) Associate Member; and -
c) Temporary Member.

2.1.2 Full Membership in the TRAINAIR Programme shall be granted to organizations that contribute at least one STP to the required standards on a topic and of a duration acceptable to the Central Unit.

2.1.3 All Civil Aviation Training Centres of developing States that have been assessed by the Central Unit as not having the required level of resources to prepare STPs shall be entitled to TRAINAIR Programme benefits as Associate Members, provided they acquire the capability to adapt and effectively utilize STPs.

2.1.4 Temporary Membership shall be available to potential Full Members and will be granted at the discretion of the Central Unit for a period of twelve ynonths to a training centre that has established a TRAINAIR Course Development Unit, and has applied in writing to the Central Unit for such membership status. The written request shall indicate that preparation of a new or upgraded STP, to TRAINAIR Standards, will begin within four months after temporary membership status has been granted. A Temporary Member may apply to the Central Unit for an extension to the twelve-month period if the centre is actively involved in preparing a new or upgraded STP.

2.1.5 The capability of a training centre to meet the conditions of membership is ascertained during the TRAINAIR participation assessment. If a prospective member receives, a positive assessment, a production schedule for the training centre's first STP will be prepared. If a prospective member is unable to complete the STP within the schedule, the Central Unit will confer with the concerned training centre to prepare a revised production schedule. If the STP cannot be prepared' within a reasonable period of time, or if an amended production plan can not be agreed to, or adhered to, the Central Unit will no longer consider the concerned training centre as a prospective member. The training centre would then be required to re-apply for membership and be re-assessed to determine its capability to join the TRAINAIR Programme.

2.2 **Responsibilities of Membership**

2.2.1 Members must:

a) undertake to maintain an active Course Development Unit with trained Course Developers capable of preparing Standardized Training Packages to TRAINATR standards;

b) comply with the TRAINAIR Programme Rules; and

c) undertake to participate in TRAINAIR activities including an active role in the setting of policies, through regular participation in TRAINAIR Coordination Conferences.

2.3 **Agreement**

2.3.1 All organizations whose training centres participate in the TRAINAIR Programme shall agree in writing to abide by the rules of that Programme.

2.3.2 The above agreements shall be signed by the most senior officer of the respective administration, or by his/her authorized representative.

3. CONTRIBUTING PARTICIPANTS

3.1 All organizations that provide civil aviation training are eligible to become Contributing Participants. To obtain the status of a Contributing Participant, a training centre shall make at least one course available for international sharing in accordance with Rule 4, Sharing Rules, below.

3.2 Contributing Participants retain this status for a period based upon the number of courses they make available to the non-STP sharing system that are deemed acceptable for international sharing by the Central Unit. An organization is recognized as a Contributing Participant of the ICAO TRAINAIR Programme for one year's period of time for each course made available for international sharing and accepted by the Central Unit.

4. SHARING RULES

4.1 Standards

4.1.1 Only courses approved by the Central Unit as STPs that conform to the standards set out in the TRAINAIR Training Development Guideline or adhere to the non-TRAINAIR Course Acceptance Criteria shall be made available to the Programme through the STP sharing system.

4.1.2 The Central Unit shall review non-STP courses prior to their acceptance into the non-STP sharing system. Acceptance of non-STP courses is based on two criteria. First, a contribution shall not completely duplicate any of the existing courses in the STP sharing and the non-TRATNAIR course sharing systems. Second, the TRATNAIR Central Unit shall determine that the course is sufficiently material dependent so that a recipient training centre can teach the course with limited advice from the originating centre.

4.2 Access to the Sharing Systems

4.2.1 STPs from the Programme shall be available only to members. However, members may offer for sale computer based training portions of an STP to non-members.

4.2.2 TRAINAIR Members retain their access to the STP sharing pool, for the periods of time indicated, upon completing any of the following activities:

a) three years, upon completion of a new or upgraded STP; or

b) two years, upon completing the adaptation of an STP from the sharing system or upon completion of the updating of an STP; or

c) eighteen months when a training center participated in at least one TRAINAIR international activity; or

d) one year upon the delivery of a course developers workshop on an international basis.

4.2.3 Training centres that no longer qualify for access to the STP sharing system will be considered inactive members. Access to the STP sharing system will be suspended until such time as a plan to meet the requirements of 4.2.2 above can be agreed to between the training centre and the Central Unit.

4.2.4 All TRAINAIR members shall have access to the non-STP sharing system. In addition, training centres that retain their status of Contributing Participants, in accordance with Rule 3.2 above, shall have access to the non-STP sharing system.

4.3 Provision of STPs and non-STP Courses

4.3.1 When requested by Members, STPs and non-STP courses shall be supplied by the originator. If the supplier wishes, a charge for actual reproduction costs and postage may be made. To facilitate sharing, this charge should be kept to a minimum.

