EUROPEAN DEFENCE AGENCY

EMAR 147 & EMAR 66 Implementation Guide for National Military Airworthiness Authorities

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The status of the document can take 3 values:

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EDITION

The Edition Number will take the following format: **Edition X.YY**:

The **value of X** will change after a **major** revision of the document.

The **value of Y** will change after a **minor** revision of the document.

NOTE

The Forms referred to in this document can be found in the EMAR Forms document.

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1. Scope

This EMAR 147 & EMAR 66 Implementation guide presents some highlights on how a NMAA can implement the sections B of EMAR 147 & EMAR 66 and therefore provides additional guidance on how to carry out EMAR 147 & EMAR 66 NMAA activities in order to develop the associated procedures for the national implementation of the EMAR 147 & EMAR 66.

The content of the present Guide is limited to general principles that highlight the Key functions:

- of the EMAR 147 initial approval and continuing oversight activities performed by a NMAA;
- of the EMAR 66 licensing activities performed by a NMAA.

Overarching topics not specific to EMAR 147 & EMAR 66 activities (e.g. creation of a NMAA with associated privileges, responsibilities, obligations, appeal process, recognition activities,…) will be addressed at a higher and generic level. Therefore, these topics will not be further developed in the present guide.

2. General considerations

2.1. Prerequisites

2.1.1. Regulation

The EMAR 147 & EMAR 66 should be nationally adopted.

2.1.2. NMAA empowerment

The authority and delegation of the NMAA within the existing national structure should be addressed.

In order to implement EMAR 147 & EMAR 66, a NMAA should be appropriately empowered to conduct the following activities:

- Issuance of EMAR 147 approvals including continuing oversight;
- Issuance of EMAR 66 licences (Line/Base maintenance);
- EMAR 147 enforcement actions (e.g. limitation, suspension, revocation of approvals);
- EMAR 66 enforcement actions (e.g. revocation, suspension or limitation of a MAML).

2.1.3. NMAA procedures

The NMAA should have clearly articulated procedures for:

- The issue of initial approvals;
- The continuing oversight of approvals;
- The issue of licences;
- The training of its personnel.

It is considered good practice to include organisational charts at both the higher level and the detailed organisational.

It is also important that all the NMAA personnel have clear terms of reference which identifies their accountabilities and responsibilities for their post.

It is considered good practice that a NMAA has a quality system to ensure compliance with EMAR 147 & EMAR 66 Sections B requirements and NMAA's internal procedures.

2.1.4. Resources

The number of the NMAA personnel should be appropriate to carry out the required assessments to perform all the EMAR 147 approval/oversight & EMAR 66 licensing activities. This number should be proportional to the number of Maintenance Training Organisations (MTOs) to be EMAR 147 approved and the amount of EMAR 66 licences to be issued.

NMAA personnel should be competent by being appropriately qualified and having all the necessary knowledge, experience and training to perform their allocated tasks. Considerations should be given to prevent loss of competence due to the NMAA personnel turn over.

Depending on their function, NMAA personnel should have received initial and continuation training on the EMAR 147 & EMAR 66 requirements, on the auditing techniques and specialized training (e.g. IT licensing system, etc.). This should also include a general understanding of the other EMAR requirements and relevant NMAA procedures.

2.2. Basic assumptions

It is assumed that the implementation of EMAR 147 & EMAR 66 is integrated in a holistic EMAR framework environment. In such environment, the issuance of EMAR 66 licences is a prerequisite for the issuance of EMAR 145 approvals (Base/Line maintenance).

When a NMAA chooses to implement EMAR 147 it should also be the case for the other EMARs because they are all interlinked:

- EMAR 21: as the approved maintenance data used by an EMAR 147 MTO for Type Training originate from the Initial/Continued Airworthiness activities (e.g. Type certificate,...);
- EMAR 66: as the Basic and type Training syllabus are contained in EMAR 66;
- EMAR 145: as the EMAR 147 MTO may contract the practical Type Training to an EMAR 145 MO.

Therefore, to get benefits from this holistic EMAR framework environment and to ensure a global consistency, a NMAA should:

- Request the application of EMAR approvals to all concerned organisations that provide Initial/Continued and/or Continuing Airworthiness services related to the MTO’s scope of work, regardless whether these organisations are military or civil;
- Avoid, as far as practicable, mixing different Airworthiness Regulatory systems (e.g. PART, EMAR, legacy regulations,...).

