Issues of planning, preparing and conducting remote audits in aerospace organizations

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DOI: 10.13111/2066-8201.2022.14.2.11

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Abstract: The article focuses on the issue of selected aspects related to the planning, preparation and implementation processes of remote audits in aerospace organizations. It informs about the definition of remote audit and the main advantages and disadvantages of this type of audit. The author describes the criteria that should be assessed in terms of the decision-making process for conducting remote audits. Emphasis is placed on general criteria, criteria in the information and technology (ICT) area and risk-based criteria. At the same time, the author pays attention to aspects, factors and information that should be taken into account in the process of planning, preparation and performing of remote audits in aerospace organizations (which are generally applicable in these processes, and also in the use of remote audits in other sectors and organizations).

Key Words: audit, remote audit, criteria, processes, ICT, risks, safety

1. INTRODUCTION

Competent National civil aviation authorities/ National Competent Authorities (hereinafter referred to as NCAs only) have been performing audits of design, production, maintenance, training organizations and continuing airworthiness organizations in accordance with relevant European and national aviation legislation.

The pandemic situation resulting from the spread of SARS-CoV-2/ COVID-19 (hereinafter referred to as coronavirus only) and the measures taken by the competent authorities have intervened or may limit the possibility of performing audits in a standard way (by using on – site audits) and audits will also be performed in the form of remote audits.

This form of auditing is also used by European Union Aviation Safety Agency (EASA) in performing its audits of NCAs and recommended by EASA in performing remote audits by NCAs in the aerospace organizations [1], [2].

The performance of remote audits is recommended and relevant guidelines are also developed by major international organizations in the field of standardization and accreditation, such as International Organization for Standardization (ISO) and International Accreditation Forum (IAF) [3].

Remote audits as a form of audit without the physical participation of auditors at the site of design, production, maintenance and training have their risks, but they become a means of

achieving the same audit objectives as if they had been performed in the standard form (with the physical participation of auditors in the audited organization).

This type of audit will be used not only during the coronavirus crisis and the state of emergency in order to prevent the spread of COVID-19, but it will also become an individual long-term form of audit or the form used in combined audits (a combination of standard onsite and remote audit), also with regard to saving time and costs during the preparation and conduct of audits.

2. DEFINITIONS, ADVANTAGES AND DISADVANTAGES OF REMOTE AUDITS

2.1 Definitions

For a common understanding of the terminology, the following audits forms definitions are used in the article:

On-site audit: an audit performed by the auditors being physically present at the audited location. [1]

Remote audit: a real-time method of performing remote audits using electronic methods (such as video conferencing, e-mail and telephone) to obtain audit evidences and assess compliance with the relevant requirements to replace the physical presence of auditors at the audited location (in the audited organizations), which replaces the personal communication between the auditors and the audited organization and should, as far as possible, achieve the same audit objectives (or most objectives) as the on-site audit technique, [1], [3].

2.2 Main advantages of remote audits

The main advantages of remote audits include: [4], [2], and [3]

- reduction of the risk to the health of auditors and audited during a pandemic situation caused by the spread of the coronavirus SARS-CoV-2 causing COVID-19, i.e. ensuring the maximum achievable level of public health protection for members of audit teams and audited organizations,
- time and cost savings during their implementation,
- release of resources at the place of audit,
- minor disruption of working hours at audited organizations,
- promote maximum efficiency by enabling audit teams to work from known locations outside the premises of the audited organizations,
- logistical support is limited to the installation and maintenance of the information and communication technologies (ICT),
- the use of ICT, electronic documents sharing and the use of video conferencing support an agile and faster audit process.

2.3 Main disadvantages of remote audits

The main disadvantages of remote audits include: [4], [2], and [3]

- the risk of performing an audit in the form of a remote audit is primarily a formal deviation from the prescribed documented audit procedures,
- non-complexity of execution/ verification of audited areas, processes and products,
- limited possibility that could render it unsuitable for some applications, inefficient and ineffective way of observing and verifying compliance with the procedures at the workplaces of the audited organization,

- high demands on risk management issue especially when they will applied for new, complicated and critical products and processes,
- risks associated with the security of the use of ICT in remote audits (e.g. ensuring protection when sharing information and documents),
- adoption of appropriate tools and the provision of solutions to technology-related problems,
- requirements for the preparedness of the audit team and the audited organization to implement this form of audit.

