वैमानिकी दर्पण

10th Edition

DGAQA MAGAZINE ON AVIATION QUALITY ASSURANCE

MAKE IN INDIA

ENSURING FLIGHT SAFETY THROUGH QUALITY ASSURANCE

आज़ादी का अमृत महोत्सव

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Articles/ suggestions may be sent to Senior Editor on email ID- dirtc.dgaqa@gov.in.
Every Article forwarded may be accompanied by a brief bio data and passport size photograph of the author.

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महानिदेशक

S. Chawla
Director General

DO: 1171/DGAQA/SJC

31 Aug 2022

All officers & staff of DGAQA Family

DG's MESSAGE ON 69th DGAQA FOUNDATION DAY

On the occasion of 69th Foundation day, I extend my felicitations and warm greetings to all DGAQA personnel and their families.

My special greetings to our esteemed DGAQA veterans and their families. It is their vision and hard work that nurtured DGAQA all along since its inception in 1954.

'DGAQA Day' is a momentous occasion to look back and note our remarkable achievements. It is also an occasion to rededicate ourselves to our primary objective of providing requisite QA towards flight safety.

In the year gone by, some of the major mile stones we have achieved towards improving quality culture, empowering industry, ease of doing business towards achieving Atmanirbhar Bharat are:

(i) AFQMS to OF-DPSU's post OFB corporatization. Major review of QC/QA stages were carried out wherein the QMS of Ordnance Factories were strengthened and brought at par with other peers namely HAL, BEL, BDL etc. Accordingly, out of total 12 factories under DGAQA ambit, four factories were granted AFQMS approval and balance are under process.

(ii) DGAQA engagement with M/s Airbus. C-295 project, which may be the game changer in the military aviation production, being the first project in private sector with Foreign OEM partnership; DGAQA has finalized CQSP with M/s Airbus & TASL for indigenous production of aircraft. DDPMAS amendment for new methodology is also taken up. Also, DGAQA-AFQMS is granted to M/s Airbus to this effect.

(iii) DGAQA-AFQMS approval. We have granted AFQMS approval to total 87 firms. Further, we have started granting AFQMS approval to Pvt Firms also and this year, three such firms have been granted approval.

(iv) Registration of Firms and Test labs. As part of capacity assessment and registration of Firms and Test labs towards expansion of Indian defence industry, a total of 77 Firms and 13 Test labs are registered with us. Further, on request from IAF, a new category i.e. authorized dealer/stockiest of foreign OEM, has been introduced and accordingly, SOP has been revised and issued in this year.

(v) DGAQA is continuously supporting Industry through proactive approach during various activities in indigenous design and development projects viz LCA, ALH, LUH, LCH, HTT-40, AMCA etc. as also indigenization, material substitution, life extension studies. Requisite coverage is also provided to MoD flagship programs viz iDEX, DTIS, MRGS etc.

(vi) On export front, DGAQA is providing QA coverage and final clearance for Dornier for Seychelles and Mauritius and also we shall be geared up for forth coming orders for export of LCA and Brahmos.

(vii) Under MoD/DDP guidance, the present DDPMAS-2021 is being reviewed in line with best International practices.

(viii) On Human resources front, Cadre review of all Group A, B & C cadres have been finalized and submitted. Further, despite a number of Court cases, a considerable chunk of officers have been promoted to higher level in this year.

(ix) On training front in preceding year, we have conducted / organised 30 courses wherein about 200 DGAQA personnel have been trained in various areas.

(x) Regarding Rajbhasha, I am glad that our Lucknow office has received award for Utkarsh Karya in Rajbhasha from NARAKAS. Additionally, Jr Translators have been provided to OADG Nasik & Koraput to facilitate Rajbhasha implementation thereof.

Our in house Technical publication i.e. **'Vaimaniki Darpan'** has completed two years and I urge all our fellow officers for providing Quality Articles for mutual benefit of all.

On the 69th Foundation Day, let us resolve to continue performing our duties with utmost dedication and professionalism. I am confident that our collective capacity to achieve excellence and our commitment will take DGAQA to further heights.

Warm Greetings.

Jai Hind!

31-08-2022

(S Chawla)
Director General

CERTIFICATION OF INDIGENOUS MILITARY MATERIALS

Joginder Kumar,
Director, PP& FOL
HQrs DGAQA

Introduction

Manufacturing of defence products requires variety of raw materials out of which certain materials are critical and strategic in nature. It is estimated that the current total annual import of military materials is Rs. 14,000 Crores (approx). With 20% CAGR, it is expected to grow to Rs. 35,000 Crores (approx.) by 2026. In order to achieve substantive self–reliance in defence manufacturing, there is a need to reduce dependence on import for critical and strategic raw materials and also to encourage domestic raw material manufacturing through policy / procedural interventions. Considering the importance of critical & strategic materials and the need for indigenization, a Task Force was constituted under the chairmanship of Additional Secretary (Defence Production) to prepare a roadmap and implementation framework for rapid indigenization of critical & strategic materials.

Majority of the strategic & critical materials are being imported due to various reasons such as lack of indigenous capability (viz lack of expertise, experience and adequate infrastructure), issues in certification of defence equipment manufactured with indigenously developed materials, lack of adequate testing facilities for critical materials for defence applications, restrictions in the use of indigenously developed materials in foreign designed defence equipment, etc.

In order to examine the above factors in an effective and time-efficient manner and to suggest actionable interventions, four sub-groups were constituted within the Task Force to: (a) carry out demand supply analysis of all entities within the country and identify the main materials (material classes) that form the bulk of the import of strategic materials today [sub-group 1], (b) look at issues related to certification [sub-group 2], (c) ascertain infrastructure related to research, development and testing of raw materials in the country [sub-group 3], and (d) ascertain existing policy provisions as well as to examine proposals/recommendations made by stakeholders, including industry representatives, to facilitate indigenization of raw materials [sub-group 4]. Initially, the different sub-groups worked individually to collect and collate the basic information relevant to the respective sub-groups and to formulate draft reports in alignment with their respective charters. Subsequently, a series of extensive deliberations were held amongst the lead members of the various sub-groups as well as with the full task force in order to combine the individual draft reports into one main document that presents the major hurdles to indigenization today and propose actionable recommendations.

Classification

Materials used for military requirement can be classified based on its end application as:

Critical: Failure endangers the safety of the aircraft or crew or at least results in aborting the aircraft mission. Critical is further classified into “Flight critical” & “Mission critical”.

Non-Critical: Failure does not endanger the safety of the aircraft or crew nor does it result in aborting the mission.

Therefore, approach to certification including testing requirement depends upon the criticality of the component which is made from the material/s. Definitions and Certification / QA Organisational Structure.

Formation of Sub-committee

The sub-committee was constituted under the chairmanship of DG,AQA alongwith CEMILAC to look into existing procedures for certification / approval of materials and make recommendations to address the issue raised by stakeholders and Indian Industry.

Key Challenges faced by Sub-Comittee in achieving 100% indigenization of military materials in the country

Even though the capabilities to manufacture many military materials, are available in the country, there are few challenges in achieving 100% indigenization of raw materials. Such as:

- Restriction in the use of indigenously developed materials in foreign designed defence equipment.
- Critical and Strategic raw materials are controlled by OEM's approved foreign vendors / international suppliers.
- Issues related to certification of defence equipment manufactured with indigenously developed materials.
- Issues related to warranty of defence equipment manufactured with indigenously developed materials.
- Sourcing of materials from traders by DPSUs / Private Sector due to cost and volume factor.
- Non utilization of existing knowledge and capabilities amongst various academic institutions, R & D centers and industry. (Knowledge domain)
- Lack of adequate testing facilities for critical materials for defence applications and long lead time for testing of materials wherever facilities are available.
- Import of materials for items produced indigenously for supplies under offset obligations.

Certification of Indigenous Military Materials

The important issues raised by the Industry and stakeholders . The subgroup deliberated on the issues and recommended for simplification of certain processes specially related to batch requirements for certifications, prescribing timelines for processes, acceptance criteria, etc. The recommendations of sub-group are given as under:-

Sl. No.	Issue raised & Recommendations	Timeline
1.	**Time bound and focused certification process including fast track methodology.** Timelines for finalization of QTP/ATP by respective certification agency/QA agency suggested. Concurrent development-cum-certification approach can be followed that can reduce substantial time.	Issue of QTP 2-3 months & ATP-01 month

2.	**Reduction in number of batch/heat/melt for non critical material, instead of three batches / heats / melts for certification purpose.** For non-critical materials, single batch/lot/heat (insteatd of 3) is recommended to obtain certification / provisional clearance from CEMILAC/DGAQA/DGQA. Suitable amendment can be incorporated in Qualification Test Schedule (QTS) accordingly.	Immediately on approval of Recommendation
3.	**Indigenously developed material should be accepted based on CoC on simillar lines as being done for imported material.** Main contractor can accept material on CoC or utilize TPIs as per approved BOM post certification based on criticality of the material.	-do-
4.	**Large quantity of material is required for development & certification purpose (viz 3 batches) I.e15-20 tons which is not economical** Small pilot test Batches can be prepared for development/ certification purpose for freezing of process parameters.Actual production batches can thereafter be scaled up based on approved process & certification.	-do-
5.	**Certification agencies should coordinate for development/ certification of materials without insisting on contract / supply order.** Development of material without firm order from user / services can be taken up by the firm under the MOD/DDP Export Promotion Scheme. Based on successful development, certification can be issued by respective agencies.	Issue already resolved and implemented

All the subgroups submitted formulated draft reports and subsequently a series of extensive deliberation were held amongst the lead members of various sub groups and a combned report was prepared to present major hurdles to indigenization today and proposed actiopnable recommendations were submitted to Hon'ble RM at Def-Expo 2022 and same was approved.