4.3.2 STPs provided to the Central Unit or to other members shall be provided in full conformity with the TRAINAIR STP Assembly Guideline or non-TRAINAIR Course Acceptance Criteria.

4.4 **Master Copies of STPs and non-STP Courses**

4.4.1 Each STP or non-STP course prepared shall remain the property of the organization that prepares it and that organization shall retain the master copy.

4.5 **Recording of STPs and non-STP Courses**

4.5.1 The TRAINAIR Central Unit shall maintain records of all available STPs and non-STP courses and keep members updated on STPs that are planned, in progress and completed.

4.5.2 A hard copy of each new STP prepared and all non-STP courses made available for international sharing shall be provided to the Central Unit free of charge, for recording and reference purposes.

4.6 **Future STPs**

4.6.1 Members may develop STPs on any topic to suit their training requirements. The TRAINAIR Central Unit shall be contacted in order to list a proposed STP in the STP Register and to avoid duplication of effort.

4.6.2 The assignment of an STP number will be made only when a Phase 1 report has been submitted to the Central Unit. The report should show that the resources required to develop the STP were identified and are likely to be provided. This step initiates the Central Unit methodological backstopping procedures.

4.6.3 An STP shall not be considered reserved by a Member until an STP number has been assigned. If another Member is interested in developing a listed course that has not yet been assigned an STP number, the Central Unit will discuss this issue with the two centres involved to determine the best course of action.

4.7 **STP Technical Backstopping**

4.7.1 Upon request by a Member, the Central Unit will co-ordinate technical backstopping, with the appropriate ICAO section, for an STP under development.

4.8 **Ordering and Use of STPs and non-STP Courses**

4.8.1 Members may request STPs and non-STP courses directly from the originator, or through the Central Unit. The Central Unit shall be advised of all transactions in order to permit records to be accurately maintained.

4.8.2 When delivering a course based on an STP, Training Centres will clearly indicate:

a) that it is a TRAINAIR STP; and

b) the name of the Centre and of the State in which the STP was developed.

4.8.3 When delivering a course based on a non-STP course, Training Centres will clearly indicate the origin of the source material.

4.9 **Hard Copy and Electronic Versions of STPs**

4.9.1 All STPs shall be available in both hard copy and, whenever possible, electronic versions. To facilitate the future sharing, adaptation, translation and revision of STPs, the electronic versions shall conform to TRAINAIR file format standards as contained in the STP Assembly Guideline.

4.10 **Updating STPs**

4.10.1 The updating of STPs shall remain the responsibility of the originator. However, the currency of any course remains the responsibility of the Centre delivering the course. Upon request by a Member, the Central Unit will co-ordinate technical backstopping with the appropriate ICAO section.

4.10.2 All revisions should be reported to the Central Unit and a copy of the revised STP provided for the recording system. The originator shall provide updates to recipients of a shared STP upon request. The update shall be provided in accordance with Rule 4.3, Provision of STPs and non-STPs.

4.11 **Adaptations and Translations of STPs**

4.11.1 An *existing* **STP** shall be assigned a new STP number:

a) when it has been translated;

b) when adaptation of the STP results in a change of a task, objective, or target population; and

c) when the STP is adapted for other specific equipment types.

4.11.2 A copy of an STP that has been assigned a new STP number shall be forwarded to the Central Unit for recording. The Member responsible for the adaptation and/or translation shall retain the new master copy.

4.12 **Implementation of STPs and non-STP Courses**

4.12.1 If requested, originators of an STP or non-STP course should provide as much assistance as possible to a recipient of a shared course so that the course may be effectively implemented. However, any costs involved in the implementation process shall be borne by the party that requested the assistance.