3. CRITERIA FOR DETERMINING WHEN IT IS SUITABLE TO USE A REMOTE AUDIT

In terms of deciding when to use remote auditing as a suitable alternative instead of performing an on-site audit, it is appropriate to assess the relevant criteria in the following areas: [1], [5], [6].

- general criteria,
- ICT criteria,
- logistic criteria,
- risk-based criteria.

3.1 General criteria

The main general criteria include in particular the following criteria: [1], [5], [6].

- the use of ICT is sufficiently flexible and non-prescriptive in nature to optimize the conventional audit process,
- adequate controls are defined and in place to avoid abuses that could compromise the integrity of the audit process,
- use of measures to ensure that security and confidentiality are maintained throughout the audit activities (including data protection and intellectual property of the organization),
- defining the soft skills available to the lead auditor (particularly effective communication, work under pressure, time management, flexibility, decisiveness).

The NCA (audit organization) should use an evaluation process to assess the remote audit feasibility - the overall remote audit capability rating as part of the decision-making process on the use of the remote audit.

This process consists of evaluating the three areas (stages of the process) in the relevant capability requirements and assessing the relevant criteria as listed in table 1, [6]. In this regard, it is necessary to assess the appropriateness of the use of remote audits, in particular when initially approving organizations, changing approval conditions and performing continuing oversight.

In the case of initial approval a remote audit is not recommended or partial possible (it is needed to specify the requirements suitable to be checked remotely) with mitigation measures in place.

When conducting an audit to assess significant changes, it is necessary to establish which changes can be audited remotely (in full or in part).

During the implementation of continuing oversight, it is necessary to establish the oversight programme considering the number of remote audits compared to on-site audits, based on the requirements suitable to be checked remotely or/and those which impose an on-site verification [1].

1 st area (process step): Assess Eligibility to perform a remote audit (rather than on-site audit)			
Capability requirement: Audit cannot be performed on-site			
No.	Eligibility criteria (selected examples)	Rating of criteria True or False?	
1.1	Travel to a specific location is not possible (i.e., for health or safety reasons, authority imposed travel restrictions)	?	
1.2	An activity or activities planned for the on-site audit could not be completed and extending the on-site assessment is not the best resolution/option.	?	
1.3	The audit can be conducted on-site or the audit can be conducted partially on-site at least for the important elements, e.g. processing of hardware, witness of inspection steps	?	
1.4	This is not an initial or qualification audit, initial assessment of a new tool, process, product or it performs an initial assessment of a new facility.	?	
1.5	The auditee currently holds a valid Approval from NCAs (DOA, POA a. o.)	?	
1.6	There is a history of non-compliance at the location being audited	?	
1.7	An activity (ies) planned for the previous on-site audit could not be completed in the allocated time and extending the on-site audit was not the best solution	?	
1.8	There are no known blocking points regarding technical data restriction, restricted auditor, confidentiality, data security, software restriction etc.	?	
	2 nd area (process step): Assess Capability		
Capability requirement: Auditee has the ability to support a remote audit			
No.	Eligibility criteria (selected examples)	Rating of criteria True or False?	
2.1	The criticality level of the product safety is high e.g., critical parts	?	
2.2	The auditee is not yet able to accept a remote or partial remote audit from the security points of view	?	
2.3	The product and/or the manufacturing and inspection processes are complex or not mature	?	
2.4	The organization does not have technical capability to support a remote audit	?	
2.5	The auditee does not have the capability to share documents, records or other information using the ICT and has to transmit the information to the audit team	?	
	3 rd area (process step): Assess Operational Status		
Capability requirement: The operational status of the auditee support the performing of an audit for the required scope			
No.	Eligibility criteria (selected examples)	Rating of criteria True or False?	
3.1	The auditee is not functioning sufficiently to support the audit	?	
3.2	The auditee has no ability to provide records, data, other evidence, available for review at any site, despite where the work is being performed	?	
I	performed		