About the Author: Shri Joginder Kumar, Director is posted at HQrs DGAQA (PP& FOL), New Delhi and joined DAQAS service in April 2001

विचार :

गुणवत्ता में करें सुधार,उन्नति का बनें आधार ।

SUPER ALLOY "GAIN FOR METALLURGIST ; PAIN FOR MACHINIST"

Sanjay Gaur
Dy Director (Armt)
HQrs DGAQA

The Reliability of a product or equipment depends on the Quality and robustness of the design. The Mechanical Design plays a crucial role in correctly designing the framework of a product and the structure of the component to achieve the desired objective. The understanding of applied stresses/ Force, understanding of Suitable material and understanding of suitable manufacturing technology are the critical factors which can impact the Design of the product. The choice of Material plays an important role during the entire design process. At the early design stage, the right selection of material has direct impact on the achievement of the expected results for design validation. Hence, material selection is crucial to a successful engineering design process. The Choice of material affects the quality & reliability of the element and establishes a relationship between the endurance of a structure as well as the technical/operational aspects of the design.

As we are aware that aerospace industry is incredibly demanding, both in terms of stringent quality requirements and ever changing performance needs. To cater this, it requires the highest standards of equipments, parts, components and design which are durable/reliable throughout the entire life cycle in the most severe environment. The Material with specific strength and factor of safety is inherent part of the robust design for Aerospace System.

The ever increasing growth of aviation sector especially the supersonic fighter aircrafts and inter-continental ballistic missiles (ICBMs) has increased the demand for materials that

have excellent mechanical and chemical characteristics along with high temperature strength resistance in comparison to originally employed various types of steels in jet engine applications. The characteristics requirements for the aerospace material are very-very peculiar in nature, because of frequently varying operational, environmental & Aerodynamic loads. It is mandatory to understand the various specific characteristics of aerospace material so that it is able to meet the stringent design requirement of the ever dynamic aviation sector. The followings main specific requirements for aerospace requirements are mentioned for understanding at glance:

- High Strength to Weight ratio
- High strength at elevated temperature
- Resistance to chemical degradation
- High Wear resistance
- Non corrosive
- High resistance to mechanical and thermal fatigue.
- High resistance to mechanical and thermal shock.

- ❖ High resistance to creep and erosion at elevated temperatures.

In order to achieve these high functional performance quality parameters, the material researcher have developed the various robust material. The developed materials, such as heat-treated steels, Ti-alloys, Nimonic super alloys, new ceramics, metal matrix composites, silicon infiltrated carbide (SiSiC), Sialon, aluminium oxide-titanium carbide etc. are usually employed in manufacturing of the components for aerospace application. Because these materials posses unique combination of properties like high strength at elevated temperature, resistance to chemical degradation, wear resistance and low thermal diffusivity etc are normally referred to as super alloy. In the Aerospace industry Nickle based, Cobalt Based and Titanium based alloys are used. These alloys are most complex and are widely used in the hotter section of aero engine of aerospace vehicle in the form of turbine blades, compressor blades and liners etc. The development of super alloy has solved the pressing demands for durability and strength in machine and system for Aerospace application that were barely imaginable a hundred years ago. Super alloys have helped us conquer air and space, plumb the depth of the earth and ocean and has addressed the other challenges evolved during the innovation and discovery of modern life.

However ability of these materials to maintain and retain their properties at elevated temperatures severely hinders its machinability and poses a greater challenge to the manufacturing engineers in the form of frequent failure of the tools, production of inaccurate geometry and poor surface finish etc. Such materials are referred as difficult-to-cut/difficult-to-machine or advanced materials

In conventional machining methods, the materials are removed from work piece by shearing in the form of chips which generate huge amount of heat at the interface of cutting edge of tool and work piece. Especially the advanced materials are inherited with the characteristics of low thermal diffusivity which does not allow to dissipate the generated heat in work piece in efficient manner rather it dissipates to cutting tool at faster rate. This results into the softening of cutting tools and thereby significantly reduces the strength and hardness of the cutting tool materials. To overcome of the softening related problems of the tool materials, tools made of ultra hard materials such as cubic boron nitride (CBN) and polycrystalline diamond (PCD) etc. have been used. Also many added machining techniques such as taper turning, self propelled rotary tooling (SPART), high pressure coolant supply, minimum quantity lubrication (MQL), cryogenic machining, plasma and laser assisted machining are used . But the challenges for efficient, cheaper and reliable machining process still remain unfulfilled. Some of the difficulties faced by the machinist in machining of these difficult materials are as follows:

Frequent Tool failure due to poor heat conductivity.

- ❖ Difficult to machine because of their high hardness.
- ❖ Difficult to make intricate shapes in these materials.
- ❖ Difficult to make channel/cylindrical hole of miniature diameter in complex units
- ❖ Deformation of tool due high hardness.
- ❖ Poor surface finish and machining accuracy.
- ❖ Wear on the tool materials results from combination of dissolution /diffusion and attrition process.
- ❖ Localization of shear stress on cutting tool due to high dynamic shear strength.
- ❖ Notch formation at cutting tool due production of abrasive saw tooth.

- Rapid work hardening during machining especially in Ni-alloy.
- Abrasion based tool failure due to presence of abrasive carbides in Ni-alloys.
- Localization of temperature due to low thermal diffusivity.
- Welding of the work piece to the cutting tool edge resulting in poor surface finish.
- Reaction of the cutting tool with work piece at elevated temperature, resulting in accelerated tool wear.

To address the difficulties faced in machining difficult to machine materials by conventional machining processes, researchers have developed non-conventional machining processes which have eased out the machining difficulties to some extent. These non conventional machining processes are also known as Advanced Machining Processes (AMPs). Some of these AMPs are: Chemical Machining Processes, Ultrasonic Machining Processes, Electrical Discharge Machining, Beam Machining Processes (Laser Beam, Electron Beam, Plasma Beam & Ion Beam), Electro Chemical Machining, and Jet Machining Processes etc. which are extensively being used in machining of advanced material in general and aerospace components in particular. Some of the advantages of the AMPs are:-

- Ease in Machining even with complex/ intricate shapes and inaccessible areas
- Better surface integrity and high surface finishing.
- Precision & Ultra precision Machining (Micro & Nano Machining).
- Higher volumetric material removal rate
- With Adaptive control leading to unmanned and automated factories.
- Computer control of process result in better performance, higher reliability, better repeatability and higher accuracy.
- Drilling of holes with High Aspect ratio
- Material removal take places in the form of atoms/molecules or in group of these

In spite of all the efforts made to machine advanced material, still the challenges are not over especially for the machining of Super alloys such as Ni-alloy and Ti-alloy. Ni-alloys and Ti-alloys are extensively used in hotter section of Aero Engine of aerospace vehicle in the form of turbine blades, compressor blades and liners etc. because they are able to meet the characteristic requirements of aerospace materials such as high strength to weight ratio, high strength at elevated temperature, creep resistance at high temperature, resistance to chemical degradation, high wear resistance and non corrosiveness, low modulus of elasticity, composite compatibility etc.

The never ending quest of metallurgist for high strength robust material to cater the stringent design requirements for aviation sector has led to development of the various super alloys. The Materials have been developed to meet the challenges of ever increasing demand of high temperature resistance, light in weight along with enhanced strength of materials, but the challenges for machining of these difficult to machine material stills remains a concern for the manufacturer. Although the Advance Machining Process have been able to ease out the difficulties faced by the machinist to some extent but the challenges for efficient, cheaper and reliable machining process still remain unfulfilled. There is need for comprehensive research and innovation for developing the advance machining processes which are economical, efficient, reliable, environment friendly and most importantly with ease in machining for the machinist.

About the Author: Shri Sanjay Gaur, Dy. Director (Armament) is posted at HQrs New Delhi and joined DAQAS Service in Aug 2009.

तकनीकी कामकाज में हिन्दी भाषा का प्रयोग एवम् कठिनाई

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प्रयोग

हमारे दैनिक जीवन में प्रशासनिक एवं पत्रकारिता के क्षेत्र में व्यवहार होने वाले भाषा रूप को हम प्रयोजनमूलक हिंदी कहते हैं। जैसे हम अपने दैनिक जीवन में अपने सगे संबंधियों या मित्रों को पत्र लिखते हैं, ई–मेल के द्वारा समाचार भेजते हैं, व्यक्तिगत या संस्थागत पत्राचार, संचार के माध्यमों, कार्यालयों एवं विभिन्न अनुसंधान संस्थानों में व्यवहार किए जाने वाले हिंदी भाषा, अर्थात जीवन की विविध विशिष्ट आवश्यकताओं की पूर्ति के लिए उपयोग में लाई जानेवाली भाषा।

सामान्य हिंदी का प्रयोग प्रत्येक हिंदी भाषी करता है और दूसरी भाषा के तौर पर हिंदी सीखनेवाले भी इस रुप की जानकारी पहले प्राप्त करते हैं। किंतु विशेष संदर्भों के लिए उचित हिंदी शैली सामान्य हिंदी शैली से भिन्न प्रकार की होती है और हिंदी भाषी को भी यह हिंदी शैली विशेष प्रयत्नपूर्वक सीखना पडती है। उदाहरण के लिए कार्यालय हिंदी, बैंक हिंदी, वाणिज्य–व्यापार की हिंदी और वैज्ञानिक एवं तकनाकी के अनुसंधान में प्रयुक्त हिंदी।