5. RULE CHANGES

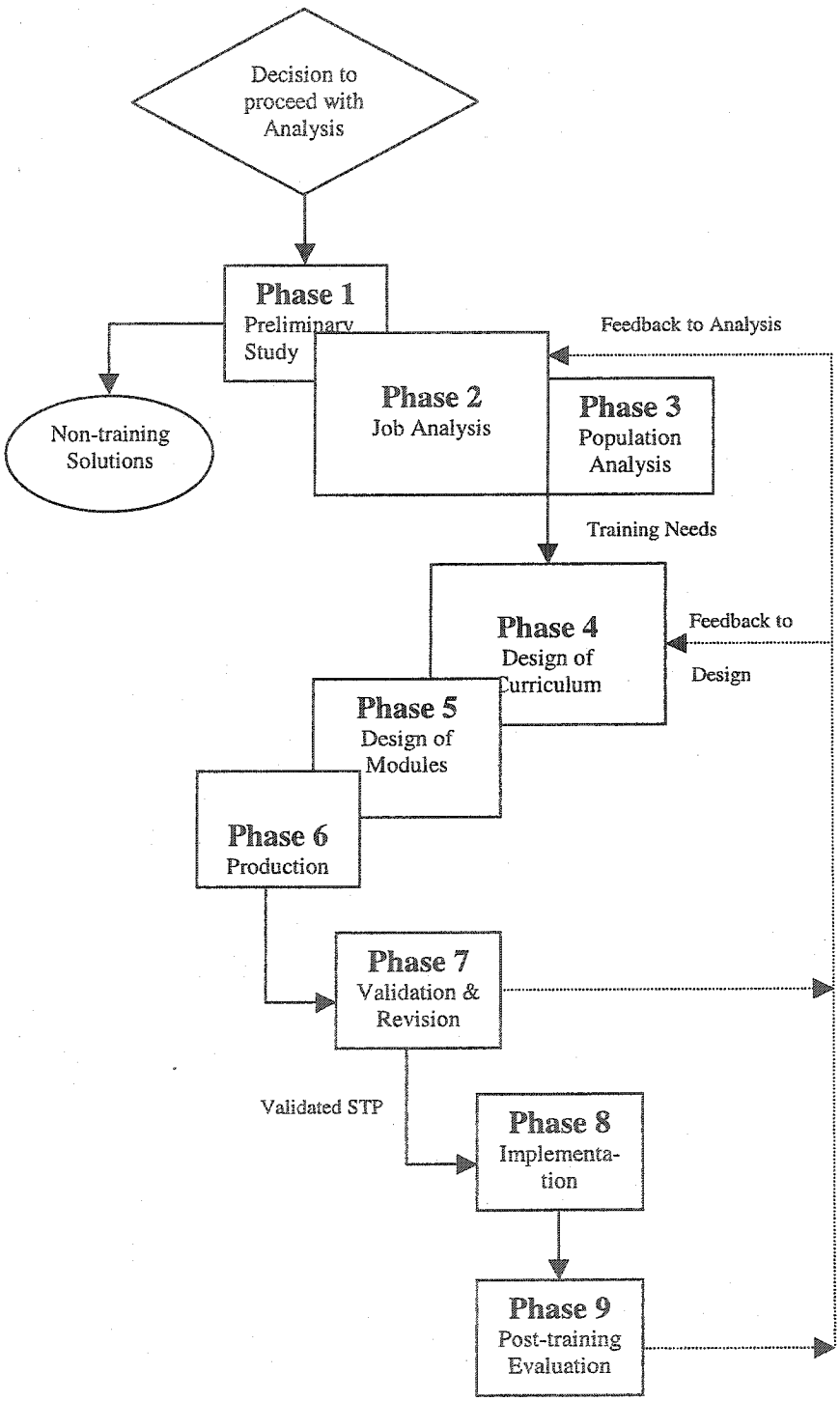
5.1 Prior to any change in the TRAINAIR Programme Rules, all Full Members must have received the proposed changes from the Central Unit and have had an opportunity to comment.

5.2 The TRAINAIR Programme Rules may only be changed with the concurrence of the Full Members.

5.3 Contributing Participants shall be given an opportunity to comment on the changes to the rules that would affect their status.

Appendix 4

Flowchart of the TRAINAIR Methodology



APPENDIX 5

Review of Comments for Phase 1 of TRAINAIR Course Development Methodology

Theme	Issues	Iran	Peru	Spain	S. Arabia	Korea	Brazil	Argentina	Kenya	Australia	Ethiopia	Jordan	Philippines	China	Cuba	Sth. Africa	Pakistan	Egypt	Barbados	Bahrain	France	Latvia
Target Population	Quantifying the target Population	x	x				x		x		x	x		x	x		x		x	x		
	Identification of primary and secondary target population		x				x						x	x						x		
Symptoms & Causes	Identification of symptoms and causes	x			x			x						x	x							
Evaluation Plan	Preparing an evaluation plan that measures improvement at level 3 & 4 including measurable indicators	x			x		x		x							x	x	x			x	
	Completion of Form 14	x	x										x	x				x		x	x	
Performance Problem	Unclear identification of a performance problem. Is it in response to the introduction of a new system? Is it a performance problem?		x		x							x									x	
Scope	Scope of the training project		x	x					x													
	Use of systems analysis (inputs, outputs, process, feedback). Subsystems should also be analyzed.		x		x		x										x					
Resources	Indication of resources required to carry out STP development including SME	x	x		x	x														x	x	

APPENDIX 5
Review of Comments for Phase 1 of TRAINAIR Course Development Methodology