2.2		â
3.3	There is no confirmation from the auditor and auditee that the audit	?
	objectives can be achieved by remote technologies based on feasibility	
	study, including the risk assessment and defined mitigation measures	
3.4	No signed agreement exists allowing the use of remote audits or	?
	product acceptance	
3.5	Auditors are not trained on the virtual audit process, especially on the	?
	use of the tools	
3.6	The number of sites to be assessed creates difficulties to physically	?
	complete all audits within an established timeframe	

3.2 ICT criteria

The main criteria in the ICT area include in particular the following criteria: [1], [6]

- ability to understand and use the ICT tools to achieve the required audit results by the auditors (including the technical experts involved) and the auditees,
- identification of the audit hosting video platform/online conferencing system (for example Google Meet, GoToMeeting, WebEx, Microsoft Lync, Microsoft TEAMS, etc.) Remark: If the auditing organization has its own online conferencing system which it would rather use, such as above-mentioned systems, then it can use this platform [7]
- assessment of documents and records by means of remote access, in real-time,
- ability of clear communication between the and the auditee,
- need for multiple cameras, imaging systems, or microphones and whether the person performing the verification can switch between them, or direct them to be switched and has the possibility to stop the process, ask a question, move equipment, etc.;
- recording, in real-time during the audit of objective evidence to document the results of the audit (nonconformities) by means of exchange of emails or documents, instant pictures, video or/and audio recordings,
- visual (livestream video) and audio access to facilities, workplaces, stores, equipment, tools, processes, operations, etc.,
- continually evaluate technology for potential future implementation (advanced technology),
- requirements for elements of the equipment:

Computers:

- ✓ Includes laptops, desktops, tablets and smart phones capable of establishing an online meeting with appropriate screen size
- \checkmark They must be capable of video and screen sharing
- \checkmark Several monitors are recommended in order to ease comparison

Camera & Video:

- ✓ The suitability of video resolution, fidelity, and field of view for the verification being conducted
- ✓ The controllability of viewing direction, zoom, and lighting
- ✓ Cameras can be standalone or a part of equipment such as a computer or smartphone
- ✓ Cameras as part of computer/smart phone or standalone cameras must be capable of transmitting live images to the auditor via meeting or virtual presence software with suitable video resolution, fidelity, and field of view for the verification being conducted by the auditors

Remark: Pixilated images can make the audit ineffective and make defect identification impossible

- ✓ Camera stabilization should be evaluated and addressed as necessary. Audio[•]
- ✓ Facilitate two-way communication/conversation with the ability to communicate in noisy areas
- ✓ Recommend using noise-canceling speakers and/or headsets as appropriate
- ✓ Use of Bluetooth speakers and headsets during audits and product acceptance allows use of tools, equipment, and ability to articulate product so all features can be displayed.

3.3 Logistic criteria

The main criteria in the logistic area include in particular the following criteria: [1], [6], [7]

- travel to a specific location is not reasonable or possible for health and safety reasons, authority imposed travel restrictions, etc. (see table 1, point 1.1),
- there are unavoidable changes in scheduling for the lead auditor or members of audit team (i.e., personal issues, change in business priorities, etc.),
- the number of sites/locations to be assessed is difficult to be completely visited during an
 oversight cycle or there are multiple locations with similar activity (e.g. line stations of
 maintenance organization) and a risk assessment was performed to establish mitigation
 measures and the level of risk was classified as low if some sites will be audited remotely.

3.4 Risk-based criteria

Risk is the effect of uncertainty [8] and any such uncertainty can have positive or negative effects. It is therefore important that auditors, especially in the preparation and conduct of remote audits, pay attention to the issue of risk assessment and the application of risk-based thinking.

In terms of implementing risk-based thinking (RBT) and auditing needs, RBT can be divided into artifacts/ areas (Fig. 1) and defined as: [9]

- risk-based problem solving,
- risk-based decision making.

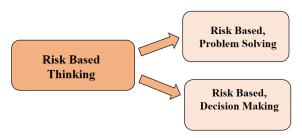


Fig. 1 - Risk Based Thinking artifacts [9]

"Risk-based auditing" offers a new, proactive form of evaluating an organization. The auditing team must identify the outputs of the process management monitoring, but in addition, the auditors are looking for critical activities, functions or mandatory requirements [10].