तकनीकी कामकाज में प्रयोग

हिंदी के वैज्ञानिक व तकनीकी विकास की स्थिति को कई आधारों पर आकलित किया जा सकता है, जिनमें प्रमुख हैं– हिंदी में अनुवाद की स्थिति, पारिभाषिक शब्दावली के निर्माण की स्थिति, मानकीकरण के प्रयास, टंकण व अन्य यांत्रिक विकास की स्थिति।

मानकीकरण के प्रयास 20वीं सदी के प्रारंभ से दिखने लगते हैं तथा धीरे–धीरे हिंदी का मानकीकरण सरकारी सहायता के साथ–साथ लगभग पूरा हो गया है।

इसी तरह, पारिभाषिक शब्दों के विकास हेतु वैज्ञानिक एवं तकनीकी शब्दावली आयोग तथा विधायी आयोग ने विज्ञान, वाणिज्य व मानविकी क्षेत्रों से संबंधित कई विषयों की मानक शब्दावली तैयार की है। हालाँकि शब्दकोष के स्तर पर सिद्धांततः हिंदी एक वैज्ञानिक भाषा बन गई किन्तु व्यावहारिक स्तर पर स्थिति अभी संतोषजनक नहीं है। इसी तरह अनुवाद कार्य हेतु भारत सरकार ने केंद्रीय अनुवाद ब्यूरो का गठन किया है जो लाखों शब्दों का अनुवाद कर चुका है तथा प्रत्येक वर्ष अपने लक्ष्यों को पूरा कर रहा है।

वैज्ञानिक एवं तकनीकी हिंदी के अंतर्गत चिकित्सा, इंजनीयरिंग, संगणक, बढईगिरी, लुहार का कार्य तथा प्रेस, मिल आदि से संबंधित विभिन्न क्षेत्रों में प्रयोग होने वाली तकनीकी भाषा आती है। वैज्ञानिक एवं तकनीकी संप्रेषण में एक विशिष्ट भाषा का व्यवहार किया जाता है। तकनीकी संप्रेषण के विभिन्न क्षेत्र होते हैं, जो मानव जीवन से अभिन्न रूप से जुड़े होते हैं। तकनीकी संप्रेषण का महत्वपूर्ण क्षेत्र वैज्ञानिक और प्रौद्योगिकी का क्षेत्र है। वैज्ञानिक क्षेत्र में होनेवाले नितनवीन अनुसंधानों के परिणामस्वरूप आज मानव जीनव में विज्ञान और प्रौद्योगिकी की भूमिका तीव्र गति से बढ रही है। ऐसे में मानव के सामान्य दैनिक जीवन के निर्वाह में भी विश्व के किसी कोने में होने वाले अनुसंधान से परिचित होना अनिवार्य सा हो गया है। वैज्ञानिक एवं प्रौद्योगिकी के क्षेत्र में होने वाले नितनवीन अनुसंधान से परिचित होने का एक मात्र तरीका उस वैज्ञानिक एवं प्रौद्योगिकी साहित्य को हिंदी में भी लाना अनिवार्य है। परंतु वैज्ञानिक एवं तकनीकी विषय की अभिव्यक्ति के लिए जिस भाषा को प्रयोग करते हैं वही प्रयोजनमूलक वैज्ञानिक एवं तकनीकी भाषा है। वैज्ञानिक और औद्योगिकी का विकास पिछले कुछ वर्षों से पूरे विश्व में काफी तेजी

से हुआ है। यह देखा गया कि विज्ञान जो सिद्धांत प्रदान करता है उसी के आधार पर तकनीकी का विकास होता है।

यह सर्वविदित बात है कि वैज्ञानिक एवं तकनीकी की उपलब्धियां किसी भी उन्नत राष्ट्र का मेरुदंड होती है। जब तक हमारे वैज्ञानिक एवं विभिन्न तकनीकी की जानकारी इस के प्रयोक्तओं, बृहद मानव समुदाय एवं देशवासियों को नहीं होगी तो इस प्रकार का प्रयोगशालाओं तक परिसीमित ज्ञान अपना दीर्घकालीन व भहुआयामी प्रभाव छोड़ने में सक्षम नहीं हो सकता। अतः आवश्यक है कि विश्व के उन्नत देशों के समानंतर चलने के लिए हम ज्ञान – विज्ञान एवं तकनीकी के क्षेत्र में अत्यंत महत्वपूर्ण विषयों को अपनी भारतीय भाषाओं, विशेषकर हिंदी के माध्यम से भी अभिव्यक्त कर प्रबुध्दजनों के साथ–साथ देश के जन–सामान्य तक पहुँचने का प्रयास करें।

कठिनाई

तकनीकी क्षेत्र में यदि हिंदी के कंप्यूटरीकरण के स्तर विकास को परखें तो यह नजर आता है कि कई क्षेत्रों में अच्छा विकास हुआ है, जैसे– वर्ड प्रोसेसिंग (शब्द संसाधन) में पत्र लिखना, रिपोर्ट तैयार करना, लेख लिखना आदि कार्य काफी अच्छी स्थिति में हैं। जहाँ तक 'सिस्टम सॉफ्टवेयर' का संबंध है, हिंदी में अपना सिस्टम सॉफ्टवेयर विकसित नहीं हुआ है। हिंदी में अभी भी आवश्यक निर्देश डॉस, विंडोज, सिस्टम जैसे सॉफ्टवेयर के माध्यम से दिये जाते हैं।

स्पष्ट है कि पिछले कुछ वर्षों में हिंदी के वैज्ञानिक और तकनीकी विकास में कई महत्त्वपूर्ण चरण हमने पूरे किये हैं। इस क्षेत्र में अभी भी काफी चुनौतियाँ विद्यमान हैं। पहली चुनौती हिंदी में वैज्ञानिक शब्दावली के साथ कंप्यूटर के सिस्टम सॉफ्टवेयर के विकास की है। इसके साथ ही, यह भी एक चुनौती है कि हिंदी में वे सभी सुविधाएँ मौजूद हों जो अभी अंग्रेजी और रोमन के लिये हैं।

हिंदी टाइपिंग के क्षेत्र में विकास के बावजूद आज भी कई समस्याएँ मौजूद हैं। इन समस्याओं में प्रमुख हैं– की–बोर्ड के मानकीकरण की समस्या, फॉन्ट्स की समस्या व उपयुक्त सॉफ्टवेयर की कमी आदि।

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विचार :

प्रक्रिया सरल बनाकर हम समय व उत्पादन कीमत घटायेंगे, तभी तो भारतीय उत्पादन को विदेशों में बेच पायेंगे।

A GLANCE: AIRCREW PROTECTIVE EQUIPMENT(FLYING CLOTHING)

Daljeet Singh
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HQrs DGAQA

Most of us have seen a Flying Pilot of a military aircraft wearing attire different from what we wear in our daily life. Not only it looks attractive but it protects the pilots during flying from various health hazards also. Even it is symbolic for career campaign of Indian Air Force.

Aeromed Group at HQ, DGAQA provides Direct Inspection to these Protective Flying Clothing items and Survival Equipments. Aeromed is acronym to Aeromedical which means a medical science to study medical disorder occurring while flying/ejection of an aircraft under non-favourable conditions. Thus Protective Flying clothing is required to minimise health hazard viz. g-loc (loss of consciousness due to g-force), fire, safety, abnormal flow of blood etc. since human body functions differently in air compared to ground under adverse conditions.

Protective Flying clothing items are specialised clothing used by Aircrews of our Armed Forces designed to suit their professional requirement and protect them too. The stringent Qualitative requirement of these items makes them exclusive from normal clothing. For example fibre used for Overall is breathable, Fire resistant, good tearing strength etc. The Flying helmet protects from wind blast and impact during ejection whereas shoes gives cushioning and safety while landing. Some items are general in use by all the crews whereas Flying Helmets Oxygen mask and Anti g-suit are specific to aircraft fleet held by Services.

A brief description of some of the Protective Flying clothing items are described in succeeding paragraphs. The Qualitative requirement of each of the item have been described separately since each item has specific test requirement for acceptance. Writing all lab tests requirements are beyond the scope of this article.

Fire Resistant Overall

FR Overall is used by all Flying Pilots of IAF, IA, IN and Coast Guard during Flying. It is manufactured from Fire Resistant (FR) Fabric and FR fasteners/zip. FR Fabric made of 93% meta-Aramid, 5% para-aramid and 2% antistatic fibre. Sewing Thread is made of Meta-aramid. Medium Duty Fire resistance fasteners are used for FR overall. The design of FR overall is so that it is easy to don and doff and sufficient pockets to keep requisite flying documents. It does not hinder in operation of various switches and panel in cockpit.

Qualitative requirements

DGAQA ensures that material is used as per specification. The main tests on Fabric are Tensile strength, tear strength, shade, colour fastness, char length to check fire resistivity etc. and cycle test for zip operation. The samples of each of the material is tested in NABL accredited Lab.

Oxygen Mask

Oxygen Mask is used mostly by Fighter/ trainer pilots shall provide breathing air/ oxygen under pressure when required from breathing regulators through a personal equipment connector (PEC) to avoid hypoxia during flying of aircraft in extreme condition at varying g-levels. The Mask is fitted with microphone and suitable end connectors for RT

communications. It consists of face piece made of silicon rubber, Inspiratory valve, expiratory valve, compensatory and anti suffocation valve. Oxygen Masks are aircraft specific like Hawk, Jaguar, SU-30 and Helicopters. However DEBEL has presently developed Common Helmet and Common Mask which will be used for all aircraft with certain replacement of the connectors.

Qualitative requirements

The hardness of silicon rubber, function of each of the valve at specified pressure, microphone communication check are main leading parameters of Oxygen Mask to be checked.

