IRAN CIVIL AVIATION NDT CERTIFICATION ADAPTATION

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Abstract
Safety is very important in aviation, and NDT makes the aviation safe. In 2003 EASA\(^1\) and FAA\(^2\) have come to mutual agreement for harmonization of NDT Personnel qualification standards and terminating the long-lasting debate in aerospace. CAO-IRI\(^3\) “the Iranian local authority” as part of aviation community had the same problems so the regulation needed to be revised.

This paper represents the modification of Iran Civil Aviation NDT Personnel certification rule in order to adapt it to the requirements of EN4179/NAS-410, to provide a vast opportunity for collaboration of the NDT expert, reducing certification lag, contribution of whole national resources and adaptation with reputable NDT aviation standards.

**Keywords:** NDT Personnel Certification

1. Introduction
Quality control and assurance are the fundamentals of a quality management system which includes the policies and procedures for ensuring the quality of products or services however, Non-destructive testing has significant roles in ensuring the through-life quality and reliability of whole products such as aircraft components. These tests as a quality assurance/control tool in the aerospace industrial have grown larger and more sophisticated day by day very rapidly. Innovation and research in all aspects as materials science, digital technology and nanotechnology are paving the way for new NDT methods. Competence and experience of NDT personnel particularly in aerospace industries are the most important factors in assuring the reliable of the test result. In Iran, more than 100 private and public companies are

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\(^1\) European Aviation Safety Agency
\(^2\) United States Federal Aviation Authorities
\(^3\) Civil Aviation Organization of Islamic Republic Of Iran
active in aerospace industries [1]. They are active in construction, design, maintenance, and training. NDT as part of the quality control and assurance has significant role in the industries. The importance of these tests comes to be inevitable in MRO for construction companies. Nowadays both of these fields are very active in IRAN. Many presences MRO’s, for example, are very active due the higher average of aircraft fleet age. In such a case, NDT is one of the pillars for maintaining organization and has great effect on the flight safety. Undoubtedly the NDT methods as part of quality control/assurance have great effect on the reliability. To be reliable in NDT, all factors of these tests shall be based on the reputable Standards. Among the factors, the personnel qualification is much more important, so the great care shall be taken for preparation a qualification and certification scheme.

2. NDT Certification and Qualification Program

For reviewing the Certification programs for Non-destructive personnel in civil aviation industry, the presence scheme has been overviewed briefly. There are two programs; In-house certification program and Third party certification program.

2.1 In-house certification program:

This program is also called Second party or employer oriented program. As in this scheme, the employer is responsible for all personnel activities; it is authorized to certify the employees. So the employer may train the NDT personnel based on Qualification and Certification Procedure, called Written Practice. Many American documents such as ANSI/ASNT CP-185, NAS 410, MIL-STD-410 (superseded by AIA NAS 410, but FAA still refer to it as certification standard) [2] and Recommended Practice No. SNT-TC-1A are “In-house” or in other words “Second Party” certification program. In these documents certification defined as:

- Written testimony of qualification (Recommended Practice No. SNT-TC-1A)
- Written testimony that an individual has met the applicable requirements of this standard. (ANSI/ASNT CP-185)

2.2 Third Party certification program:

In contrary to In-house, the Third Party program knows the employer unauthorized to certify the employees. The NDT personnel shall be trained and certified by agency other than the employer and the clients. The
documents other than US are based on this program such as: EN 473, EN4179-2000, Canadian CGSB 48-GP and so on. In this program all training, examination and certification affairs transferred to Training, Examination and Certification bodies. The employer is not authorized to train and certified their personnel solely. People shall be trained by authorized NDT training body and pass the examination in authorized examination body. The issued certificates are not the property of employer. Qualified individual receives their certificate from the Certification Body. In these documents certification defined as:

- Procedure, used by the certification body to confirm that the qualification requirements for a method, level and sector have been fulfilled, leading to the issuing of a certificate. (ISO 9712)
- Procedure used by the certification body to confirm that the qualification requirements for a method, level and sector have been fulfilled, leading to the issuing of a certificate. (EN-473)

**2.3 Advantages and disadvantages:**

Both programs even third party and in-house have advantages and disadvantages:

- **In-house advantages:**
  - Training and certification refer to whom responsible for personnel performance (Employer)
  - Suitable scheme for where specialized performance is required
  - Suitable scheme for industries, where self-regulating certification system is understood by whole hands responsible for quality

- **In-house disadvantages:**
  - The certificate is only limited to the employer
  - The certificate is not portable from company to company
  - It may be only a sealed paper not Written testimony of qualification

- **Third party advantages:**
  - Certification of unqualified person is limited
  - Certificate is not the property of the employer
  - A uniform training, and examination system are used

- **Third party disadvantages**
  - Certified people may be not qualified for specific jobs
- Certification is limited to only a few methods
- Certification in new method is time consuming
- Personnel certification and recertification take huge time

In reviewing of the certification scheme, it seems that although in third party program some of the disadvantages of the in-house program have been eliminated but the third party disadvantages are very crucial especially for aviation industries.