Theme	Issues	Iran	Peru	Spain	S. Arabia	Korea	Brazil	Argentina	Kenya	Australia	Ethiopia	Jordan	Philippines	China	Cuba	Sth. Africa	Pakistan	Egypt	Barbados	Bahrain	France	Latvia
Task oriented	Indication that the training will be dividing between theory and practice. Planned training is not task oriented.			x				x												x		x
Aim	Does not state what trainees will be able to do once training is completed				x				x								x			x		x
	State the aim of the course. Defining as early as possible what the trainee will be able to perform after the course will clarify what the STP's objectives are.					x	x		x													
Non-training solutions	Identification of non-training solutions				x												x					
Mode of delivery	Detailed information concerning the planned mode of delivery				x								x									
Project Plan	Lack or incomplete project plan				x	x				x		x		x	x	x						
Org. Chart	Inclusion of an organizational Chart	x				x																
Problem Statement	Confusion between statement of training need and statement of problem						x															
	Problem statement not detailed enough													x					x			

APPENDIX 5

Review of Comments for Phase 1 of TRAINAIR Course Development Methodology

Theme	Issues	Iran	Peru	Spain	S. Arabia	Korea	Brazil	Argentina	Kenya	Australia	Ethiopia	Jordan	Philippines	China	Cuba	Sth. Africa	Pakistan	Egypt	Barbados	Bahrain	France	Latvia
Existing training	Lack of description of existing training	x						x							x		x					
Duration	Indication of the duration of the course										x				x							
Organization/Consistency of the report	Elements of the phase 1 report are not located appropriately. Symptoms are found in problem statement, etc.																					

Appendix 6

Course Development Quality Assurance System

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Full Phase 1 Report Items	Performance Indicators		Reference Standards	Is the phase report compliant with this performance indicator? If no, please provide an explanation.	Explanation	Is the Phase report Compliant?	If no, why?
Performance Problem	1.1	Has a performance problem been identified?	CDS/03 DP No. 2; TDG Chap. 2 paras 6.4, 3				
	1.2	Has the preliminary analysis been coordinated with operations?					
Systems Analysis	1.3	Has an analysis of the system and sub-systems been carried out?	TDG Chap. 2 paras 3, 5, 6.4				
	1.4	Has the system affected by the problem been clearly identified?	TDG Chap. 2 paras 4, 6.1				
	1.5	Has an organizational chart been included?					
Target Population	1.6	Has the primary target population been quantified and described?					
	1.7	Is there more than a primary and secondary target population? If yes, have common tasks been identified?					
Symptoms and Causes	1.8	Have symptoms been identified and described?	TDG Chap. 2 paras 4, 6.3, Fig. 2.5; CDS 2003 DP/2				
	1.9	Have causes been identified and described?					
Solutions	1.10	Have training and non-training solutions been identified?	TDG Chap. 2 paras 2, 6.5				
	1.11	If there is more than one training solution, has justification for the solution selected been provided?					

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Full Phase 1 Report Items	Performance Indicators		Reference Standards	Is the phase report compliant with this performance indicator? If no, please provide an explanation.	Explanation	Is the Phase report Compliant?	If no, why?
	1.12	If training already exists for this performance problem, has it been described?					
	1.13	Has a description of how the solutions will address the causes of the performance problem been provided?	TDG Chap. 2 paras 6.5, 6.6., 6.7; CDS 2003 DP 2				
	1.14	Is the development of validated training material required?	TDG Chap. 6, para 5.2, TDG Form 8*				
Aim	1.15	Is there a description of what trainees will be able to do once the training is completed?	TDG Chap. 2 para 6.8				
Mode of Delivery	1.16	Has the tentative mode of delivery been identified?					
Constraints	1.17	Have constraints for the STP Development project been identified, including the availability of training equipment, a team of Course Developers and SMEs?					
Job and Task Analysis	1.18	Has a description of how the job and task analysis will be carried out, including resources, been provided?	TDG Chap 2 para 10.10				
Form 11*	1.19	Has Form 11 been completed indicating the schedule of development for the STP?					
Form 12*	1.20	Has Form 12 been completed indicating the resources required to develop an STP (including SMEs)?	Consult TMG Table 5.1; Form 12*				

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Full Phase 1 Report Items	**Performance Indicators**		**Reference Standards**	**Is the phase report compliant with this performance indicator? If no, please provide an explanation.**	**Explanation**	**Is the Phase report Compliant?**	**If no, why?**
Form 14*	1.21	Has an evaluation plan (Form 14) been prepared that includes indicators based on symptoms?	Form 14*; TMG Table 5.1				