Flying Helmet

Flying Helmet is used by Aircrew to protect from windblast, impact and penetration of any sharp object during ejection from aircraft under adverse conditions. It also provides R/T communication through R/T chord and earphones. It shall have strong yet light weight shell incorporating an energy absorbing layer of expanded polystyrene, Dual acrylic visor, mask anchoring mechanism and a suitable adjustment pads for comfortable fitment. It may be fitted with Night vision devices as per requirement.

Qualitative requirements

The Helmets are subjected to Penetration resistance and Impact attenuation test for specified designed value to evaluate its design parameters during acceptance check. In addition DC resistance, Impedance, Frequency response and sensitivity tests are carried out on earphone used in Helmets. The visors are required to be tested for transmittance, refractive index, haziness tests etc.

FR Anti G suit

This garment is worn by the fighter pilots over FR overall to give effective protection primarily against +Gz forces through the flight envelope of the aircraft. Anti g-suits are manufactured as per aircraft fleet. It is capable of inflation and pressuring the lower portion of the body, viz., thigh, calf and abdomen to the required level to restrict the blood flow pooling downwards under gravity and maintain uniform blood flow in human body. It has a bladder made of neoprene coated nylon fabric to interface with PEC connected to the aircraft. The bladder inflate/deflate automatically as per requirement. Anti g-suits are under DEBEL specifications and are Type Approved by CEMILAC.

Qualitative requirements

FR anti-g suit is a life saving and critical garment. During acceptance check, the material characteristics of neoprene rubber, dimensions of end connector, leakage of the bladder, the time required to fill the bladder are the critical parameters to be checked. FR fabric characteristics are similar to the fabric used for FR overall.

Flying Boots

Flying Boots are used by Aircrews of armed forces. These are manufactured under Aeromed and DEBEL specifications. Flying Boots are made of Full Grain Leather and are air permeable and light in weight. The shoes are so designed that it does not interfere with any system of aircraft and also gives adequate grip during operation of rudder pedals/skid resistance during walking. It also protects the feet of the aircrew on ejection and landing on ground. It is also fire resistant.

Qualitative requirements

The flying Boots are subjected to testing parameters like Flex testing for 100000 cycles, Anti skid, Mould Growth, tensile strength and tear strength of leather, Flame resistance, Water penetration etc.

Extreme Cold Conditions (ECC) Clothing

ECC clothing is used by Flying Aircrews in extreme cold weather/high altitude conditions. FR Arctic Gloves, Fur lined Boots, NATO Suits and Winter Overall etc. are some of

the ECC clothing. FR Arctic glove is augmented by a suitable heating element to provide adequate warmth at desired set temperature and provides adequate insulation without affecting sensitivity and dexterity. It is light in weight and exhibits satisfactory wear comfort. Similarly heated insoles are used for shoes. They are provided with a suitable power source, controller for regulating power supply and a thermostat to cut-off/cut-in the power supply to conserve the power source and also provided with a battery charger.

Qualitative requirements

The ECC clothing are designed to withstand cold temperature as low as -35ºC. Clo value is required to be tested as thermal insulation value of ECC clothing. The fabric used for Gloves is tested for abrasion resistance, Air permeability, resistance to delamination, water vapour resistance, dimensional stability etc. The heating elements are tested for different rating, cut in temperature, cut out temperature, short circuit protection, endurance testing etc.

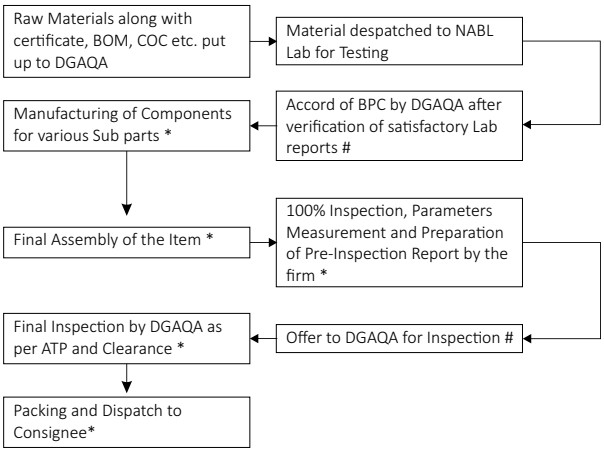
Inflatables

Aeromed Group also provides Inspection to other survival equipments like 10 men Dinghies, One man Dinghy, Personal Survival Pack (PSP) for various aircrafts, Arctic Tents etc. PSP is set of components installed in the seat pan used by all aircrews and has a seat cushion attached to the top of a carbon fiber laminate shell. PSP consists of no. of life saving items which may be used under adverse conditions during ejection in land/sea/jungle.

Qualitative Requirements.

Most of the inflatable are manufactured from two ply Butyl proof/Neoprene coated nylon fabric. The fabric is tested for Tear strength and tensile strength in Warp and Weft Direction, Peel strength, Flex cracking, permeability, weight etc. The seam strength is also tested to under varied temperature.

Bulk Production Clearance for Flying Clothing items are accorded only after raw material sample has met all the requirements as per specification. The flow chart of Inspection procedure is shown below.



*** Inspection and testing by Firm QC**

 # Inspection and testing by DGAQA (Aeromed)

There are so many other items like Bullet Proof Jackets, Leg Garters, Air survival Jacket, FR Air Inflatable Life Jacket(AILJ), Thermal Vest, Thermal drawer etc. for which Aeromed Group, DGAQA provides QA coverage. Though there are challenges due to the limited vendor base for Flying Clothing items, DGAQA is committed to provide Qualitative items to our Armed Forces.

About the Author: Shri Daljeet Singh, Deputy Director (AeroMed) is posted at HQrs DGAQA and Joined DAQAS Service in June 2009.

विचार :

गुणवत्ता है सफलता की सर्वश्रेष्ठ विधि।

वैमानिकीय सॉफ्टवेयर गुणवत्ता आश्वासन

मनीष राज शिवारे,
वरिष्ठ वैज्ञानिक सहायक
अलिस्डा, बैंगलुरू

हाल के दिनों में रक्षा एवं नागरिक विमानन के क्षेत्र में स्वायत्त (Automatic) मानवयुक्त एवं मानव रहित हवाई जहाजों (Aircraft) के विकास पर अधिक बल दिया जा रहा है, ताकि हवाई जहाजों का प्रयोग निगरानी (survellience), बचाव, नियंत्रण, सामरिक, भूमि सर्वेक्षण और आपदा प्रबंधन आदि कार्यो में सुगमता एवं अधिक सटीकता के साथ किया जा सके। किसी भी प्रकार के यन्त्र या उपकरण में स्वचालिता हार्डवेयर एवं सॉफ्टवेयर को एक साथ अंतर्निहित (Embeded) कर प्रदान की जाती हैं। किसी भी यन्त्र या उपकरण के कुशल कार्यप्रणाली को एक उचित परीक्षण प्रणाली द्वारा ही सुनिश्चित किया जा सकता है। यह लेख सॉफ्टवेयर की उचित परीक्षण प्रणाली को निर्धारित करने से संबंधित हैं, ताकि सॉफ्टवेयर की गुणवत्ता का आश्वासन कुशल एवं प्रभावकारी तरीके से किया जा सके।

सॉफ्टवेयर, अपने निर्माण के जीवन चक्र (Life Cycle) में वह सात (Seven) चरणों (Phases) से गुजरता है, जो इस प्रकार है– योजना, विश्लेषण, डिजाइन, विकास, परीक्षण, कार्यान्वयन और रखरखाव।

विमानन के क्षेत्र में में सॉफ्टवेयर को उनसे संबद्ध उपकरण/यन्त्र के उपयोग के स्थान के आधार पर विभाजित किया जाता हैं। इस आधार पर सॉफ्टवेयर को मुख्यतः दो श्रेणीयों में विभाजित किया जाता हैं, प्रथम हवाई (Airborne) सॉफ्टवेयर एवं द्वितीय स्थल (Ground) सॉफ्टवेयर / सॉफ्टवेयर की श्रेणी के आधार पर ही उसकी परीक्षण प्रणाली को निर्धारित किया जाता है। परीक्षण प्रणाली के निर्धारण के लिए मानकों (Standards) को आधार माना जाता है।

वर्तमान समय में, विमानन के क्षेत्र में सैन्य एवं व्यावसायिक परियोजनाए मानकों के एकीकरण पर अधिक बल देने लगी है क्योकि–

1. दोनों समाकलन (Integration) की उच्च श्रेणी की जटिलता रखते हैं।
2. दोनों उच्च श्रेणी की सुरक्षा यथोचित लागत पर चाहते हैं।
3. दोनों पुनर्प्रयोग एवं गुणवत्ता लागत प्रभावशीलता पर चाहते हैं।
4. दोनों को अग्रणी धारा वाली वाणिज्यिक प्रौद्योगिकी तक पहुंच की आवश्यकता है।

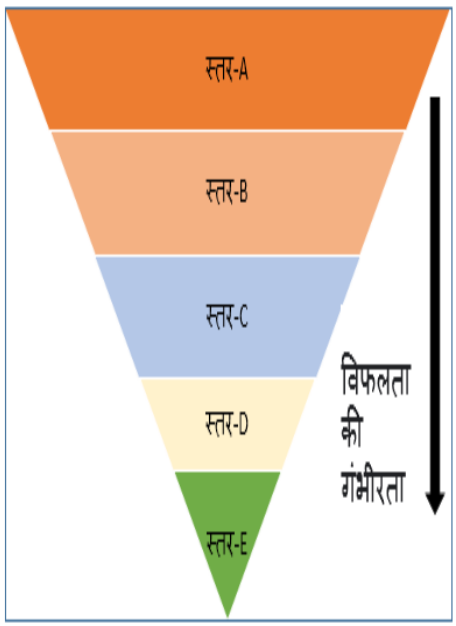
किंतु, सैन्य विमानन के क्षेत्र में उपरोक्त बिंदुओं के अलावा मिशन (Mission) को सटीकता के साथ क्रियान्वित कर पूर्ण करने की चुनौती भी रहती है, फलस्वरूप मानकों के एकीकरण में जटिलताए एवं चुनौतियां का सामना करना पड़ रहा है। यह लेख आरटीसीए डीओ–178 बी एवम् आरटीसीए डीओ–278 मानको को संदर्भ लेकर लिखा गया है।

