

ASSIGNMENT 2: IMPLEMENTATION OF REAL- TIME REMOTE TEST WITNESSING AND SURVEILLANCE

TO ACCELERATE THE ISSUANCE OF REGULATORY APPROVALS

Abstract

The following improvements are proposed by utilizing the Information and Communication Tools (ICT):

1. Current process of witnessing the tests (Static & Dynamic) for parts or products manufactured within the Organisation or at the supplier's facilities is based on a physical visit of the Authorised staff to the test facility. Some of these tests, based on the discussions and agreement with the Regulatory bodies (e.g. EASA) or Original Equipment Manufacturers (OEM), can be witnessed remotely in real time with the use of ICT tools. Hence, accelerates the issuance of the regulatory approvals and contributes directly to the financial benefits of the company.
2. The current system of surveillance of the Organisation and other internal audits across different sites are performed by physical presence of the auditors onsite. Some of the audits can be performed remotely in realtime. The remote auditing with the use of ICT tools reduces the travelling time and contributes to the financial benefits of the company.

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Abbreviations

AC	- Advisory Circulars
AI	- Artificial Intelligence
ARP	- Aerospace Recommended Practices
CFR	- Code of Federal Regulations (by FAA)
CS	- Certification Specifications
CVE	- Compliance Verification Engineer
DOA	- Design Organisation Approval
EASA	- European Aviation Safety Agency
HDO	- Head of Organisation
ICT	- Information and Communication Tools
ISM	- Independent System Monitoring
IT	- Information Technology
LoI	- Level of Involvement
OEM	- Original Equipment Manufacturer (e.g. Airbus, Boeing, Bombardier etc)
PS	- Policy Statement
SMS	- Safety Management System
SAE	- Society of Automotive Engineers
STC	- Supplemental Type Certificate
TC	- Type Certificate holder

Introduction

This document is written considering Aircraft industry, but is not limited to. With the unprecedented global challenges in terms of Artificial Intelligence and Technologies, every company has to catch up with these growing demands for financial benefits to sustain. This has triggered many companies to utilise or invest on Information technology tools and infrastructure for many things like, automation, robotics, digitisation, software development, artificial intelligence etc. The situation has led the companies to hunt for automation related continuous improvement opportunities within the organisation. Some of these improvement opportunities covered in this document are as below.

- Proposal for Real time remote participation of witnessing the tests conducted within the company or at the supplier facility, by the authorised staff of the regulatory bodies. This will improve the turnaround time of the issuance of the appropriate approvals from the regulatory bodies
- Proposal for real time remote participation of witnessing the tests by authorised staff of OEMs or third party (e.g. STC holder) for certification activities of a product.
- Proposal for Real time remote participation of witnessing the tests by the company's authorised staff at the subcontractor / supplier test facilities for satisfactory approval of certification.
- Proposal for Remote surveillance or audits of the certification activities by the authorised staff, where it is deemed feasible. Hence, improves the turnaround time with mutual financial benefits.
- Internal audits, e.g. Independent System Monitoring across different sites can be conducted by remotely, where deemed practical. Hence, improves the turnaround time with a great financial benefit.
- External audits eg. AS9100 audits also be performed remotely, where deemed practical. This improves the efficiency with a mutual financial benefit between the auditing body and the company.

Aims & Objectives

Following are the objectives envisaged with the above proposals.

a. Turnaround time improvement

The real time remote witnessing of the tests, remote surveillance and other internal & external audits can improve the turnaround time of the certification documents approval, audit results etc. Hence the issuance of approvals by the authorised staff of the regulatory bodies and the audits could be executed quickly.

b. Improve efficiency

The agreed test witnessing or surveillances activities can improve the efficiency as these activities are carried out remotely with no additional efforts of travelling to the sites. The effort of travelling across different sites is completely eliminated. The travelling time saved can be utilised effectively for other efforts in the business. The fatigue involved in travelling is also eliminated.