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Phase 2 Report Items	Performance Indicators*		Reference Standards	Is the phase report compliant with this performance indicator? If no, please provide an explanation.	Explanation	Is the Phase report Compliant?	If no, why?
Phase 2 Report	2.1	Have the obstacles encountered (if any) during job and task analysis been described in a brief narrative?	TDG Chap. 3 Phase 2 Checklist, paragraphs 8.1, 8.2.1 and 8.5				
Forms 2 and 3**	2.2	Have all fields of Forms 2 and 3 been completed?	Forms 2; TDG Chap 3 paragraph 4; Forms 3 recto/verso				
	2.3	Are the wording of job, duties, and tasks consistent between Forms 2 and 3?					
Forms 2**	2.4	Are the duties based on existing job descriptions?	TMG Chap 2 paragraph 4				
	2.5	Are the tasks listed in Form(s) 2 related to the duty(ies)?	TMG Chap 2 paragraph 4; TDG Chap 3 paragraph 2				
	2.6	For every task, has the frequency, difficulty, importance and consequential priority been completed?	TDG Chap 3 paragraph 5.1				
Forms 3**	2.7	Are the SKAs relevant to the sub-task?	TDG Form 3 verso				
	2.8	Has a brief description of where the task is performed and with what equipment been provided?	TDG Form 3 verso				

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Phase 2 Report Items	Performance Indicators*		Reference Standards	Is the phase report compliant with this performance indicator? If no, please provide an explanation.	Explanation	Is the Phase report Compliant?	If no, why?
	2.9	Is there for each task an observable indication that signals that a task should be started (I.e. a triggering event)?	TDG Chap 3 paragraph 5.2; Form 3 verso				
	2.10	Is there for each task an observable indication that signals the task is completed (I.e. a terminating event)?	TDG Chap 3 paragraph 5.2; Form 3 verso				
	2.11	Are tasks, sub-tasks and SKAs written as observable and measurable behaviours?	Forms 3 verso				
	2.12	Are each sub-task worded as a single action?	TDG Chap 3 paragraphs 2.2.2				
	2.13	For each task, is the process standard and reference stated?	Form 3 verso paragraph 4				
	2.14	Does the sequence of sub-tasks correspond to the process standard of the task outlined in point 4 of Form 3?	TDG Chap 3 paragraph 5.4				
	2.15	For each task, is there a statement describing the characteristics of the product of the task that provides evidence that the task has been correctly performed?	TDG Chap 3 paragraph 5.4; TDG Form 3 verso				
	2.16	For appropriate sub-tasks, are conditions affecting the level of difficulty of performance of the sub-task stated as required?	Form 3 verso				
	2.17	Has a decision flowchart for each task been produced?	TDG Chap 3 paragraph 5.3				

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Phase 3 Report Items	**Performance Indicators**		**Reference Standards**	**Is the phase report compliant with this performance indicator? If no, please provide an explanation.**	**Explanation**	**Is the Phase report Compliant?**	**If no, why?**
Process	3.1	Have means such as surveys, interview with performers, interview with supervisors, observation been used to determine the entry requirements, acquired SKAs and instructional strategies for the target population?	TDG Chap. 4, paragraphs 7.1, 7.2.2, 8 and 9; TDG Annex 4				
Results/Product/ Output	3.2	From the surveys and/or interviews have the learning characteristics of the primary target population been determined?	TDG Chap. 4 paragraphs 6; TDG Annex 4				
	3.3	From the surveys and/or interviews has demographic information for the target population (age, educational background, vocational training background, etc.) been gathered?	TDG Annex 4; TDG Chap. 4 Paragraph 7.1				
	3.4	From the surveys and/or interviews, have the previous job experience and prior training of the target population been determined as it relates to the job under study?	TDG Chap 4 paragraph 4				
	3.5	From the information above, can the acquired SKA (entry capability) of the target population be inferred/deduced?	TDG Chap 4 paragraph 2.1				
	3.6	Do the results of the population analysis confirm that the development of an STP is still required?	TDG Chap 4 paragraph 2.1				

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Phase 4 Report Items	Performance Indicators*		Reference Standards	Is the phase report compliant with this performance indicator? If no, please provide an explanation.	Explanation	Is the Phase report Compliant?	If no, why?
Report	4.1	Has an explanation been provided for any deviation from the job and task analysis?	TDG Annex 1 para 3; TDG Chap 5 para 1 & 11				
	4.2	Is the Phase 3 report included?	TDG Annex 1 para 3				
Forms 4 & 5**	4.3	For all tasks for which a job aid is required, have Forms 5 been completed?	TDG Chap 5 para 2 & 3; TDG Forms 4 and 5				
Forms 6**	4.4	Is there a Form 6 for each terminal objective?	TDG Chap 5 para 5.2				
	4.5	Has a Form 6 for on-the-job training been prepared for tasks that require "post-course" objectives?	TDG Chap 5 para 5.4				
	4.6	Has the information and wording found in Form 3 under "where performed, triggering event, terminating event, and standards" been used to complete "conditions, behaviours and standards" in Forms 6?					
Mastery Tests	4.7	For each terminal objective in Form 6, does the mastery test outline match the conditions, behaviours and standards described?	CDS 2001 DP/4; TDG Annex 7B				
	4.8	Has the wording found in Form 3 for each sub-task been used to write intermediate objectives in Forms 6?					