जहां आरटीसीए डीओ– 178 बी मानक हवाई (Airborne) सॉफ्टवेयर विकसित करने के लिए दिशानिर्देशों को प्रदान करता है, वहीं दूसरी ओर आरटीसीए डीओ– 278 स्थल (Ground) सॉफ्टवेयर विकसित करने के लिए दिशानिर्देश प्रदान करता है। यह विदित है कि आरटीसीए डीओ–178 बी को संघीय उड्डयन प्रशासन, संयुक्त राज्य अमेरिका के द्वारा विमानन सॉफ्टवेयर को प्रमाणित करने के स्वीकृत साधन के रूप में स्थापित किया गया है।

किसी सॉफ्टवेयर के प्रमाणीकरण से पहले सर्वप्रथम सॉफ्टवेयर स्तर को निर्धारित करना आवश्यक है। सॉफ्टवेयर स्तर, सॉफ्टवेयर की विफलता के परिणामों के आकलन पर आधारित है और इसे इस प्रकार

परिभाषित किया गया है।

स्तर	विफलता का परिणाम	विवरण	उद्देश्यों की पूर्णता
स्तर–A	प्रलयंकर	वायुयान या मानव जीवन की पूर्णक्षति	66
स्तर–B	खतरनाक/गंभीर –प्रमुख	वायुयान क्षति या मिशन की विफलता	65
स्तर–C	प्रमुख	मिशन की विफलता	57
स्तर–D	लघु	वायुयान या मिशन पर गौण प्रभाव	28
स्तर–E	प्रभावहीन	–	0



किसी सॉफ्टवेयर के स्तर का निर्धारण, प्रणाली सुरक्षा मूल्यांकन (System Safety Assessment) दस्तावेज (Document) के आधार पर किया जाता हैं। एक बार जब प्रणाली सुरक्षा मूल्यांकन हो जाता है और सॉफ्टवेयर का प्रभाव ज्ञात हो जाता है तो सॉफ्टवेयर स्तर को परिभाषित किया जाता है।

डीओ–178 बी दस्तावेज का अनुलग्नक 'ए' सारणीबद्ध रूप में विभिन्न स्तरों के उद्देश्यों को पूरा करने के लिए अपनाए जाने वाले उद्देश्यों और प्रक्रिया को परिभाषित करता है। प्राप्त किए जाने वाले उद्देश्यों की संख्या को सॉफ्टवेयर स्तर के अनुरूप उपरोक्त सारणी में दर्शाया गया है।

किसी सॉफ्टवेयर के द्वारा, डीओ–178 बी दस्तावेज का अनुपालन मूल्यांकन के लिए उपकरण (Tools) का प्रयोग किया जाता हैं। उपकरण जो विकास के लिए उपयोग किए जाते हैं, उन्हें डीओ–178 बी प्रक्रिया के लिए योग्य होना चाहिए। बाजार में उपलब्ध कुछ उपकरण पहले से ही योग्य हैं। जो उपकरण योग्य नहीं हैं, एवं उनके द्वारा उत्पन्न परिणाम निर्धारणात्मक (Deterministic) प्रवृत्ति के हैं, उन्हें ही उपयोग से पहले उपकरण योग्यता योजना (Tool Qualification Plan) (TQP) के अनुसार योग्यता प्राप्त करने की आवश्यकता है। उपकरण योग्यता गतिविधियों को मानक दस्तावेज की धारा 12.2 में विस्तार से संबोधित किया गया है।

डीओ–178 बी प्रमाणीकरण में निम्नलिखित प्रक्रियाएँ शामिल हैं–

1. योजना प्रक्रिया (Planning Process)
2. विकास प्रक्रिया (Development Process)
3. सत्यापन प्रक्रिया (Verification Process)
4. विन्यास प्रबंधन प्रक्रिया (Configuration Management Process)
5. गुणवत्ता आश्वासन प्रक्रिया (Quality Assurance Process)
6. समाकलित प्रक्रिया (Integral Process)

एक चरण से दूसरे चरण में संक्रमण, संक्रमण मानदंड (Transition Criteria) पर आधारित होता हैं। परियोजना (Project) के विकास के दौरान निर्मित सभी प्रकार के डेटा की जांच, मूल्यांकन सूची (Checklist) के आधार पर सत्यापन एवं प्रमाणीकरण समूह (Verification & Validation Team) एवं सॉफ्टवेयर गुणवत्ता आश्वासन समूह (SQA) के द्वारा की जाएगी, और अनुमार्गणीयता (Traceability) की स्थापना की जाती हैं, ताकि प्रत्येक आवश्यकता (Requirement) के सही कार्यान्वयन को परीक्षण मामलों (Test Cases) के आधार पर मूल्यांकन किया जा सकें। अनुमार्गणीयता की स्थापना सभी चरणों में जाती हैं, ताकि सभी आवश्यकताओं के कार्यान्वयन की शुद्धता और पूर्णता सुनिश्चित की जा सके।

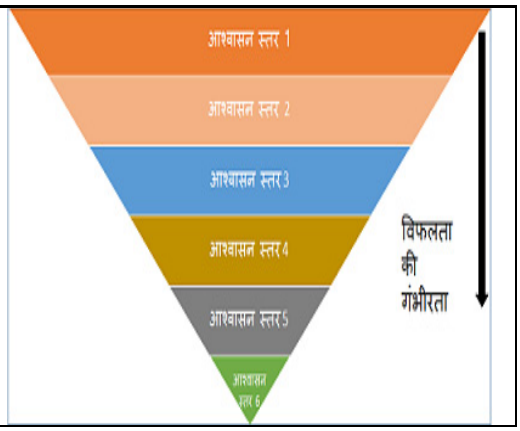
परियोजना के जीवन चक्र के दौरान मूल्यांकन के चरणों को चार भागो में विभाजित किया गया है, जिन्हें संयुक्त होने का चरण (Stage of Involvement) कहा जाता हैं। संयुक्त होने के चरण एवं उसके क्रियान्वयन का समय निम्नानुसार हैं, जिसे पूर्ण करने के पश्चात सॉफ्टवेयर को प्रमाणित कर दिया जाता हैं।

1. चरण I – योजना दस्तावेजों के पूरा होने के बाद।
2. चरण II – आवश्यकताओं, डिजाइन और कोडिंग चरण के पूरा होने के बाद।
3. चरण III – परीक्षण चरण के पूरा होने के बाद।
4. चरण IV – यह प्रमाणीकरण का अंतिम चरण है, जिसमे सभी रिकॉर्ड और महत्वपूर्ण दस्तावेजों का मूल्यांकन किया जाता हैं।

आरटीसीए डीओ–278, आरटीसीए डीओ–178 बी का पूरक है। यह गैर–हवाई संचार, नेविगेशन, निगरानी और हवाई यातायात प्रबंधन (सीएनएस/एटीएम) प्रणालियों में निहित सॉफ्टवेयर के आश्वासन के लिए दिशानिर्देश प्रदान करता है। आरटीसीए डीओ–278 में डीओ–178 बी के उद्देश्यों की समीक्षा की जाती है और गैर वायुवाहित सीएनएस/एटीएम प्रणालियों पर लागू करने के लिए संशोधित किया जाता है।

आरटीसीए डीओ–278 का भी प्रथम चरण सॉफ्टवेयर स्तर को निर्धारित करना है, किंतु यहाँ इन्हें आश्वासन स्तर कहा जाता हैंद्य आश्वासन स्तर को आरटीसीए डीओ–178 बी के स्तर से संबंधित कर परिभाषित किया जाता हैं।

डीओ–278 आश्वासन स्तर	डीओ–178 बी स्तर	उद्देश्यों की पूर्णता
आश्वासन स्तर 1	स्तर–अ	67
आश्वासन स्तर 2	स्तर–ब	66
आश्वासन स्तर 3	स्तर–स	60
आश्वासन स्तर 4	कोई समानता नहीं	44
आश्वासन स्तर 5	स्तर–द	25
आश्वासन स्तर 6	स्तर–ई	0



आश्वासन स्तर 4, कुछ सीएनएस/एटीएम (ग्राउंड–आधारित) सिस्टम के लिए रखा गया है जहां आश्वासन स्तर 3 बहुत कठोर है, वहीं आश्वासन स्तर 5 बहुत उदार है। इस आश्वासन स्तर के लिए कोई DO–178 बी समकक्ष नहीं है।

आरटीसीए डीओ–278 दस्तावेज का अनुलग्नक 'ए' सारणीबद्ध रूप में विभिन्न स्तरों के उद्देश्यों को पूरा करने के लिए अपनाए जाने वाले उद्देश्यों और प्रक्रिया को परिभाषित करता है। सॉफ्टवेयर के आश्वासन के अनुसार प्राप्त किए जाने वाले उद्देश्यों की संख्या को उपरोक्त सारणी में प्रदर्शित किया गया है।

जहां आरटीसीए डीओ–178 व्यावसायिक बिकने वाला

(COTS) मदों का उपयोग मानक के सभी उद्देश्यों को पूरा करने के अधीन है, वही आरटीसीए डीओ–278 उन्हें आश्वासन के साथ स्वीकार्य करने के निर्देश देता हैं।