c. Financial Benefits

The aim of every company is to make profit and sustain in the market. The remote test witnessing offers a mutual financial benefits creating a win-win situation. A direct financial benefit can be achieved by all the parties involved with the improvements proposed. These benefits are further explained in Conclusion section, of this document.

d. Level of Involvement (EASA, Level of Involvement, n.d.)improvement

With the seamless use of remote witnessing by the regulatory bodies of certain tests, the Design Organisation's performance could improve and the confidence of the regulatory bodies on these test

activities will build up. This could reduce the level of involvement of the regulatory bodies in future, due to the increased confidence level on the organisation and the performance of the organisation could be rated high by the regulatory bodies and hence opens could open up new opportunities or privileges for Organisation's growth. This could lead to test witness delegation to the Organisation staff, than the regulatory bodies themselves. This is not limited to the regulatory bodies, but also to the OEMs where the level of confidence of the OEM is built up slowly and could delegate the witnessing to the Organisation's staff.

e. Improved work life balance

With the implementation of the remote participation in test witnessing, surveillance and auditing, travel and overnight stays could be potentially eliminated. Therefore a better work life balance is maintained.

f. Contribution towards low carbon emissions

Due to the global warming, many countries in the world have committed to contribute towards lowering the carbon emissions. The governments of different countries have taken major steps towards carbon emission reduction. As a resident of the earth, it is each and every individual's responsibility and an obligation to contribute towards lowering the carbon emissions. With the implementation of the remote participation in test witnessing, surveillance and auditing, travel is completely eliminated. This will directly contribute to the Organisation's commitment to low carbon emissions. On a bigger picture, it helps the country's commitment to reduce carbon emissions.

General prerequisites prior to implementing

A number of considerations that should be taken into account before implementing the real time participation of remote test witnessing are to be understood. These could directly impact the outcome or the efficiency of the remote participation in witnessing or surveillance by the regulatory bodies or by the OEMs. If, for any reasons, the remote witnessing does not work when the testing starts, the testing may be postponed in the interest of all parties. Hence, proactive approach in which a dry run of the testing and remote witnessing should be performed beforehand to make sure the system is working.

These are listed below and the list is not exhaustive.

a. Type of test

An initial assessment should be carried out prior to proposing for the real time remote participation of the test witnessing or inspection. Some of the complicated test witnessing like dynamic testing, may not be feasible for witnessing remotely. Simple tests should be proposed for real time participation of remote witnessing. Some inspections involving safety related checks which, when ignored, could result in a catastrophic event on the passenger, will need involvement of the authorised staff in person.

b. Right Infrastructure

Availability of right tools and equipment for the real time remote participation of witnessing or inspection is very important aspect. Right infrastructure, for example, acceptable IT tools, video streaming equipment, compatible systems, cloud management for easy and efficient data transfers, high end digital cameras, high speed uninterrupted internet connections, sufficient cameras capturing the results of the test or inspection, secure systems with a good antivirus, cybersecurity etc, must be in place to perform the remote activities. IT helpdesk should be easily available, for any quick help required.

The infrastructure of the remote witnessing should also support where multiple people across different facilities are involved in remote witnessing. For example, remote witnessing at the supplier facility, where the Company subcontracted and the regulatory body involved or the OEM involved.

An uninterrupted power supply should always be there including a power backup, where needed.

Cloud management is an important aspect for the live video streaming and data storage that is generated or stored across multiple sites. The overall system performance is enhanced with the integration of the advanced video analytics. Refer (Lynn, 2021) where it explains how the cloud integration helps enhance the overall system performance. Recorded videos must be safely stored without any tampering of the results. A backup should always be in place for any unseen events.

c. Cybersecurity (EASA, Cybersecurity, 2021)

Where there is a technology, there is a high degree of threat to the systems involved because of cyber-threats. Since many systems are interconnected through the internet, the system becomes more exposed to the external cyber risks. No information systems in this world are immune to the cyber-attacks or other threats posed by the hackers. Hence, the systems involved in the remote witnessing must be robustly built to overcome these risks.