The main risk-based criteria include in particular the following criteria:

- Performance of the organization in compliance,
- Safety priorities, safety culture and safety performance of the organization,

- Risk profile of the organization,
- Assessment of the associated risks.

3.4.1 Performance of the organization in compliance

This criteria reflects how well the organization fulfils its duties and obligations [11]. The audit of the organization performance is based on the audit of key processes and requirements by assessing the relevant indicators that characterize the compliance. The compliance is generally defined as adherence to policies, plans, procedures, regulations, contracts and requirements, [12-modified].

The indicators that might be used to evaluate the performance of the organization are the number of findings (in absolute numbers or adjusted for the duration of the inspection or the number of inspections), their severity, effectiveness and timeliness of corrective measures. The dynamic evolution of these indicators should also be considered [11].

The compliance monitoring serves to proactively protect the organizations from risks and noncompliance by identifying the gaps and issues within the compliance management function [10]. With regard to the issue of compliance, it should be emphasized that compliance should be part of the culture in the organization, not an individual organization part (section, department, division, etc.).

From the point of view of the decision to conduct remote audits, it is appropriate for auditors to know and assess the level of five functions in the covered compliance program within an audited organization: [13]

- identification detecting and defining the risks that an organization faces and building the program on these,
- prevention the design and implementation of controls to protect an organization from the risks. In this regards it is essential to map the processes that are followed within the organization.
- monitoring and detection establishing a systematic observation of controls and being able to report on their effectiveness,
- resolution the organization's reaction to any difficulty that has surfaced, either through the detection of a breach in the controls or through other escalation means,
- consultancy or advice compliance's constant advice and presence in the organization, including consultations with NCAs.

3.4.2 Safety priorities, safety culture and safety performance of the organization

The aerospace organizations have been implemented a Safety management system (SMS) consistent with ICAO Annex 19.

This standard addresses the implementation of the four components and twelve elements of SMS [14] within organizations undertaking design, manufacturing or maintenance responsibilities and activities or both as approved organizations (holding an organizations approval, e.g. DOA, POA, AMO/MOA) and other organizations (holding a certificate for design or manufacturing or both) [15].

The importance of the safety management is highlighted in the basic regulation (EU) 2018/1139 of the European Parliament and of the Council on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, which states that "application of sound safety management principles is essential for continuous improvement of civil aviation safety in the Union, anticipating emerging safety risks, and making best use of limited technical resources" [16].

Safety priorities should be included in the organization's safety policy. Establishing and fostering a safety culture of organization as a set of enduring values, behaviors and attitudes regarding safety management, shared by every member at every level of an organization [15], is a very important part of the improvement of the safety performance of organization.

ICAO Annex 19 defines the safety performance as a service provider's safety achievement as defined by its safety performance targets and safety performance indicators. [14] Safety performance indicators (SPIs) are a data-based safety parameter used for monitoring and assessing the safety performance.

From the point of view of the decision-making process concerning the remote audits performing, it is very important that the auditors take into account the level of SPIs processing, their practical use and evaluation in the audited organization. In this regards, they should also take into account the size of the organization, the complexity of its activities, the specifics of processes and products as well as specifics and professional level of defined SPIs divided into the following categories: [17], [18]

- Indicators for systemic issues in compliance area,
- Indicators for operational issues,
- Indicators for monitoring external factors.

3.4.3 Risk profile of the organization

The risk profile is defined as the description of the set of risks that can relate to the organization [9]. Each organization has its own unique risk profile, based on the assets it wants to protect, the goals it wants to achieve, its ability to handle risks and its willingness to do so [19].

A risk profile considers generally the following factors: [19- modified]

- the nature of the risk faced by an organization while operating and working for its objectives,
- the degree to which those risks could adversely impact the organization,
- the likelihood that those risks will have an impact on the organization,
- the type of disruptions that could occur if those risks impact the organization,
- the costs associated with each type of risk, and
- the controls that the organization has in place to manage or mitigate the identified risks that face the organization.

From the auditing point of view, the organization risk and performance profile is based on: [11].

• The Intrinsic Organization Risk Profile includes the elements of risk inherent to the nature and complexity of the organization.

Those elements include, for example, the scope of approval, the number of staff, the stability of the organization or the use of organization privileges given by EASA or NCA.