2.3. Implementation strategy considerations

The NMAA should plan the EMAR 147 & EMAR 66 implementation based on the:

- Scope of the MTOs to be EMAR 147 approved (e.g. military and civil MTOs, national and/or foreign);
- Constraints for EMAR 147 implementation (e.g. time line, resources);
- Training needs;
- Prioritization of the MTOs to be EMAR 147 approved;
- Amount and scope of the MOs to be EMAR 145 approved (for the EMAR 66 licences to be delivered for the certification of aircraft maintenance);
- Constraints for EMAR 66 implementation (e.g. in accordance with the time line for the EMAR 145 approvals to be delivered, resources).

2.3.1. Transition considerations

NMAAs should determine a transition period to migrate from their national current MTO system towards the EMAR 147 environment as well as for the migration of their current national qualification system towards the EMAR 66 licences. During this period transitional measures should be determined to ease this change:

- Transition period should be dependent on:
  - number and scope of MTOs to be approved;
  - number and scope of MOs to be approved (to estimate the amount of EMAR 66 licences to be delivered);
  - number of available resources (possible utilization of contracted resources to increase rate of assessment);
  - desired time for completion.
- Action to be taken if EMAR 147 implementation exceeds desired deadline;
- Action to be taken if EMAR 66 implementation exceeds desired EMAR 66 implementation deadline;
- Approach to concurrent management of approved and non-approved organisations;
- Approach to concurrent management of EMAR 66 licenced and non-licenced personnel;
- Prioritization within EMAR approvals to be delivered (e.g. 145 vs M vs 147) and EMAR 66 licences to be issued.

2.3.2. Industry specificities with regards EMAR 66 licences

NMAAs should take into consideration the civil industry specificities when implementing the EMAR 66 (e.g.:

- Reuse of PART 66 licences to issue EMAR 66 licences:
  - PART 66 licences can be recognized (fully or partially) to issue EMAR 66 licences;
  - PART 66 Basic Training and/or Type Training and/or maintenance experience on civil aircraft can be recognized (fully or partially) to satisfy respective EMAR 66 requirements;
- For cases where maintenance personnel have both PART & EMAR 66 licences, NMAAs can establish relations/exchanges with the CAAs to share information for their mutual benefit (also applicable for the initial issuance of the EMAR 66 licence).

2.3.3. Civil specificities with regards EMAR 147 approvals

NMAAs should take into consideration the civil specificities when implementing the EMAR 147 (e.g.:

- Reuse of PART 147 approval to issue EMAR 147 approval:
  - EMAR 147 MTOE with references to the PART 147 MTOE (the PART 147 MTOE approved by the CAA does not guaranty that the NMAA will accept the civil procedures for the EMAR 147 MTOE);
  - Acceptance of Form 4 holders (reduced extent of the interviews).
- Location (maintenance training on/off government property, across foreign sites).

For cases where MTOs have both PART & EMAR 147 approvals, NMAAs can establish relations/exchanges with the CAAs to share information/resources for their mutual benefit (e.g. audit reports, joint audits).

Usually EMAR 147 approvals are required of civil through contracts by national procurement agencies. Possible conflicts between contractual requirements and EMAR 147 requirements could be faced. In such cases, the NMAA should only be responsible for the EMAR 147 requirements and not for the contractual ones and the EMAR 147 requirements shall be satisfied despite of any other contractual agreement.

In addition, the NMAA could advise any procurement agency responsible for EMAR 147 related contracts.

2.4. Alternative acceptable means of compliance

In addition to the existing EMAR 147 & EMAR 66 AMC & GM, a NMAA may consider to define other criteria for specific topics (e.g. qualification criteria for training staff, grandfather rule criteria, etc.).

Examples of other acceptable means of compliance can be found on the EASA web site (e.g. foreign PART 147 training organisations, etc.).

2.4.1. Acceptance policy

When a training originates from a non EMAR approved MTO (e.g. US or CA environment, etc.) the NMAA should establish an acceptance policy on how to accept these training. (e.g. US training certificate, etc.).

2.4.2. Reuse of external artefacts

A NMAA could decide to reuse artefacts (e.g. 147 approvals, 66 licences, etc.) issued by other authorities/organisations (e.g. NMAAs, CAAs, MTOs,…).
The reuse of these artefacts presumes that appropriate recognition and/or arrangements have been established.

In the case of reuse of an EMAR 147 approval or EMAR 66 licences issued by another NMAA, particular attention should be given to the possible differences and peculiarities between the national EMAR 147 approval or EMAR 66 licences approaches (e.g. type/model of aircraft, training syllabus, maintenance data, etc.).

The present guide does not address these recognitions and/or arrangements given that these activities are subject to specific documents (e.g. EMAD R and MARQS for NMAAs).

In order to ease the reuse of artefacts, it is considered as good practice that an English and/or bilingual version of the MTOE can be provided since some NMAAs will have this as a national requirement for foreign MTOs and this may facilitate mutual interactions.