The systems must be cyber resilient and should deliver the same level of safety continuously at all times even when regular output mechanisms are attacked.

The computer based systems should not be vulnerable to external or internal cyber-attacks.

The potential likelihood of such an occurrence should be assessed well in advance and a proper anti cyber squad should be made available within the organisation.

Where necessary, robust passwords should be used to avoid any easy access to the hackers.

d. Calibration of equipment.

The tools and equipment used for the testing and the ICT tools used for all the applications involved during remote witnessing or inspection must be calibrated at regular intervals. A history of calibration should be maintained and provided to the witnessing staff, if requested.

e. Experience of the Test facility and Personnel

The personnel conducting the test should be trained and experienced for the task that he/she is performing. Any interruptions caused during the testing should be addressed at the quickest. The facility should have been conducting similar tests in the past. Sufficient personnel should be trained for any unforeseen eventualities, where absence of a personnel can be easily handled with a backup.

f. Experience and Training of Personnel

The personnel conducting the test should be trained and experienced for the task that he/she is performing. Any interruptions caused during the testing should be addressed at the quickest. The facility should have been conducting similar tests in the past. Sufficient personnel should be trained for any unforeseen eventualities, where absence of a personnel can be easily handled with a backup.

g. Agreement with the witnessing staff or authority

The organisation handbook should contain the real time remote witnessing approved by the authority. If not, an agreement should be reached with the witnessing authority through an appropriate way, eg. Certification Plan should define the witnessing arrangements.

h. Capability and performance of the Cameras and equipment used

The cameras should have the ability of video and audio streaming, recording, zoom-in & zoom-out capabilities, auto-focusing, high definition videos with high resolution, good pixel, direction of the video viewing, auto adjustment of the camera, a good lighting without artificial backgrounds, ability to interface with the computer systems, etc. No interruptions and no extra brightness or darkness during the witness or inspection for any reasons. The audio and video quality should be uncompromised at any instant. This is not an exhaustive list and is not limited to these characteristics of the cameras and equipment. These equipment must be highly reliable and should not pose any safety or security threats. The cameras must be static and should be kept at a safe distance to avoid unwanted movements of the cameras due to vibrations. The cameras must be able to be moved by the participant, if requested by the witnesser. They should be flexible in movements to allow the witnesser to view effectively at the positions and parts, of his/her choice.

The website (Lynn, 2021) gives a good information regarding the cameras and other interfacing systems used for remote witnessing.

i. Data protection

The systems used for remote witnessing should protect the data that is being shared or recorded. The data must be backed up at regular intervals like daily backups to a different location. Multiple storage systems at different locations should be adopted for backups. In case of a failure of one backup system, the data will still be available in the other.

j. Environmental conditions

The environmental conditions e.g. temperature, pressure variations should not have significant effect on the video streaming and audio or any other effect that could hamper the witnessing remotely.

k. Risk assessment

An initial risk assessment of the test facility, test setup, information technology tools, resources, etc should be prepared prior to the test witnessing proposal.

Background Research

a. Test Witnessing and Surveillance by Regulatory Bodies or third party

Certification (EASA, Certification, n.d.) of a part or product is a very important process in the approval of a part or product for installation on to the aircraft. It primarily involves testing a part designed and manufactured to certification requirements (e.g. CS, CFRs) set by the regulatory bodies or other industry specific standards (e.g. ARPs, SAE). The parts manufactured to the applicable design data (eg. drawings, models, process specifications etc) are subjected to appropriate tests with suitable conditions as per the requirements. The tests conducted in support of the certification involves witnessing by the authorised staff of the regulatory bodies. The test results are then analysed and the compliance documents are prepared in support of the certification.

The test witnessing scenarios are mainly classified into three groups as below.