• The organization Performance Risk Profile includes elements related to regulatory compliance and mitigation of risks as part of safety management. Those elements include, for example, the result of audits/inspections, the severity of findings, the stability of the organization or the compliance history.

3.4.4 Assessment of the associated risks

In terms of associated risk assessment, there may be a significant range of risks in organizations such as strategic risk, compliance risk, operational risk (technical risk, process risk, human factor, etc.), financial risk, etc. However, it is also important to take into account the concept of "auditing based on risks" to be applied from the preparation and audit program

planning. Especially the planning changes of audits require a risk assessment associated with the creation, implementation, monitoring and reviewing of the audit program, which may affect the achievement of the audit objective [10].

4. REMOTE AUDIT PLANNING AND PREPARATION PROCESS

In the case of a positive decision to perform a remote audit, in terms of planning and preparation of this type of audit, it is necessary to take into account the key factors and aspects that make up the framework of remote audit.

4.1 Key factors and aspects to consider when planning and preparing a remote audit

When planning and preparing a remote audit, it is necessary to define and take into account: [1], [2], [6]

- a remote audit plan with predefined records and documentation to be available during the audit, the required scope of the audit, including the determination of remote ICT and scope of their using for audit purposes, in order to optimize their efficiency and effectiveness while maintaining integrity of audit process,
- a list of activities, areas, information and personnel of the organization involved in the remote audit,
- a list of requirements to be verified,
- time frame for performing the remote audit (with the determination of the number of hours per day and the number of audit days; the recommended time frame is usually 4-6 hours per day for a maximum of 3 days) [1],
- a plan for checking information that cannot be shared remotely (for reasons of confidentiality or access issues). It should be defined or expressed how this will be handled (i.e. follow up on-site audit, issue of non-compliance, etc.),
- the communication tool to be used and the time of its testing, if this tool is used for the first time,
- the ability to understand and use the ICT tools used to achieve the required audit/ evaluation results by auditors and other audit participants (e.g. technical experts),
- the risks and possibilities of the ICT used and the impacts that may have on the validity and objectivity of the information collected.

4.2 Obtaining selected information from the audited organization in connection with the planning and preparation of the remote audit

Prior to planning and preparing the audit, the lead auditor will receive answers from the audited organization by sending a request / questionnaire in particular on the following questions related to the issue of electronic document sharing and videoconferencing: [2]

- What are your current working times?
- Is your organization equipped with a meeting room allowing videoconferences?
- Is it possible to connect from the room to the organization's intranet/ IT system (if the organization uses it) and share documents and records from it during the audit?
- What platforms does the organization use / prefer to conduct video conferencing?
- In which areas / processes are electronic records and documents available?
- Are there measures currently in force within the organization that may affect the conduct of videoconferences, such as mandatory teleworking, restricted number of persons in a meeting room, etc.?

4.3 Agreement of lead auditor with audited organization in remote audit planning

When planning a remote audit, make sure that the lead auditor agrees with the audited organization (in the written statement), particularly in the following areas:[1], [2], [6]

- identification of the audit hosting platform/type of video conference,
- pre-audit compatibility testing of the platform between the audit organization and the audited organization,
- consider the use of webcams, multiple cameras, microphones and other devices when a physical evaluation of the product, component, process and the possibility to switch between them and their directions is needed (including taking pictures/videos and screen shots), as well as the possibility to stop the process, ask a question, relocate the device, etc.,
- ensuring uninterrupted real time communication between the audit team and personnel of the audited organization located in a place other than the conference / meeting room (e.g. in production and storage areas, etc.),
- to define the agenda that may require different provisions than an on-site audit
- approval of audit plan that identifies how ICT will be used and the extent to which they will be used for audit purposes, in order to optimize their effectiveness and efficiency while maintaining the integrity of the audit process,

Depending on the scope of the control activities and the specifics of the audited organization and the audited processes, products and procedures, the plan may specify an audit period of several days to three to four weeks, including the request for the necessary documents, records and information, time for their assessment, frequency and duration of videoconferences.

- confirmation and management of reasonable and mutually acceptable call / connection times,
- a documented statement by the audited organization that it ensures full cooperation and the provision of up-to-date and valid data as required by the auditors, including, where necessary, the provision of cooperation by suppliers or subcontractors,
- all legal and other requirements related to confidentiality, security and data protection.