3. The previous national aviation NDT regulation:

The first and somehow the second national aviation NDT regulations of Islamic republic of Iran are based on the third party program. These certification schemes had been selected due to the fact that like many other countries, almost all Iranian people prefer a central system for qualification and certification of NDT personnel. During the period of the first regulation NDT expert and the managers who were responsible for NDT had experience many problems. In reviewing the second version of the National regulation, more NDT expert was invited to the Certification Board. The board were satisfied to give more right to the employer for training and certification of the NDT Personnel; it means in-house certification program has been accepted.

4. Second national aviation NDT regulation:

Based on the second regulation, the employers were authorized to use in-house certification scheme but all their training and certification should be under the closed supervision of the Civil Aviation Organization. While it was not a must for preparation of Written Practice but many employers prepare the WP. All personnel who had been qualified as per the employer Written Practice, should be introduced to certification Board of CAO.IRI for final approval. People who receive the approval of the board were deemed qualified to perform NDT on aircraft.

5. Level of qualification and NDT Methods:

Three levels of qualification (Level I, II and III) were assumed for common methods:

- Electromagnetic Testing (ET)
- Liquid Penetrant Testing (PT)
- Magnetic Particle Testing (MT)
- Radiographic Testing (RT)
• Ultrasonic Testing (UT)
• Visual Testing (VT)

6. Processes of personnel certification:

6.1 Authorized CAO.IRI training centre:
These training centres were under supervision of CAO.IRI. Those people who passed the training program successfully were eligible to attend the CAO.IRI qualification examination. The examinations were administered by CAO.IRI certification board.

- There were three examinations
  - General examination (computer based examination)
  - Oral examination (field examination)
  - Practical examination (field examination)
- The NDT board was responsible for specific and practical examinations.

6.2 Outside agency:
These agencies worked mostly based on SNT-TC-1A and EN 4179. People who passed the qualification examination successfully, should only attended the Practical and oral examinations of the CAO.IRI. The examinations were administered by CAO.IRI certification board.

6.3 CAO.IRI NDT board:
This board consisted of followings:

- CAO.IRI examination department manager
- CAO.IRI examination department staff
- CAO.IRI NDT designee

6.4 Requirements of the NDT Certification:

- CAO.IRI Airframe and Power plant licenses
- Required documented experience as per CAO.IRI regulation
- Required documented training course
- Successfully passed the CAO.IRI examinations
6.5 Examination:
- Minimum examination grading was based on CAO.IRI regulation.
- Vision examination was based on CAO.IRI regulation.

6.6 Recertification:
- All level of qualifications shall be recertified annually by the employer under supervision of CAO.IRI.

7. Shortage and limitation:
In spite of the fact that employer could use the in-house certification scheme but as all level of the qualification shall be certified by CAO.IRI, the certification scheme was third party. Therefore aviation NDT society encounters with same problem of such program.
- Certified people may be not qualified for specific jobs: As the examination question bank had limited resources some the special techniques were not covered.
- Certification is limited to only those methods that explained in paragraph 4.
- Certification in new method is time consuming: In order to prepare the required resources is time consuming; certification in new method is takes time
- Personnel certification and recertification take huge time: As all personnel were certified by an organization therefore they were very busy and some time took huge time.

