

# QUALIFICATION AND CERTIFICATION SCHEMES OF NON-DESTRUCTIVE TESTING PERSONNEL IN AEROSPACE INDUSTRY THROUGH THE IMPLEMENTATION AT HELLENIC AEROSPACE INDUSTRY (HAI SA)

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## 1. Introduction

In the aerospace industry, there is a clearly established requirement that the qualification and certification of personnel for Non-Destructive Inspection (NDI/NDT) shall be carried out in compliance with specific approved rules. Moreover, 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. However, an expressed unanimous opinion is 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 [2] and ISO9712 [3], fully supported by International Committee for NDT (ICNDT), was achieved by mutual agreement. The new ISO/FDIS 9712:2004, after a two-month voting, was approved in January 2005 and the revised standard ISO9712:2005 is expected to be published by May 2005. ICNDT is preparing 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].

Training and Certification of Non-Destructive Testing (NDT) personnel procedures, in accordance with the specific rules imposed by standards and regulations, are recognized by many NDT professional bod-

ies. 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.

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

The centralized certification via an “independent certifying body” (ICB) is the centerpiece of the EN473. 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 is no longer involved in the certification process. In the aerospace field, the standard EN473 is applied by a considerable number of companies, but the majority of European aerospace companies refuses 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 situa-

tion, 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 [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].

Due to the close cooperation with the US market, the EN4179 tried to achieve an extensive harmonization with MIL-STD-410. First step towards this was the second revision of NAS410 (Feb2003) [8], which set up equiva-

lency in technical content with the EN4179: 2000. Recently, 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) [9] states 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. This recent advancement 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 scenario ICNDT is proposing to set up a "Recommended Guidelines for the Qualification and Certification/Approval of NDT Personnel according to NAS410/EN4179"[4].

### 3. 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 [10].

Company-based certification is mostly based on the American Society's of NDT (ASNT) Recommended Practice SNT-TC-1A approach [11] 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 [12] in several European countries.

It is therefore obvious the need of international harmonization on the basis of mutual recognition of the individual certification schemes. In that 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 ECP are given in ref. [13].

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 used in the correct way - as part of an organization's quality systems for NDT - and the standards for company-based certification are bringing in requirements for external assessment e.g. independently certified Level 3s [10]. ASNT now offers a range of schemes including a family of central certification options known as ACCP (ASNT Central Certification Program). Many companies now combine the written practice of the employer-based schemes with the use of third party certifica-

tion to ISO9712 or EN473, ensuring a better matching of certification to customer's technical and business needs.

### 4. Accreditation

The third parameter in Certification of Personnel (apart from Training & Standardization) 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. ISO9712/EN473 and EN4179 require that the certification system should be controlled and administered by a "certifying body" (CB) that conforms to the requirements of the standard EN45013 [14]. As EN45013 has been superseded by ISO/IEC 17024:2003 [15] (from April 2005), the new ISO/FDIS 9712:2004 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.

Moreover, EFNDT intends to ensure that the qualification and certification is based on accreditation in line with EN45013/ISO 17024 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 EN45013/ISO1724 by a government department or recognized accreditation agency/body. It intends to promote harmonization of the operations of the independent NDT personnel certification schemes nominated by the national NDT societies of European Union (EU) and European Free Trade Association (EFTA) countries, to facilitate recognition of qualifications and certifications of NDT personnel in Europe and internationally in order to facilitate the free movement of plant, equipment and personnel and to avoid uneconomic re-inspection.

More than 25 national NDT Societies have signed the MRA and 16 Certification Schemes in 14 countries have gained EFNDT Recognition. EFNDT has now modified its MRA, so that countries outside Europe can participate [16].

The certifying body, which shall fulfill the requirements of EN45013/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). Whilst, some AB operate outside their national boundaries, EFNDT has expressed its concerns about the uniformity of accreditation in the different countries.

Third Party Qualification and Certification of NDT personnel is also dependent on the employer, "the organization for which the candidate works in regular basis", and its 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 [17].