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Phase 4 Report Items	Performance Indicators*		Reference Standards	Is the phase report compliant with this performance indicator? If no, please provide an explanation.	Explanation	Is the Phase report Compliant?	If no, why?
	4.9	For each intermediate objective, have the types of SKAs been indicated?	TDG Chap 6 Table 6.1				
Module Sequencing	4.10	Has a sequencing flowchart been produced?	TDG Chapt 5 para 6; TDG Annex 6				
	4.11	Does each module correspond to a task?	TDG Chapt 5 para 6; TDG Annex 6				
	4.12	If no, are complex tasks broken into consecutive modules?	TDG Chapt 5 para 6; TDG Annex 6				
	4.13	If more than one task is taught in a single module, do these tasks have similar skill sequences?	TDG Chapt 5 para 6; TDG Annex 6				
	4.14	Have all intermediate objectives and terminal objectives been sequenced and grouped in modules?	TDG Chapt 5 para 6; TDG Annex 6				
Forms 7**	4.15	Has a Form 7 been prepared for each module identified in the sequencing flowchart?	TDG Chap 5, para 6.2				
	4.16	If a course objective is covered in a module, are the conditions, behaviours and standards listed in Forms 6 reflected in Forms 7?					
	4.17	If the end-of-module objective is a course objective, have supplementary information on the mastery test been provided?					

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Phase 4 Report Items	Performance Indicators*		Reference Standards	Is the phase report compliant with this performance indicator? If no, please provide an explanation.	Explanation	Is the Phase report Compliant?	If no, why?
	4.18	If the end-of-module objective is not a terminal objective, has a test been outlined under "supplementary information on mastery test" in Form 7?	TDG Chap 5 para 6.2 & 6.3				
	4.19	If a key intermediate objective has been identified in Form 6, has a skill-based progress test been described in Form 7?	TDG Chap 7 para 8.1				
	4.20	For each intermediate objective in Form 6, have all corresponding SKAs listed in Form 3 been included as teaching points in Form 7?					
	4.21	If it has been decided that a job aid is required for a task or sub-task, have teaching points corresponding to the use of these job aids been included in Form 7?	TDG Chap 5, para 2 and 3				
	4.22	Has the following information been developed for mastery tests: instruction for administering the mastery test and evaluation instruments such as score key and model answer?	TDG Annex 7A				

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Phase 5 Report Items		Performance Indicators	Reference Standards	Is the phase report compliant with this performance indicator? If no, please provide an explanation.	Explanation	Is the Phase report Compliant?	If no, why?
	5.1	Have all fields of Forms 9 been completed?	Form 9*				
	5.2	For each module, have general notes been provided to the instructor outlining what an instructor needs to prepare to teach the module?	CDS 2001 DP/1; Form 9				
	5.3	Have the modes of delivery been selected for each module?	TDG Chap 6 para 5; TDG Form 8*				
	5.4	Are the intermediate objectives and teaching points of Forms 9 consistent in content and sequence with those of Forms 7?	CDS 2001 DP/1				
	5.5	For each module, is there an introduction covering the objectives of the module, the mastery test, and an indication of the relevance of the module content to the job?	TDG Chap 6 para 3.1 to 3.4; CDS 2001 DP/1				
	5.6	For each intermediate objective, have main points been presented and clarified, practice provided and feedback provided?	TDG Chap 6 para 3.5 to 3.8; CDS 2001 DP/1				
	5.7	Within each intermediate objective and for each teaching point have training strategies, use of media, instructional techniques been selected and described?	TDG Chap 6 para 4 & 7; CDS 2001 DP/1				

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Phase 5 Report Items	Performance Indicators		Reference Standards	Is the phase report compliant with this performance indicator? If no, please provide an explanation.	Explanation	Is the Phase report Compliant?	If no, why?
	5.8	For each instructional event, do Forms 9** describe both the content and the instructional strategy of the instructional event?	CDS 2001 DP/4				
	5.9	Has a full set of design documentation such as outlines, specifications, scripts, etc., been assembled in draft form ready for production?	TDG Chap 6 para 9.2				

STP No./ STP Title			For Training Centre Use		
Phase 6 Report Items	Performance Indicators*		Reference Standards	Is the phase report compliant with this performance indicator? If no, please provide an explanation.	Explanation
	6.1	Have the evaluation instruments been designed so that they would be reliable measures of trainee performance?	CDS 2001 DP/4; TDG Chap 5 para 8; Chap 7 para 8; TDG Annex 7B		
	6.2	Have mastery tests been validated?	CDS 2001 DP/4; TDG Chap 5 para 8; Chap 7 para 8; TDG Annex 7B		
	6.3	Have the training materials undergone developmental testing?	TDG Chap 7		