आरटीसीए डीओ–178, किसी हवाई (Airborne) सॉफ्टवेयर के प्रमाणीकरण से संबंधित हैं, तो वही दूसरी ओर आरटीसीए डीओ–278 स्थल (Ground) सॉफ्टवेयर के अनुमोदन से संबंधित हैं।

सॉफ्टवेयर गुणवत्ता आश्वासन (QA), किसी सॉफ्टवेयर जीवन चक्र की प्रक्रियाओं (प्रोसेस) और उनके परिणामो (Output) का मूल्यांकन यह निम्नलिखित आश्वासन प्राप्त करने के लिए करती है कि–

- उद्देश्य संतुष्ट हैं,
- कमियों का पता लगाया गया है,
- मूल्यांकन किया गया है,
- ट्रैक किया गया है,
- हल किया गया है,
- सॉफ्टवेयर उत्पाद प्रमाणन आवश्यकताओं के अनुरूप है।

रक्षा अनुसंधान एवं विकास संगठन की प्रयोगशाला वैमानिकी विकास प्रतिष्ठान (ADE), भारतीय सशस्त्र बलों की आवश्यकताओं को पूरा करने के लिए अत्याधुनिक मानवरहित हवाई वाहनों और वैमानिकी प्रणालियों और प्रौद्योगिकियों के डिजाइन और विकास में शामिल एक प्रमुख वैमानिकी प्रणाली डिजाइन हाउस है। जहां वैमानिकीय सॉफ्टवेयर डीओ–178 के आधार पर प्रमाणित करने पर बल दिया जाता है, वही स्थलीय सॉफ्टवेयर को डीओ–278 के आधार पर प्रमाणित करने पर बल दिया जाता है। सॉफ्टवेयर के स्तर का निर्धारण सिस्टम सुरक्षा मूल्यांकन के आधार पर किया जाता है।

विमानन क्षेत्र ने वास्तव में सॉफ्टवेयर की शक्ति का उपयोग किया है और इसे अपने संचालन के हर स्तर पर नियोजित किया है – छोटे कार्यों से लेकर जोखिम–महत्वपूर्ण कार्यों तक और लागत में कटौती करते हुए दक्षता में वृद्धि की है। लेकिन जैसा कि किसी भी सॉफ्टवेयर उत्पाद के साथ होता है, एक अच्छे परिणाम के लिए उत्पाद दक्षता और सुरक्षा सुनिश्चित करने के लिए विमानन क्षेत्र में बहुत कठोर सॉफ्टवेयर परीक्षण की आवश्यकता होती है। उड्डयन के मामले में, मानव जीवन की सुरक्षा सुनिश्चित करने के लिए नियम हैं जिनका वैमानिकीय सॉफ्टवेयर को पालन करना चाहिए। डीओ–178 एवं डीओ–278 सुरक्षा विनियमन दिशानिर्देश हैं, फलस्वरूप मानव जीवन की सुरक्षा आश्वासित की जा सके।

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विचार :

गुणवत्ता निश्चय से शुरू होती है और प्रबंधन द्वारा सुनिश्चित की जाती है।

AIRCRAFT ICE AND RAIN PROTECTION SYSTEM

Santa Kriti Lahiri
SSO-I, OAQA
Barrackpore

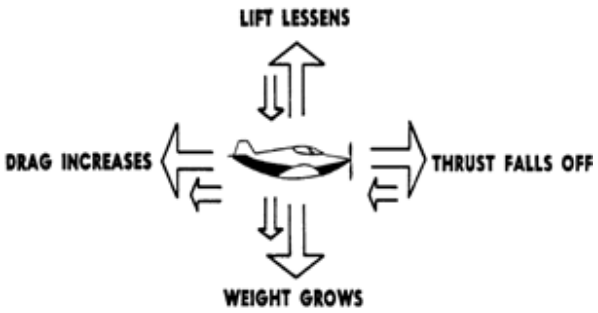
Ice, Rain and snow are aviation's long standing enemies.

ICING:

Under certain atmospheric conditions, ice can build rapidly on airfoils and air inlets. The two types of ice encountered during flight are Rime and Glaze. Rime ice forms a rough surface on the aircraft leading edges. It is rough because the temperature of the air is very low and freezes the water before it has time to spread. Glaze ice forms a smooth, thick coating over the leading edges of the aircraft. When the temperature is just slightly below freezing, the water has more time to flow before it freezes. Ice may be expected to form whenever there is visible moisture in the air and the temperature near or below freezing.

Effects of Icing:

If ice is allowed to accumulate on the wings leading edges, it destroys the lift characteristics of the airfoil. Ice or rain accumulations on the windshield interfere with vision. Ice on an aircraft affects its performance and efficiency in many ways. Ice buildup increases drag and reduces lift/ increases weight. It causes destructive vibration, and hampers instrument readings. Control surfaces become unbalanced or frozen. Fixed slots are filled and movable slots jammed. Ice causes propellers to become in efficient and out of balance. Radio reception gets hampered and flow of air gets restricted, resulting in engine rough run or complete Stopping.



Icing on Aircraft has caused several fatal accidents.

Ice detection system:

Modern aircrafts are equipped with the following systems to detect and locate ice during flight and on ground. A.)Visual Detection .B) Electronic detection – eg. Ice detection probe C) Optical ice detectors

Contaminant /fluid integrity measuring system (CMS)

ANTI ICING & DEICING

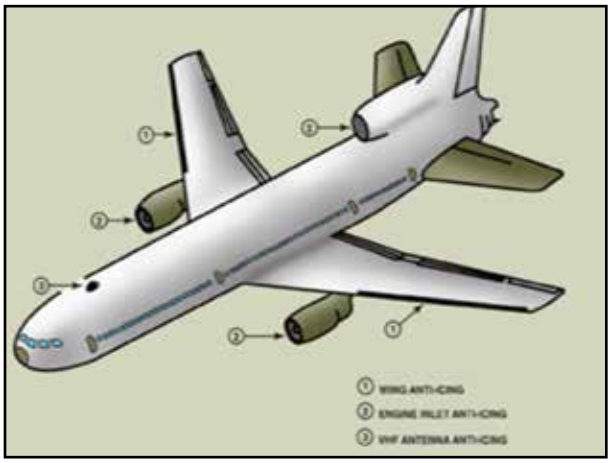
The methods used to prevent icing (anti-icing) or to eliminate ice that has formed (deicing) vary

with the aircraft make and model. Ice prevention or elimination systems ensure safety of flight when icing conditions exist.

Prevention of Icing (Anti Icing)

The Procedures used for anti icing are thermal anti-icing, electrical anti-icing, chemical anti-icing and weeping wing. A surface may be anti-iced either by keeping it dry by heating to a temperature that evaporates water upon impingement or by heating the surface just

enough to prevent freezing, maintaining it running wet.



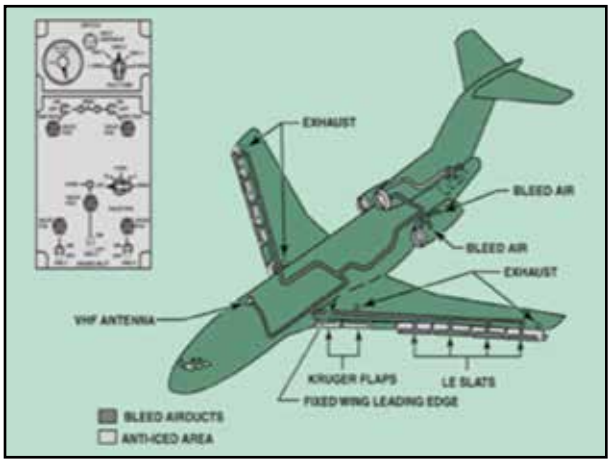
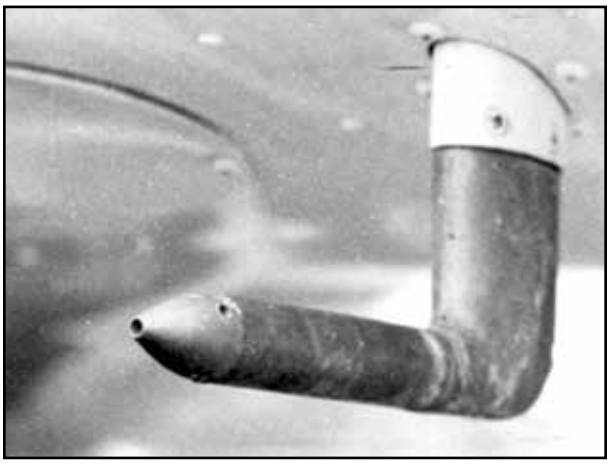


Fig: Places of Thermal Anti Icing



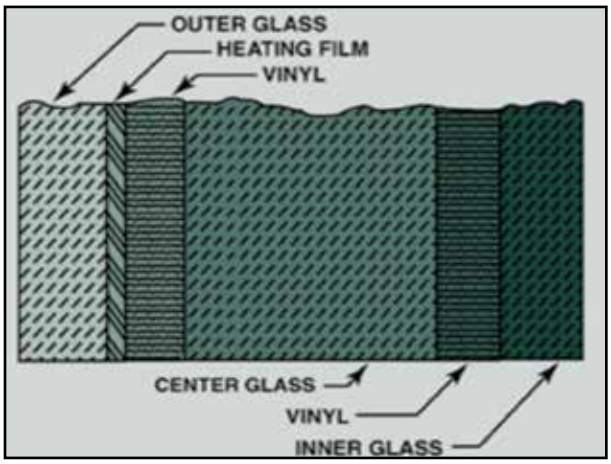


Fig: Electric Anti Icing

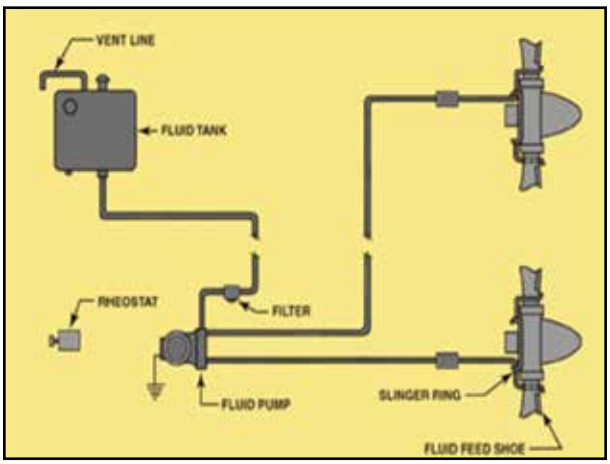


Fig: Ethylene glycol and isopropyl alcohol (chemical anti icing)