- Witnessing by the regulatory body for issuance of the approvals.
- Witnessing by the third party (E.g. OEMs, STC holder, TC holder) where the part manufactured is approved by the third party.
- Witnessing of the tests by the company for subcontractor or supplier activities.

In all the three cases, the conditions are no different except that the regulatory body issues the approval certificate, whereas the witnessing by the third party and witnessing of the company authorised staff at the subcontractor facility is for supporting the certification or qualifying the parts.

The scope for real time remote participation of witnessing the tests and inspections became incredibly evident and a necessity during the Covid situation, which took the world through a storm with a technological revolution. Although, the concept of remote participation of witnessing the tests and inspection was being worked out on the background by the regulatory bodies (EASA, Remote Witnessing, 2021), the situation of covid literally accelerated the companies to adopt to the situation. This has also led to the investments of the companies into technology, softwares, equipment, etc and wide variety of other infrastructure to continue the work remotely. Currently we stand in a situation, where companies are overwhelmingly looking for opportunities to use technology for cost reduction due to travel and various other improvement across the business.

Where a particular test is performed repeatedly during the certification and is proposed for real time remote participation of test witnessing, it must be recorded in the company procedures and reviewed and approved by the regulatory bodies.

If the remote witnessing arrangement is with the third party (e.g. OEMs or STC holders), it should be agreed in the certification plan during the initial phase of the project.

The initial project level certification plan that is submitted to the regulatory bodies or to the third party, should contain a section explaining how the remote witnessing will be performed. It is up-to the regulatory bodies or third party, whether to accept the proposal or decline it based on their judgement regarding performance, experience, IT facilities, capability of the test facility etc, level of involvement (EASA, Level of Involvement, n.d.) of the organisation, etc.

In addition to the company defined requirements for certification, following are the details in relation to the real time remote participation in test witnessing, that need to be contained in the project based certification.

I. Test facility capability:

The test facility must have an experience of carrying out such testing without any difficulties in the past. The facility must be fully equipped for carrying out the testing, for which the remote witnessing approval is sought. It should contain all the tools to carry out the real time remote participation for witnessing the test. The Information technology tools used must be ready to interface seamlessly with the IT tools used by the regulatory bodies without any delays in streaming. The audio and video quality must be such that, it should feel close to the onsite witness. As seen feel factor, should be achieved during the remote witnessing. Sufficient number of cameras must be installed to capture all the important areas of the testing. Specification of equipment, like, not limited to, cameras, audio systems, operating system platforms, Cloud system, data transfer method, must all be listed in the certification plan to be submitted. Where necessary, the systems should allow the witnesser to capture pictures. All the tools and equipment should be appropriately calibrated. The calibration reports must be submitted, if requested.

Any new IT tools to be used must be mentioned and an agreement with the witnessing authorities must be obtained prior.

II. Trained and experienced professionals

The personnel carrying out the test must be qualified and experienced. These personnel must be trained to overcome any circumstances of failures in the test including Information technology tools. He or she must be trained to make sure, there is an uninterrupted testing and remote witnessing until the end. Unnecessary interference of the personnel should be avoided in the test witnessing. A clear guidance of speaking only when it is necessary or asked, should be in place.

III. Process of remote witnessing

A brief explanation of how the process of remote witnessing. A step by step approach of the process should be written to help authorised staff acting as the witnesser. This will help both the parties to understand their part in advance.

IV. Limitations, if any

A clear and precise limitations should be listed and defined which will help the witnesser to foresee and make judgements in advance.

b. Internal Test Witnessing and Surveillance

This kind of test witnessing or surveillance is carried out by the company at the subcontractor/suppliers test facilities. In such cases, the supplier should provide all the above explained details of para I to IV about the remote witnessing. A proper working arrangement must be in place with the testing facility for that matter.

c. Remote Internal ISM Audits

There are multiple sites in which the ISM audits are carried to be carried out. These audits are carried out onsite as per the audit schedule across the sites in France and United Kingdom. Where necessary and practical, a remote audit can be performed. In these cases, an agreement with the HDO and the auditor must be agreed. The company approved information and communication tools, as per the company policy, must be used.