### 5. Implementation of standards at Hellenic Aerospace Industry (HAI S.A.)

EN473 and EN4179 were adopted by Hellenic Organization for Standardization in 1/2/2001 and 8/5/2000 respectively. Moreover, EN4179 has become national standard by law. There is no wondering, therefore, why Hellenic Aerospace Industry chose to adopt the organization-based personnel certification system of EN4179 instead of the centralized personnel certification system on EN473. EN4179 provides the flexibility to satisfy the needs for safety and efficiency of the aero-

space and to react to the recent technological developments. However, since the company has to satisfy its clients, as well as those who are in some way concerned with respect to products for American companies, it is solely inspected for compliance with the NAS410 requirements during audits performed by such customers, licensees, or the FAA.

Hellenic Aerospace Industry has to comply on one hand with its American clients specifications (e.g. BSS7698 of Boeing, NDTQ of Pratt & Whitney, based solely on the NAS410) and, on the other hand, with the national standard of EN4179 regarding Hellenic Civil Aviation Authority (HCAA). Thus, an operative and active quality system and training sector were prerequisite in order to achieve all these goals to the customer's satisfaction. The need of a flexible quality system to implement the changes to the customers' and authorities' satisfaction leads to the merge of all the requirements in the form of a quality document. Thus, a Quality Instruction (QI) regarding certification of NDT personnel is issued and revised every time a new/revised standard is officially adopted by the company [18]. This QI complies with the requirements of HAI clients' specifications, the EN4179 and the NAS410 following the stricter rules and approved by the responsible Level 3, which is a Level 3 independent certified individual designated by the Quality Assurance Director. The above-mentioned convergence of the American and the European standards has already facilitated this process.

The cognizant NDT organization, which is HAI Training Directorate, holds the responsibility for the certification process. It qualifies trainees, Level 1 and 2 personnel, NDT auditors and instructors and personnel responsible for the technical adequacy of NDT methods. All of them are certified by the responsible Level 3.

Combining the advantages of the two certification systems and to the satisfaction to its clients, HAI utilizes an outside agency (ASNT) for the qualification of its Level 3

personnel. In fact the 3 NDT Level 3s of HAI followed the programs:

- ASNT NDT Level 3 Program complying with STN-TC-1A
- ASNT ACCP Program complying with ISO9712

Moreover, two representatives of the company also participate to the National Aerospace Non-Destructive Testing Board (NANDTB) in order to implement procedures for the qualification and certification of NDT personnel per requirements of the EN4179, and therefore the equivalent NAS410, and/or provide support for these processes. By establishing such a board, the aerospace companies in Greece will have the opportunity to cooperate and save costs on auditing and approval of outside agencies and subcontractors.

## 6. Conclusions

Harmonization of training and certification of NDT personnel internationally is essential to achieve high standards of safety and performance of engineering components. 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 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. The versatile quality system and training sector of Hellenic Aerospace Industry, following guidelines/requirements of the ISO9000 series of standards, allowed the absorption of the recent changes and provides the company with the advantages for cooperation with the European, American, and international market.

### References

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- [18] (HAI) Quality Instruction 00-03-01, *NDT Personnel Certification Program*.

### Abbreviations

- AB: Accreditation Body/Agency
- ACCP: ASNT Central Certification Program
- AECMA: Association Europeene des Constructeurs de Materiel Aerospatial / 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: Comite Europeene de Normalisation / European Comitee 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
- HAI: Hellenic Aerospace Industry
- HCAA: Hellenic Civil Aviation Authority
- IAF: International Accreditation Forum
- ICB: Independent Certifying Body
- ICNDT: International Committee for NDT
- ISO: International Organization for Standardization
- MRA: Mutual Recognition Agreement
- NANDTB: National Aerospace Non-Destructive Testing Board
- NCB: National Certifying Body
- NDI: Non-Destructive Inspection
- NDT: Non-Destructive Testing