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Phase 7 Report Items	**Performance Indicators**		**Reference Standards**	**Is the phase report compliant with this performance indicator? If no, please provide an explanation.**	**Explanation**	**Is the Phase report Compliant?**	**If no, why?**
	7.1	Does the report provide information for each module including diagnosis of deficiencies (causes)?	CDS 2001 DP/2; TDG Chap 8 para 6				
	7.2	Were the trainees of the validation delivery considered part of the intended target population?	TDG Chap 8 para 4				
	7.3	For each module, have 80% of the trainees achieved the end-of-module objective?	CDS 2001 DP/2; TDG Chap 8 para 2				
	7.4	Are 80% of the modules valid?	CDS 2001 DP/2; TDG Chap 8 para 2				
	7.5	Does the report include the results of end-of-module objective tests for each trainee?	TDG Chap 8 para 10.4; CDS 2001 DP/2				
	7.6	Has a revision workplan for the STP been provided that addresses the course deficiencies?	CDS 2001 DP/2; TDG Chap 8 para 6				
	7.7	For each module, has a summary of the validation questionnaires (Form 22) been compiled?	Form 22; TDG Chap 8 para 5 & 10.5; CDS 2001 DP/2				
	7.8	Does the report include the opinion of instructors that delivered the STP?	TDG Chap 8 para 10.6				

STP No./ STP Title			For Training Centre Use			For ICAO Use	
Full STP Items		**Performance Indicators**	**Reference Standards**	**Is the phase report compliant with this performance indicator? If no, please provide an explanation.**	**Explanation**	**Is the Phase report Compliant?**	**If no, why?**
	F.1	Has the STP Assembly Checklist and Guideline been followed to package both the electronic and hard copies of the full STP?	TOM Part IV Section 2				
	F.2	Has the information provided in Forms 2, 3, 4, 5, 6, 7 & 9* been verified for consistency of wording and numbering?					

Definition of Concepts and Processes

The following definitions of concepts and processes are provided to support the completion of the course development quality assurance checklists for phases 2, 4 and 6.

Phase 2 – Job Analysis

Job

A job is usually identified by the job title. A job consists of one or more duties directed toward a common objective.

Duty

It is a permanent and ongoing major area of responsibility of a job. The result of a duty is observed and measured through the results of the tasks that constitute it.

Task

A task can be considered as a system. It therefore consists of inputs, process, standards, outputs/products and feedback. The characteristics of a task are listed below against system component:

System Component	Task Characteristics
Inputs	• A triggering event* • Equipment, tools, job aids, documentation, references
Process	Perform all necessary steps (i.e. sub-tasks) to achieve the output/product. It should be worded with an active verb.
Output/Product	• A measurable and observable result of the process. • A terminating event*
Product Standard	A specification of what the output should look like.
Feedback	Result of the comparison between product and standard. If the result is compliant with the standard, the terminating event of the task has been reached. If not, the task process has to be started again until the product meets the standard.

* Definition of these terms can be found on the verso of Form 3.

Sub-Task

A sub-task is a single step in the process of a task; it is measurable and observable; it requires the use of several SKAs.

Process standard

The process standard is the sequence and correct performance of each sub-task of a task. The validity of each task process (sequence of sub-tasks) is established with a subject-matter expert.

Skills/Knowledge/Attitudes (SKAs)

What a performer requires to perform a sub-task i.e. underlying knowledge (recall), underlying cognitive skills (classifying, problem-solving, rule-using, etc.), psychomotor skills and attitudes.

Phase 4 – Design of Curriculum

During phase 4, the information found in a form 3 (Task Description Form) is used to complete form 6 (Terminal Objective Form) and Form 7 (Module outline). Below are Forms 6 and 7 in which brief explanations are provided concerning the completion of different components of these forms.

Terminal Objective

State:	T. Centre:	STP / /	
Completed by:		Date:	Page: /
Objective derived from Task/Sub-Task: *The Task from which the objective is derived should be copied from Forms 2 and 3 here.*		Task/Sub-task No.: Job Aids? Yes ☐ No ☐ *If job aids exist or will be developed for this task, it should be indicated here. This will impact the statements of conditions and standards below.* Objective No.:	

A. Course objective ☐ Post-course objective ☐

If on-the-job training is required for this objective to be met, then two Forms 6 should be prepared: one Form 6 for the course (check the course objective box) and one Form 6 for on-the-job training (check the post-course objective box).