Advantages

Following are some of the advantages of adopting the remote witnessing and remote auditing in common.

1. The cost related to international and domestic travel and overnight hotel stay are some of the direct costs related to the onsite witnessing and audits. With the introduction of remote witnessing and auditing, a significant cost saving can be achieved on the travel and hotel arrangements.
2. Efforts, for e.g. booking, exploring stay options etc. due to the onsite travel are completely eliminated which again adds up to the direct benefit to the company in terms of cost.
3. A quick turnaround time for the approval of the certificates. Thus saving time and avoiding unwanted delays.
4. Improves the efficiency by utilising the available IT resources efficiently.
5. Eliminating any rear personal injuries due to accidents (e.g. electrocution, accidents due to oil spillage on the floor) during the testing.
6. Eliminating personal road or air accidents that could occur due to travel.
7. A continuous improvement towards the organisation goals in achieving the cost benefits.
8. Great work life balance because of elimination of travel and overnight hotel stays.
9. Low carbon emissions due to elimination of travel.
10. Reduced insurance premiums due to elimination of incidents.
11. Can effectively contribute towards the safety management system (EASA, SMS, n.d.) of the organisation, where the accidents are avoided.
12. Customer satisfaction due to quick turnaround time of approvals.

Disadvantages

1. High cost involved for investment on the initial setup, infrastructure, equipment, training, IT tools, high definition video and audio equipment, high speed internet connection, internet security systems etc.
2. Cybersecurity is a big threat, as more systems are interconnected and use the internet. This could go as far as to the hacking into the intellectual property, personal data and even bank accounts, if not protected.
3. High difficulty in achieving, as seen condition.
4. Limitations in seeing hidden parts or parts attached with adhesives, on a big assembly.
5. Risk of tampering the results or other settings.
6. If, the remote witnessing does not work when the testing begins, the testing will to be postponed which causes frustration for both the parties and may involve some financial damages and becomes a question on the company's infrastructure.

Limitations

Tests involving safety critical items are to be discussed with the regulatory bodies prior to the plan. It is highly difficult to adopt remote testing, where safety features that lead to catastrophic failure or cause a threat to the passengers on the aircraft. In such cases, the regulatory bodies may retain to visit in person for test witnessing.

High level of dependency on the internet.

The same limitations, as explained above, also affect suppliers who are involved in such testing.

Certification of parts with Novel design features.

Some of the tests that are restricted with remote witnessing are explained in (EASA, Certification Memorandum, 2021).

Conclusion

As explained in the previous sections, there are many advantages related to adopting the remote witnessing of tests, surveillance and remote audits. The rapid advancement in the use of technology impacted the areas where physical presence was involved.

Although the initial investments on the equipment set up is high, but the returns as explained in Advantages section are high.

The benefits of using the remote participation of witnessing a test, or remote surveillance & auditing can become a talk of the town, if implemented effectively.

As described in the Advantages section, there are wide variety of benefits ranging from personal to professional to the organisation to the country and to the globe.

Recommendation

Implement this as soon as possible to incur all the benefits as explained in Aims & Objectives and Advantages section.

A special attention towards cybersecurity is necessary as the systems are interconnected and work based on the internet, which is prone to cyber-attacks.

Constant software updates provided by the company IT services must be implemented.

All the equipment used for remote activities must be calibrated at regular intervals.

The links of the regulatory bodies (EASA, Remote Witnessing, 2021), (FAA, 2020) provided in the References section must be carefully read and implemented to comply with the regulatory requirements.

Artificial Intelligence and robotics could also be integrated by taking a step further in witnessing. For example, movement of the cameras, zoom in & zoom out features controlled by the authorised staff or the auditor without requesting the participant in the test facility. This will enable the authorised staff to view the areas of their interest instantly.

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