

Current Issues in Qualification and Certification of Non-Destructive Testing Personnel in the Aerospace Industry

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Abstract. In the aerospace industry the qualification and certification of personnel for Non-Destructive Inspection (NDI/NDT) is carried out in compliance with specific approved rules. In 2003 The European Aviation Safety Agency (EASA), the essential authority for Civil Aviation Safety in Europe, and the United States Federal Aviation Authorities (FAA) have reached a common agreement to harmonize the requirements of standards EN4179 and NAS410 regarding NDT Personnel Qualification. This recent advancement towards an easier certification in Aerospace NDT qualification procedure is considered as an outstanding example of convergence of European and American standards, pointing out the advantages of enhancing cooperation through harmonization in the American and European aircraft markets.

On the other hand, the convergence of EN473 and ISO9712, fully supported by ICNDT, was achieved by mutual agreement. The new ISO/IEC 9712:2005, approved in January 2005, was published in February 2005.

Given the above-mentioned harmonization in standards, the present paper discusses several aspects of competition and opportunities for cooperation between the different NDT personnel certification schemes and in various countries.

Introduction

There is a well recognized requirement of quality assurance systems that all company's engineers and technicians are able to demonstrate the required level of knowledge and skills, as mentioned in ISO9001 [1]. This stands in particularly for NDT, since non-destructive inspection activities remain much operator dependent, and those in authority have to place great reliance on the skill, experience, judgment and integrity of the personnel involved.

On the other hand, the globalization of world trade makes ever more important that users of NDT can rely on suppliers of NDT services in overseas countries to carry out NDT competently. So that, an unanimous opinion is expressed for the need for certification harmonization and recognition of NDT personnel. International harmonization would ensure uniform levels of competence and standards of testing throughout all the countries. The first step in the international harmonization is the identification of the common international standard, on which the national standards can be based.

The convergence of the two standards regarding Qualification and Certification of NDT personnel, EN473:2000 [2] and ISO9712:1999, fully supported by the International Committee for NDT (ICNDT), was achieved by mutual agreement. The new ISO/IEC 9712:2005 [3] was approved in January 2005 and published in February 2005. Moreover, ICNDT issued the new "Recommended Guidelines for Qualification and Certification of

NDT Personnel according to ISO9712”, addressing the changes required to ensure that the guidelines meet the requirements of the revised ISO9712 document [4].

Apart standardization, the harmonization of Training and Certification of NDT personnel procedures, in accordance with the specific rules imposed by standards and regulations, is recognized as prerequisite by many NDT professional bodies. These professional bodies have initiated their own training and certification schemes following their own national standards. While some programs (such as ASNT, PCN, etc.) are well structured and established, many others are in various stages of development and acceptance (e.g. ECP). Therefore, in order that companies all over the world take advantages from the harmonization benefits, the training and certification procedures must also be harmonized and/or mutual recognized.

1. Aerospace Field: EN 4179 (and the revised NAS 410) in comparison to EN 473 / ISO 9712

Quality and safety are primordial issues in aerospace industry, so that a major emphasis is given in the qualification and certification of personnel for Non-Destructive Inspection. The centralized certification via an “independent certifying body” (ICB) is the centerpiece of the standards EN473 / ISO 9712. This ICB is responsible for all formal issues of the qualification and certification of Levels 1, 2 and 3 inspectors, whereas the employer confirms such information as school education, training, and experience of his personnel towards these bodies, but he is no longer involved in the certification process. Although EN473 is applied in a considerable number of companies in various industrial sectors, the majority of European Aerospace companies refuse to use it. The main argument is that a centralized certification system would require a great amount of additional formalities and costs, without gain of additional safety. The second important argument against a certification system independent from the employer is that, in the aerospace industry, high safety requirements in connection with the necessity to reduce weight, wherever possible, require the introduction of new materials and manufacturing processes. Consequently, the requirements for the existing and the new NDT procedures and also for the qualification of the inspection personnel keep becoming stricter. Often, new NDT procedures must be developed, qualified and introduced very quickly and, naturally, the correspondingly qualified personnel must be available, too. In this situation, every employer must be able to react flexibly with respect to the training and certification of his NDT personnel [5].

The specific for aerospace EN4179:2000 [6], conceived about 10 years ago, is based on “employer or prime contractor” certification. The EN4179 highlights the special responsibility of the “prime contractor” with respect to the meaning of the word “employer”. Within this framework the word “certification” is deliberately avoided, and the word “approval” is used instead, including not only the verification procedure for qualification, but also the employer's authorization of the inspector. Furthermore, a “written practice” shall be developed and maintained by the employer to meet the requirements of EN4179. The qualification is strictly oriented towards the actual requirements of the respective employer, and that is the reason why the practical examination consists of the candidate performing tasks typical of those to be accomplished in the performance of his duties. The above wording by far differentiates from the requirements of the EN473 for sector-specific training. Regarding the argument that the requirement of the minimum training hours and the minimum experience for Level 1, 2 according to EN4179 are still below the requirements of the EN473, it has to be considered that, within the aerospace industry, the very specific training at the industry's own training facilities leaves enough available time for training that can be used effectively. Therefore, the required periods can be reduced in comparison with multi-sector training.