Conditions: *The information here should describe what tools, data, equipment, reference materials are available to perform the task and location where the trainee will carry out the behaviour of the task. If job aids will be used for this task, then it should be indicated here. The information to complete this part of Form 6 is derived from different parts of Form 3 such as "Where performed and equipment used"; and "Triggering event". The conditions may be different for a given behaviour if it is a course objective or a post-course objective.*

Behaviour: *The measurable and observable action of the task should be stated here.*

Standard: *The information provided here should indicate the level to which the trainee should perform the task, to demonstrate that the objective has been achieved. This is drawn from information found in Form 3 under "Standards & References for the Task". The standard may be different for a given behaviour if it is a course objective or a post-course objective. If a job aid is used for the performance of this task, then the standard should include criteria for the use of the job aid.*

B. Mastery test (brief outline):
A brief description should be provided here of the mastery test that will be administered for this task. The mastery test should match as closely as possible the conditions, behaviour and standards stated above.

Sub-Task No.	Int. Obj. No.	Intermediate Objectives	Type of S/K/A
Sub-task Nos. should be consistent with those of Forms 3.		*Intermediate objectives are derived generally from sub-tasks. The sub-tasks should be stated here using the wording found in the corresponding Forms 3.*	*The type of SKA for each sub-task is determined after analyzing the list of SKAs found in the corresponding Form 3. Based on this analysis and using TDG Table 6.1, the type of SKA is determined.*

Module Outline

State:	T. Centre:	STP / /	
Completed by:		Date:	Page: /
Module Title:		Module No.:	

A flow diagram with the sequence of Modules and the numbers of Terminal and/or Intermediate Objectives covered in each Module should be attached to the set of Form 7s.

End-of-Module Objective/Mastery Test

Conditions:

Behaviour:

Standard:

- *If the module covers all the intermediate objectives for a single task, then the conditions, behaviour and standard above should be the same as those found in the corresponding Form 6.*
- *If the module covers more than one task, the conditions, behaviour and standard above should include the corresponding statements for these tasks. This implies that the tasks covered in a single module have similar skill sequence and sub-tasks.*
- *If the module covers a part of a complex task, the conditions, behaviour and standard statement should correspond to the end-of-module objective. The end-of-module objective is usually the last intermediate objective covered in the module.*

Supplementary information on Mastery Test material, whether linked to group activity, et

If the module covers a single task, then the statement made in Form 6 concerning mastery test should be reproduced here. If the module covers more than one task or part of a complex task, then the end-of-module test should be described here.

Intermediate Objective No.	Brief Description of Progress Test (if applicable)

Outline of Contents

Intermediate Objective No.	Teaching Points	Source of Contents
	Teaching points are derived from SKAs corresponding to a sub-task from which an intermediate objective is derived. The teaching points are derived from the SKAs listed in the corresponding Forms 3.	

Phase 5 – Design of Modules

During phase 5, the information found in a Form 7 (Module Outline) is used to complete form 9 (Module Plan). Below is a Form 9 in which brief explanations are provided concerning the completion of different components of this form.

Training Development
Form 9

MODULE PLAN
ADMINISTRATOR'S / INSTRUCTOR'S GUIDE

State:	**T. Centre:**	**STP / / /**	
Completed by:		**Date:**	**Page: /**
Module:		**Module No.:**	

End-of-Module Objective
Conditions:

Behaviour:

Standard:

For each module, the conditions, behaviour and standard should be the same as those found in the corresponding Form 7.

Intermediate Objectives:

General Notes for the Instructor:

A statement should be made here concerning what an instructor needs to prepare to teach this module. This can relate to equipment that should be available, to reproduction of documentation, to security and safety measures, etc.

MODULE PLAN
ADMINISTRATOR'S / INSTRUCTOR'S GUIDE

State:	T. Centre:	STP	
Completed by:		Date:	Page: /
Module:		Module No.:	
Time	**Main Units/Steps/Aids**	**Contents, Summary of Activities, points to be emphasized, etc.**	
An approximate time should be indicated in this column for each main unit and intermediate objective.	*In this column, the main units of the module should be stated such as the introduction, progress tests, the mastery or end-of-module test, etc. The intermediate objectives should also be listed, as well as the training aids corresponding to it.*	*The teaching points for an intermediate objective listed in the corresponding Form 7 should appear here. Each teaching point should have detailed information concerning its main points, the instructional strategy and the media to be used.*	

List of Acronyms

CATC	Civil Aviation Training Centre
EAO	Evaluation and Audit Office
FANS	Future Air Navigation Systems
ICAO	International Civil Aviation Organization
ISD	Instructional Systems Development
QMS	Quality Management System
STG	Standardized Training Guideline
STP	Standardized Training Package
TCU	TRATNAIR Central Unit
TDG	TRAINAIR Training Development Guidelines
TMG	TRAINAIR Training Management Guideline
TMW	Training Managers Workshop
TOM-	TRAINAIR Operations Manual
TO/TCU	Training Officer/TRAINAIR Central Unit
UNDP	United Nations Development Programme