4.4 Preparation of the audit team for remote audit

1. In cooperation with the members of the audit team, the lead auditor prepares, a draft of notification concerning the audit performing, which is sent in writing to the audited organization.

The audit notification usually contains the following areas: [1], [2], [6]

- an introductory part containing information on the type of audit (inspection) with reference to the relevant legislation and an indication that, due to the obligation to comply with the epidemic measures related to the spread of SARS-COV-2, auditing organization will perform the audit in the form of remote audit,
- an indication of the documents, records and information required from the audited organization for the assessment, indicating their specification and assigning serial numbers (to facilitate their identification by electronic transmission),
- address (addresses) and time for delivering of the requested documents and information,
- reference to an agreed and tested communication platform for conducting video conference(s),
- remote audit plan, with emphasis on the timing of the planned videoconferences (considering the need of videoconference during the opening and final meetings)

Remark: During the remote audit, unscheduled videoconferences may be held to interview the relevant employees of the audited organization and to consult the findings

- (contact details of the lead auditor and / or the relevant auditors.
- 2. Video conference room and communication platform preparation The main tasks and activities in this area include: [1], [2], [6]
- provision of a video conference room for the audit team members and participants on the premises of the auditing organization,
- identification of the auditing organization employee responsible for the technical side of providing videoconferencing (electronic communication) and solving possible technical problems during the audit (if it is necessary),
- internal verification of the functionality of ICT and the agreed communication platform for videoconferencing with the audited organization in the given room,
- a preliminary meeting of the audit team members in the video conferencing room for the purpose of instructing in the operation of the communication platform, including recording the course of the remote audit,
- performing testing of the agreed communication platform with the audited organization.

5. REMOTE AUDIT PERFORMING PROCESS

The main activities of the audit team during the performance of the remote audit include: [2], [6]

- monitoring the sending of the requested documents, records and information within the set deadline,
- assessing the obtained required documents, records and information; if necessary, request additional / explanatory information (by e-mail, telephone call or video conference),
- conducting scheduled video conferences. *Remark:*^{1/} *An introductory meeting via videoconference may not be required or its time can he minimized in the area of multiple experimential which have a long term design*

be minimized in the case of audited organizations which have a long-term design, manufacturing, maintenance and training approvals, for which there is a high level of confidence in the organization's quality system and safety culture.

²⁷ In the case of audited organizations that have been received approval for production, maintenance and training in the last two years ,organizations that have changed accountable managers and organizations with a low level of confidence in the organization's quality system and safety culture, it is recommended to carry out, an full scale introductory meeting in the form of a video conference, as a part of the remote audit.

- formulation of findings, their justification with reference to aviation legislation and regulatory requirements and proposal of their levels classifications,
- holding a final meeting with representatives of the audited organization via videoconference (with the participation of its accountable manager) in order to acquaint the audited organization with the results of the audit and discuss and agree the formulation of findings, preliminary timetable for corrective actions (delivery the corrective action plan) and any other necessary activities,
- forwarding the draft audit report containing the formulated findings, their rationale and levels of classification for approval to the responsible auditing organization manager and ensuring its submission after approval to the audited organization.

6. CONCLUSIONS

Remote auditing is one of the audit methods. The current COVID-19 pandemic situation has led to the wider use of remote audits in aerospace organizations by the relevant oversight authorities as well as in other industrial sectors, in the case of certification and oversight processes in organizations according to the relevant regulation and quality management systems requirements (including their using as part of internal audits) and their application in other areas. However, regardless of this fact, remote audits become a permanent type of audits methods or part of combined audits (a combination of standard on-site audit and remote audit).

New information and communication technologies (ICT) have made remote auditing more feasible. However, during remote audit planning, preparation and performing, due attention must be paid to the requirements for the correct application of ICT, as well as to the assessment and application of other general criteria and both logistic and risk - based criteria.

The author's aim was to inform about the issue of remote audits, describe the advantages and disadvantages of this type of audits and relevant criteria for determining when it is suitable to use remote audits and highlight selected aspects and activities concerning the process of planning, preparing and performing the remote audits.

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