8. Certification scheme in aviation industries
Qualification and certification of NDT personnel have been started since years and various countries of entire the world consider this issue. SNT-TC-1A was published for the first time by A SNT\(^5\) in 1966. Afterward, considering the significance of the topic, various countries in the world formulated and revised the standards of certification, eligibility and the process of training \(^[3]\). After establishment of the European Federation of non-destructive testing in 1998, the editing and revising of the European standard was developed rapidly. There were huge difference in European and American standards, this made many difficulties. Finally, EASA and FAA agreed for common standards EN 4179 and NAS410 in 2003. The common version was published

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\(^5\) American Society for Non-Destructive Testing
in 2008 [4]. New horizons opened when board assembly formed and NANDTB established during the European Conference on NDT in Berlin [5]. On the other hand this standard found global alignment and employed in most of the world as a direct result of EASA regulation part 145, which mandates the implementation of Standard EN 4179 by maintenance organizations subject to the regulation and describe a National Aerospace NDT Board as: “an independent national aerospace organization representing a nation’s aerospace industry that is chartered by the participating prime contractors and recognized by the nation’s regulatory agencies to provide or support NDT qualification and examination, and/or certification services in accordance with this standard”. Gradually other countries are joining to the board.

9. Local Regulation

NDT operation in Iranian aerospace industries has been activated from 1962 although NDT department in the Iran Air which established in 1970 [6]. In the Islamic Republic of Iran, the first version of certification and qualification of NDT personnel in aviation was ratified in Sep. 1998 by CAO.IRI [7]. Based on this regulation, different criteria such as training syllabus, examinations, educational qualification, experience in aerospace, previous type certificate, etc. were evaluated by CAO.IRI. This regulation referred to ISO 9712 and SNT-TC-1A. Next version of certification and qualification of NDT personnel in aviation was developed in 2004 by CAO.IRI referred to EN 4179(2000), ISO 9712 and SNT-TC-1A.

10. Third national aviation NDT regulation:

In 2008 and 2009, CAO.IRI revised parts: 21, 66, 145 and 147 and put them in the portal for polling [8]. The “Non-destructive testing – Qualification and certification of personnel” regulation was in the Subpart C of Part 66. This revision was based on EN 4179/NAS 410. In 2009, as per recommendation of this regulation the NANDTB was going to be established in Islamic Republic of Iran. But some Iranian aviation companies were not agreed with these revisions. Because of the ambiguous situation in order to prevent any misunderstanding the revised regulations offered for further study by the aviation community.

11. NANDTB

In 2010, following the revising the national regulation for NDT Personnel Certification and Qualification, a group of experienced NDT experts were invited to certification committee of CAO.IRI for reviewing of NDT

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6 EN 4179 has been technically harmonized with AIA-NAS-410 since 2008.
Certification regulation and providing the basis for founding the Iranian National Aerospace NDT Board. In first meeting, the founders came to common goal:

- Updating the national aviation NDT regulation based on the reputable standards
- Eliminating the presence shortages of NDT Certification regulation
- Providing a system for upgrading of the whole NDT society in aviation
- Establishing the annual national aviation NDT expert symposium
- Contacting to other national NDT societies such as National aviation NDT board
- Preparation of the NANDTB bylaws

12. NANDTB bylaws:

Although as per EN 4179/NAS 410, establishing of NDT Board was not a must, but due to the previous regulation shortages, one foundation of the aerospace nation board was one of the fundamental goals of revising the nation regulation. The objectives and strategy of the Iran-NANDTB:

- Harmonies aerospace NDT department in the Islamic Republic of Iran
- Define and promote best practice in NDT.
- Promote the importance of NDT and related accreditation, certification, Act as the voice of the group of people that work in Aerospace NDT the Islamic Republic of Iran.
- Promote the implementation of R&D projects and their uses.
- Develop and maintain strategic action plan
- Organize conferences and seminars related to NDT
- Organize working groups and make studies in the field of NDT
- Publish Journals, reports in the field of NDT
- Provide support for training certification examinations in the Islamic Republic of Iran
- Offers a route to NDT Societies, members and personnel certification bodies.
- Provide way to become qualified NDT personnel in aerospace as per EN 4179.
13. Conclusion

- As the applied technologies in the NDT methods progress, the role of personnel qualification becomes more vital.
- In-house certification scheme has more advantages to third party certification program in aviation industries.
- Harmonization of NAS 410 and EN 4179 provides better environment for improving the NDT personnel qualification and certification in aviation industries all around the world.
- Iranian aviation community comes to this conclusion that foundation of NANDTB has an inevitable positive effect in aerospace industries
- Although the Iranian Aerospace NDT Board is not still founded, but it has taken many steps forward.

References

[7] Qualification and certification of non-destructive testing; CAO.IRI; Flight standard licensing-1998
[8] CAO.IRI; Flight standard licensing regulations-2008 and 2009

Now the Iranian National Aerospace NDT Board bylaw has been developed.