At this point, it should be mentioned that European Aviation Safety Agency (EASA) - composed by national CAA's - has already adopted the EN4179 in Part 145 as the basis for the qualification of the NDI staff [7]. So that, personnel working in maintenance aircraft facilities shall be trained and examined in accordance with EN4179 under the control of a National Aerospace NDT Board. Personnel working in the aircraft manufacturing sector under EASA Part 21 [8] will continue to be eligible to take examinations under EN473 or EN4179.

Due to the close cooperation with the US market, the working and EN4179 supporting groups tried to achieve an extensive harmonization with MIL-STD-410. First step towards this was the second revision of NAS410 (Feb2003) [9], which set up equivalency in technical content with the EN4179: 2000. EASA and the United States Federal Aviation Authorities (FAA) have reached a common agreement to harmonize the requirements of standards EN4179 and NAS410 regarding NDT Personnel Qualification. Furthermore, the new prEN4179 (Feb2003) [10] dictates technical equivalency with NAS410 (Feb2003). In an admirable example of harmonization between Europe and the USA, the Aerospace Industries Association (AIA) and the European Associations of Aerospace Industries (AECMA) have declared the new edition of NAS410 equivalent to prEN4179. Two memoranda of understanding (MOU) aimed at improving global interoperability and standardization of procedures were signed. One MOU deals with common technical publications data, and the other covers certification and qualification of nondestructive testing (NDT) personnel. A second MOU, signed in February 2003 promotes common interoperable international technical publications data through the joint development, updating, and maintenance of an existing AECMA specification S-1000D [11].

These recent advancements towards an easier certification in aerospace NDT qualification procedure consists an outstanding example of convergence of European and American standards, pointing out the advantages of enhancing cooperation through harmonization in the American and European aircraft markets. Based on this, ICNDT set up a "Recommended Guidelines for the Qualification and Certification/Approval of NDT Personnel according to NAS410/EN4179" [4].

2. Personnel Certification Schemes

There is long-standing debate between the different NDT personnel certification schemes. Proponents of company-based certification argue the benefits of training and certification being directed closely at the needs of the particular company's NDT business. Those who favor third party central certification argue the benefits of standardization, harmonization and independence [12].

Company-based certification is mostly based on the American Society's of NDT (ASNT) Recommended Practice SNT-TC-1A approach [13] and is especially favored in the USA and used worldwide in business areas, which employ American codes and standards. Third party independent central certification based on EN473 / ISO9712 is employed in the rest of the world and is particularly favored in Europe, parts of Asia, Canada etc. Throughout Europe there exist accredited national third party independent certification schemes, which are linked to the national NDT societies. In some countries (e.g. Russia, Sweden) there are several such schemes. These schemes, which offer EN473 / ISO9712 certification, operate in competition with providers of ASNT Certification to SNT-TC-1A. ASNT conducts Level 3 examinations to its own standard, CP-189 [14] in several European countries.

It is therefore obvious the need of international harmonization on the basis of mutual recognition of the individual certification schemes. Cooperation in the area of

training and certification of NDT personnel began in 1985, when ICNDT published its Recommendation ICNDT WH 15-85 "Basic Requirements for National Personnel Qualification and Certification Schemes" which had been prepared by a Working Group on Harmonisation of Training and Qualification of NDT Personnel [15]. This document set down the key principles to be followed in the establishment of national independent third party central certification schemes.

In the same sense, the European Federation of NDT (EFNDT), founded in 1998, proceeded with the development of the European Certification Process (ECP) in order to ensure a high degree of technical harmonization of the application of the European standard EN 473 by the National Certifying Bodies (NCB) of the EFNDT members. Participating certification bodies will continue to maintain their separate independent status and national accreditation, whereas a greater confidence in the resulting certification is expected to be attained, facilitating the mutual recognition and the worldwide acceptance of the national certificates issued in Europe. More details for the aims and development of the ECP are given in ref. [16].

It has to be mentioned of course that there is a gradual coming together of the central independent and company-based approaches. The former are increasingly aware of the need for the central certification to be applied in the correct way - as part of the organization quality system for NDT - and the standards for company-based certification are bringing in requirements for external assessment (e.g. independently certified Level 3s) [11]. ASNT now offers a range of schemes including a family of central certification options known as ACCP (ASNT Central Certification Program) in order to improve NDT reliability [17]. Many companies now combine the written practice of the employer-based schemes with the use of third party certification to ISO9712 or EN473, ensuring a better matching of certification to their customer's technical and business needs.

In the aerospace field, the National Aerospace NDT Board (NANDTB), representing a nation aerospace industry, whenever exists, shall provide guidance to NDT qualification and examination services in accordance to EN 4179 / NAS410, by administer procedures and/or by recognizing equivalences of qualification and certification of personnel. The prerequisite of a NANDTB, which should control the examinations for NDT personnel, imposes actually a second-level need for mutual agreements between the different countries NANDTBs to ensure the objectivity and impartiality of the examinations and the validation of certificates throughout the countries.