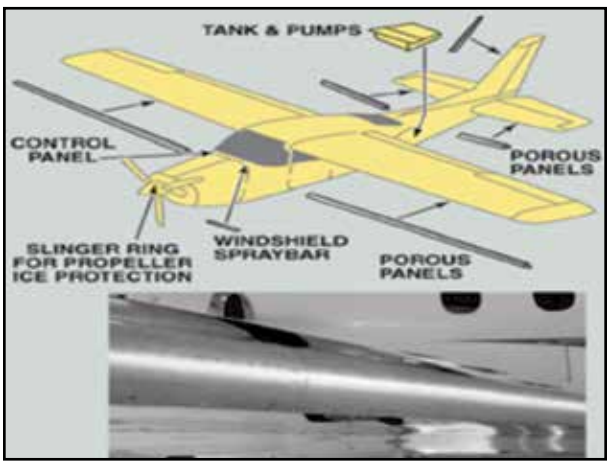


Fig: Weeping Wing (chemical)

Elimination of Icing (De Icing)

Pneumatic deicing systems use rubber Deicers, called Boots, attached to the leading edge of the wing and stabilizers. The deicers are composed of a series of inflatable tubes. During operation, the tubes are inflated with pressurized air, and deflated in an alternating cycle. This inflation and deflation causes the ice to crack and break off. The ice is then carried away by the airstream.

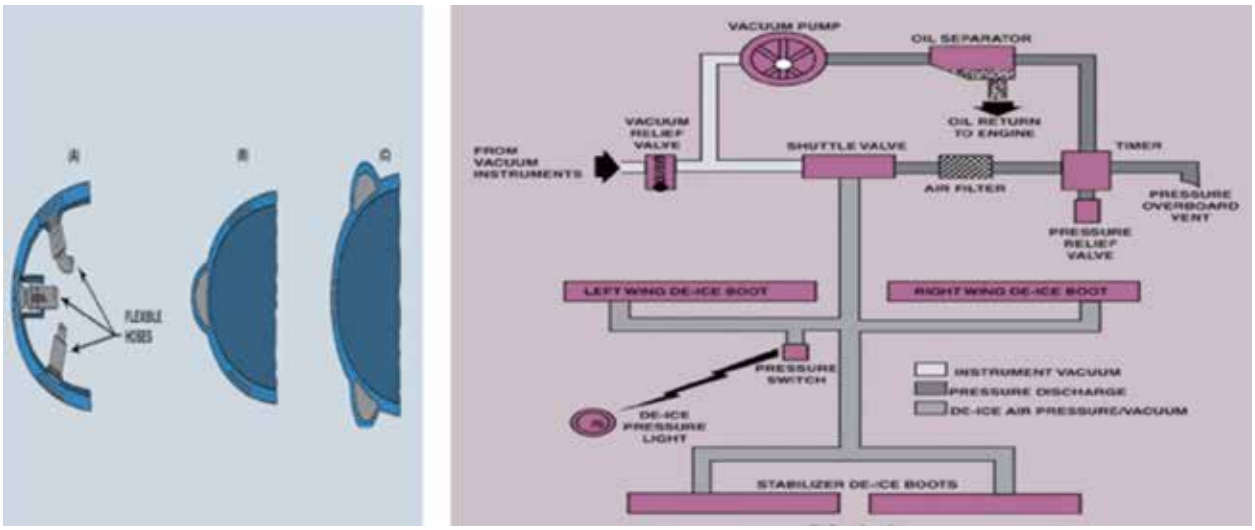


Fig: De Icing Boots and System

Ground De-icing of aircraft

This process is the removal of ice and snow on Ground with hot water/steam and chemicals.

Fig: Removal of Ice on Ground

Rain eliminating system

When rain forms on a windshield during flight, it becomes a hazard and must be eliminated. To provide a clear windshield, rain is eliminated by wiping it off, blowing it off and removal involving chemical rain repellants. Rain is blown from the windshield of some aircraft by air from jet nozzles located beneath the windshield. On other aircraft, windshield wipers (powered by electric or hydraulic systems) are used to eliminate the rain. The

windshield wipers of an aircraft accomplish the same function as those of an automobile. In each instance, rubber blades wipe across the windshield to remove rain and slushy ice. In chemical repellent system glass is treated with certain chemicals, a transparent film is formed which causes the water to behave very much like mercury on glass. The water draws up into beads which cover only a portion of the glass and the area between beads is dry. The water is readily removed from the glass.

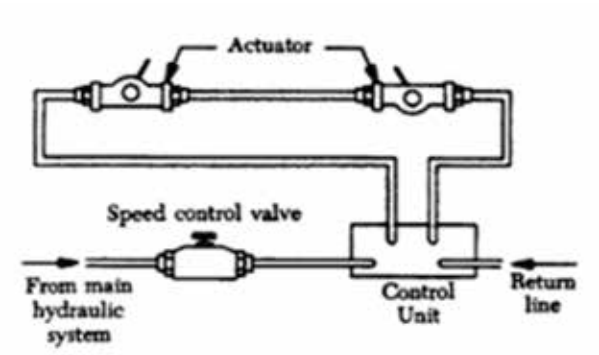


Fig: Hydraulic Actuator Wiper

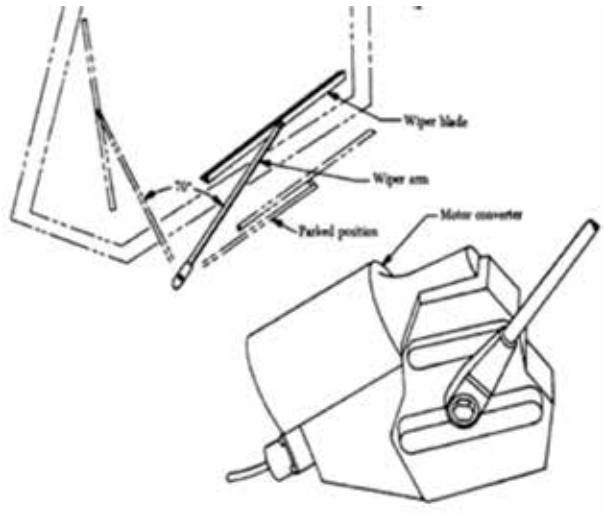


Fig: Electric Motor Wiper

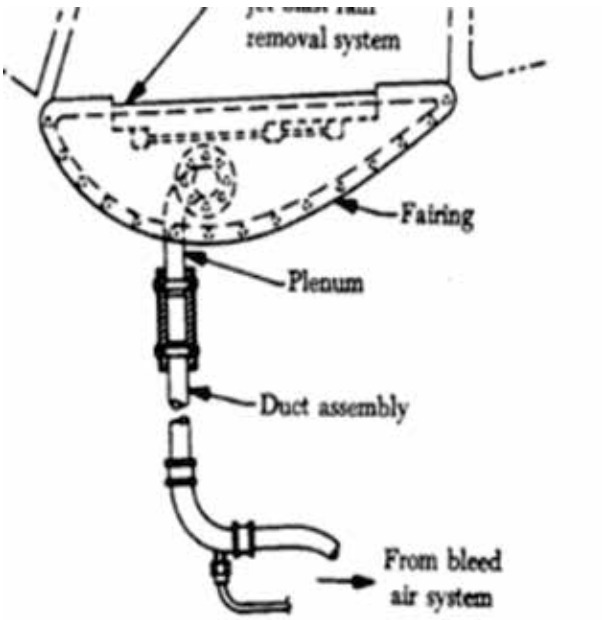


Fig: Pneumatic Jet Blast

About the Author: Shri Santa Kriti Lahiri, SSO-I is posted at OAQA, Barrackpore and joined Service in Mar 2011.