3. Accreditation

The third parameter in Certification of Personnel (apart from Standardization & Training) is Accreditation. Accreditation reduces risk for companies and its customers by assuring them that accredited bodies are competent to carry out the work undertaken within their scope of accreditation, increasing the confidence of the users.

EN473 requires that the certification system should be controlled and administered by an independent "certifying body" (CB) that conforms to the requirements of the standard EN45013 [18]. As EN45013 has been superseded by ISO/IEC 17024:2003 [19], the new ISO/IEC 9712:2005 requires that certification bodies comply with ISO/IEC 17024:2003 and the International Accreditation Forum (IAF) has published guidance on the application of ISO/IEC 17024:2003 [20].

The *Certifying Body*, which shall fulfill the requirements of ISO17024, is responsible for the administration of a certification scheme, the *Authorized Qualifying Agency* shall apply a documented quality procedure, whereas the *Employer* shall not be directly involved in the certification procedure itself. The CB should be adequately qualified for its role and independent of any single interest. In many countries CB have

gained accreditation by independent agencies, generally used as “Accreditation Bodies” (AB).

EFNDT intends to ensure that the qualification and certification is based on accreditation in line with ISO17024 within the EFNDT “Mutual Recognition Agreement” (MRA). The MRA Agreement is open to NDT Personnel Qualification and Certification schemes, which are nominated by national NDT Societies in current membership of the EFNDT and/or accredited to the European standard ISO17024 by a governmental department or recognized accreditation agency/body. Each certification body recognized under this agreement is accredited by a national accreditation body and meet the minimum requirements of the applicable standards specified in the schedule of accredited scope (e.g. EN45013, EN473, CEN Technical Report - presently document CEN/TC138 N211, prEN4179 etc.).

Third party qualification and certification of NDT personnel is also dependent on the employer, “the organization for which the candidate works in regular basis”. Employer responsibilities are similar to those using in-house certification and should be reflected in the employer’s quality system/written practice. This is important in terms of quality assurance meeting the requirements of ISO9001 [21].

In the aerospace prEN4179 refers EN 45013 in basic documentation, but the term “certification” meaning “approval by the employer” is predominant issue. Each NANDTB shall develop and publish the policy as applied by the national accredited body when assessing agencies for accreditation as providing Level 3 services, including training and examinations. A certificate of accreditation, referring to the NANDTB criteria for assessment and accreditation of outside and internal Agencies is awarded to the applicant organization that has satisfied the criteria.

4. Conclusions

Harmonization of training and certification of NDT personnel internationally is essential to achieve high standards of safety and performance of engineering components. In industrial sectors and services the new ISO/IEC 9712:2005, published in February 2005, enhances the applicability of the European standard EN473 promoting the agreement on technical cooperation between ISO and CEN (Vienna Agreement) and facilitating the world trade.

In aerospace industry, which also has to deal with challenges of the global market, the barriers of harmonization were discharged by the issuance of EN4179:2000 and the equivalence of NAS410 to the prEN4179:2003. The employer based organizational scheme of EN4179, by avoiding superfluous formalism, simplifies the process of qualification and approval of NDT personnel and allows more attention to be devoted to technical considerations.

Another essential requirement of international harmonization is the mutual recognition of the individual certification schemes existing in the different countries. Towards this, both the International Committee for NDT (ICNDT) and the European Federation of NDT (EFNDT) focused their efforts with sustainable success. By the establishment of the European Certification Process (ECP) and by the approval of mutual agreements between the different organizations/NDT societies a greater confidence in the resulting certification of personnel is expected to be attained, facilitating the mutual recognition and the worldwide acceptance of the national certificates.

In the aerospace field the establishment of National Aerospace Non-Destructive Testing Boards (NANDTB) to provide guidance for NDT qualification and examination services in accordance to EN 4179 / NAS410, is also primordial. On a second level, different NANDTBs shall consent to harmonize their procedures to ensure objectivity, impartiality and acceptance by the Aircraft Industries and the Civil Aviation Authorities.

References

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Abbreviations

AB: Accreditation Body/Agency
ACCP: ASNT Central Certification Program
AECMA: Association Européenne des Constructeurs de Matériel Aérospatial / European Associations of Aerospace Industries
AIA: Aerospace Industries Association
ASNT: American Society For Non-Destructive Testing
CAA: Civil Aviation Authority
CB: Certifying Body/Agency
CEN: Comité Européenne de Normalisation / European Committee for Standardization
EASA: European Aerospace Safety Agency
ECP: European Certification Process
EFNDT: European Federation for Non-Destructive Testing
EFTA: European Free Trade Association
EU: European Union
FAA: Federal Aviation Authorities
IAF: International Accreditation Forum
ICB: Independent Certifying Body
ICNDT: International Committee for NDT
ISO: International Organization for Standardization
MOU: Memorandum of Understanding
MRA: Mutual Recognition Agreement
NANDTB: National Aerospace Non-Destructive Testing Board
NCB: National Certifying Body
NDI: Non-Destructive Inspection
NDT: Non-Destructive Testing