DG COMMENDATION AWARD 2022

RECIPIENTS OF DG,AQA COMMENDATION AWARD FOR YEAR 2021-22

S. No.	Name & Designation	UIN/ ID No.	Field Establishment
01	Sh. Udai Narain Rai, PScO(NF)	D-100127	ALISDA, Bengaluru
02	Sh. Sakalesh P K, SSO-I	D-100150	ORDAQA (GW &M), Hyderabad
03	Sh. Dinesh Gupta, SSO-I	D-100151	ORDAQA (ASERDC), Lucknow
04	Sh. Daljeet Singh, Dy. Dir	D-100154	Aeromed Gp, HQrs DGAQA
05	Sh. Nirmal Kumar, Dy. Dir	A-236393	Admin-I, HQrs DGAQA
06	Sh. Rajesh Kumar Raushan, Dy. Dir	D-100178	Tech-Coord, HQrs DGAQA
07	Sh. Sanjay Kumar Sharma, Dy. Dir	D-100197	E&I Gp, HQrs DGAQA
08	Sh. Santa Kriti Lahiri, SSO-I	D-100248	OAQA, Barrackpore
09	Sh. Dipak Kumar Das, SSO-II	D-200013	ALISDA, Bengaluru
10	Sh. Vivek Singh, SSO-II	D-100278	ORDAQA(Hel), Bengaluru
11	Sh. Harsheet Kumar, SSO-II	D-100285	MSQAA, Hyderabad
12	Md Azhar, SSO-II,	D-100289	OADG (Koraput)
13	HFO Neer Singh	677265-S	Aircraft Gp, HQrs DGAQA
14	Sh. Prasad Sundararaju, JSO	D-200046	ORDAQA (MRO & RWRDC), Bengaluru
15	Sh. Biswanath Gauda , JSO	D-200076	ORDAQA(LCA-TD), Bengaluru
16	Sh. Ajay Kumar Srivastava, JSO	D-200078	Tech-coord, HQrs DGAQA
17	Sh. Anil Kumar, JSO	D-200468	ORDAQA(ADL), Lucknow
18	Sh. Deepak Sukumar, JSO	D-200480	ORDAQA(H), Bengaluru
19	Sh. Baboo Ram, Chief Draftsman	D-200120	Drawing Sec, HQrs DGAQA
20	Sh. Laxmidhar Sahu, Foreman	D-200137	AQAW(A) DumDum, Kolkata
21	Sh. Shri Prakash Tripathi, Foreman	D-200138	AQAW(A) Khamaria
22	Sh. Arindam Halder, SSA	D-200489	ALISDA, Bengaluru
23	Dr. Subhash, SSA	D-200512	Aeromed Gp, HQrs DGAQA
24	Sh. Rakesh Kumar, SSA	D-200536	ORDAQA, Kanpur
25	Sh. Sachin Kumar, SSA	D-200572	OADG (Koraput)
26	Sh. Bijay Kumar, ASO	A-261029	Admin-II, HQrs DGAQA
27	Smt. Rekha Dhamija, Steno-I	D-200202	ORDAQA, Ghaziabad
28	Sh. Amit Kumar Pandey, UDC	D-200252	DAQAW (A) Dum Dum, Kolkata
29	Sh. Mahendra Naryanrao Gaidhane, THSG-II	D-200406	AQAW(A), Bhandara
30	JWO Pradeep Kumar Singh	743714-H	AE Group, HQrs DGAQA
31	Sh. Maheshanand, LDC	D-200259	OAQA, Dehradun
32	Sh. Ram Avtar, SSG-I(OS)	D-200268	Dett AQAW(A), Muradnagar
33	Sgt Pradeep Madala, Equipment Assistant	902364-S	HQrs DGAQA

PHOTO GALLERY OF DGAQA

First Visit of Shri Sanjay Jaju, AS (DP) to HQ, DGAQA

Release of 9th Edition of Vaimaniki Darpan by Shri Sanjay Jaju, AS (DP)

Inaguration of DGAQA Raising Day Celebration at HQ, DGAQA

PHOTO GALLERY OF DGAQA

Release of Standing Order of Aircraft Group at HQ, DGAQA

Visit of CEO (BC) HAL Bengaluru to HQ, DGAQA

Farewell of Shri Suresh Kumar, Joint Director on his Superannuation

PHOTO GALLERY OF DGAQA

Farewell of Shri Chandraker Bharti on his Promotion as Addtional Secretary (MHA)

Visit of GM OEF Hazratpur to HQ, DGAQA

DGAQA Raising Day Celebration at ORDAQA (GW&M) Hyderabad

PHOTO GALLERY OF DGAQA

DGAQA Raising Day Celebration at AQAW Khamaria

DGAQA Raising Day Celebration at OADG Koraput

DGAQA Raising Day Celebration at OADG (SZ) Bengaluru

PHOTO GALLERY OF DGAQA

मुख्यालय वै. गु. आ. मनि में हिन्दी पखवाड़ा 2022 का समापन समारोह

मुख्यालय वै. गु. आ. मनि में हिन्दी पखवाड़ा 2022 का समापन समारोह

मुख्यालय वै. गु. आ. मनि में हिन्दी पखवाड़ा 2022 का समापन समारोह

Appointments, Promotions and Superannuations during July-Sep 2022

Shri N K Dua, Joint Director (Aircraft) took over charge of Director at HQrs DGAQA on 1st July 2022 and Joined DAQAS Service in August 2001.

Promotions:

Sl. No.	Name of officer	From	To
1	Smt Sarika K	SSO-II, ORDAQA Bengaluru	SSO-I, ORDAQA Bengaluru
2	Shri Thomson George	SSO-II, ORDAQA(A), Kirkee	SSO-I, ORDAQA(A), Kirkee
3	Shri Anshul Kumar Dohre	SSO-II, OADG Nasik	SSO-I, OADG Nasik
4	Shri M Saravanan	SSO-II, MSQAA Hyderabad	SSO-I, MSQAA Hyderabad
5	Shri Srijith R	SSO-II, MSQAA Hyderabad	SSO-I, MSQAA Hyderabad
6	Shri Rajiv Paswan	SSO-II, OAQA Barrackpore	SSO-I, OAQA Barrackpore
7	Shri Venkataramana Kodi	SSO-II, SSQAG Hyderabad	SSO-I, SSQAG Hyderabad
8	Shri Santa Kriti Lahiri	SSO-II, OAQA Barrackpore	SSO-I, OAQA Barrackpore
9	Shri Gokulraj K	SSO-II, ORDAQA Bengaluru	SSO-I, ORDAQA Bengaluru
10	Shri Kuthadi Indrasena	SSO-II, DGAQA Cell HAL Missamari	SSO-I, DGAQA Cell HAL Missamari
11	Shri Subhajit Maitra	SSO-II, MSQAA Hyderabad	SSO-I, MSQAA Hyderabad
12	Shri Appanna Setty Potnuru	SSO-II, SSQAG Hyderabad	SSO-I, SSQAG Hyderabad
13	Shri Ranajit Mohapatra	SSO-II, MSQAA Hyderabad	SSO-I, MSQAA Hyderabad
14	Shri G Vasudeva Vrma	SSO-II, MSQAA Hyderabad	SSO-I, MSQAA Hyderabad
15	Shri Prabhod Kumar D	SSO-II, SSQAG Hyderabad	SSO-I, SSQAG Hyderabad
16	Shri Rajesh Kumar	SSO-II, ORDAQA Kanpur	SSO-I, ORDAQA Kanpur
17	Shri Harish Vijapuri	SSO-II, OADG Nasik	SSO-I, OADG Nasik
18	Shri Pramod Kumar Padhi	SSO-II, ORDAQA Kanpur	SSO-I, ORDAQA Kanpur
19	Shri Hemanta Kumar Panda	SSO-II, Dett. AQAW(A) Dumdum	SSO-I, Dett. AQAW(A) Dumdum

20	Shri Vinayak Mahale	SSO-II, ORDAQA Bengaluru	SSO-I, ORDAQA Bengaluru
21	Mohammed Zulkarnain	SSO-II, HQrs New Delhi	SSO-I, HQrs New Delhi
22	Shri Santosini Behra	SSO-II, ORDAQA Bengaluru	SSO-I, ORDAQA Bengaluru
23	Smt Kusum Lata	SSO-II, ORDAQA Lucknow	SSO-I, ORDAQA Lucknow
24	Shri Meheswar Behera	SSO-II, ORDAQA Lucknow	SSO-I, ORDAQA Lucknow

Superannuations:

Sl. No.	Name of the Officer	Designation and FE/ Unit	Retired on
1	Shri Suresh Kumar	PScO (NFSG), HQrs New Delhi	30 Sep 2022
2	Shri Vijay Kumar	SSO-II, OADG(N&CZ), Lucknow	31 Jul 2022
3	Shri V R Datchnamoorthy	JSO, OADG Nasik	31 Jul 2022
4	Shri S S Salve	Foreman, ORDAQA Kirkee	31 Jul 2022
5	Shri N N Mali	Chargeman, ORDAQA Kirkee	31 Jul 2022
6	Shri S Chitale	Chargeman, AQAW(A), Khamaria	30 Sep 2022
7	Shri Manmohan	Tradesman Skilled Grade, AQAW(A), Khamaria	31 Jul 2022
8	Shri B K Narasimha Murthy	MTS, ALISDA Bengaluru	31 Jul 2022

New Joinings/ Appointments:

Sl. No.	Name	Designation	Date of Joining	Field Establishment
01	Shri Abhishek Jangir	SSO-II	18 Jul 2022	SSQAG Hyderabad
02	Smt Mausami Gupta	Jr Translation Officer	01 Jul 2022	Dett. AQAW(A), Dumdum
03	Smt Rachna Mishra	Jr Translation Officer	14 Jul 2022	ORDAQA, Kirkee Pune
04	Shri Divyanshu Singh	Jr Translation Officer	14 Jul 2022	Dett. AQAW(A), Muradnagar
05	Shri Umesh Kumar Prajapati	Jr Translation Officer	22 Jul 2022	OADG Koraput
06	Smt Khusboo Nidhi	Jr Translation Officer	31 Aug 2022	ORDAQA Ghaziabad
07	Shri Vicky Deswal	MTS (General)	23 Sep 2022	OADG (N&CZ), Lucknow

5 **CERTIFICATION OF INDIGENOUS MILITARY MATERIALS**
Joginder Kumar, Director, PP& FOL, HQrs DGAQA

तकनीकी कामकाज में हिन्दी भाषा का प्रयोग एवम् कठिनाई
विजय मनादुली, सहायक निदेशक (राजभाषा) कार्यालय अपर महानिदेशक (दक्षिण क्षेत्र) 11

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