2.5. Contracting of NMAA activities

A NMAA may consider contracting part of its activities to a competent entity (e.g. audits, licensing, training, personnel, etc.). In any case, the NMAA remains responsible for the outputs of the contracted activities (e.g. recommendation issued to NMAA). Such contracted activities should be documented by the NMAA.

3. EMAR 147 approval and audits

3.1. General

The scope of this chapter is to enable an NMAA to process EMAR 147 approval applications and allocate internal / external resources as necessary to carry out the MTO audit and issuance of an EMAR 147 approval following a satisfactory recommendation.

This chapter describes how a NMAA could handle the approval of EMAR 147 MTOs.

The approval shall be delivered in accordance with the requirements of EMAR 147 Section A and Section B.

Rights and obligations from applicable national regulations and arrangements (e.g. Bilateral/ Multilateral arrangements for Mutual Recognition) should be taken into account.

3.2. Initial approval

3.2.1. Application

A new application for an EMAR 147 approval shall be made in accordance with Section A of EMAR 147 by using the EMAR Form 12. This application form shall be sent directly to the NMAA.

The NMAA should acknowledge receipt of the application. The NMAA should check the application and its eligibility. When incorrect or incomplete information is supplied, the NMAA should notify the MTO as soon as possible detailing the omissions and errors. In case of refusal of an application, the NMAA should notify this decision in writing to the MTO together with the reasons thereto.

An initial application package should include:

- The EMAR Form 12;
- The EMAR Forms 4;
- The MTOE (including related procedures/documents);
- Any additional document requested by the NMAA (e.g. samples of training material and courses, samples of examination questions, EMAR 66 training syllabus, etc.).

3.2.2. Audit team

The NMAA should nominate an audit team made up of a lead auditor/auditor to carry out the audit process.

The MTO should be informed in writing about the allocated audit team by the NMAA. This writing should also specify the contact details of the NMAA (e.g. PoC).

The composition of the audit team (e.g. number, experience, skills) should be appropriate and based on the following criteria:

- Complexity of the MTO (e.g. scope of approval, contracting of practical training, etc.);
- Number and location of sites to be audited;
- Size of the MTO;
- Any additional reason deemed necessary by the NMAA and justified by a specific situation.

It is considered as good practice to have a minimum of two auditors in the team and a number of audit trainees lower than the number of auditors.

3.2.3. Audit process

a. On desk Review

EMAR Form 12:

The audit team should ensure that the application package is consistent with the EMAR Form 12 (e.g. scope of work, locations, contract).

MTOE:

The audit team reviews the MTOE (including EMAR 66 training syllabus, associated list(s) and procedure(s) as applicable) to ensure full compliance with the applicable requirements and the relevant NMAA instructions. For this review, the audit team should refer to the expected content of the MTOE, detailed in the Appendix I to AMC to EMAR 147.

The audit team should assess:

- the qualification and experience of instructors, knowledge examiners and practical assessors as regards standards contained in the chapter 5.4 of the present guide;
- a sample of Multiple Choice Questions (MCQ) and Essay Questions (EQ).

The NMAA should request the MTO to provide:

- For any Basic & Type Training (both theoretical & practical):
  - Course approval Form (§ 5.1 refers) that describes the complete syllabus (topics/training duration/number of MCQ and/or EQ,..) for each category of licence.
- For Theoretical Basic Training:
  - 10% of the data bank questions, per module;
  - The summary of each training material;
  - The complete training material for at least 2 modules.
- For Theoretical Type Training:
  - 10% of the data bank questions, per category of licence;
  - The complete training material for the “Airframe”, “Avionics” and “Powerplant” topics (ATA chapters).
- For Practical Training:
  - A summary of tasks to be performed;
  - At least an assessment model.

Note:

It is important that the choice of the samples provided to the NMAA is not made by the MTO but selected by the audit team. This choice shall be consistent with the scope of work of the MTO and should cover it, as wide as possible.

When the proposed MTOE is not acceptable (i.e. procedures or required information not available, not compliant with EMAR 147 requirements and NMAA instructions) and therefore could not be reviewed, the lead auditor should formally notify the MTO of the findings (e.g. MTOE audit report). If after several exchanges, should the MTO still fail to provide acceptable documents (MTOE, EMAR 66 training syllabus, associated lists, procedures, etc.), the NMAA should determine the most appropriate actions including termination of the application.

EMAR Form 4:
The audit team verifies the compliance of each management personnel (EMAR Form 4 holders) with the applicable requirements by using the relevant instructions as reference material.

b. Internal audit report from the MTO’s quality system

It is strongly recommended that the internal quality system of the applicant MTO conduct preliminary audits to ensure the MTO compliance with the applicable EMAR 147 requirements. Any finding raised during such internal audits should have been closed with appropriate corrective actions before applying to the NMAA for an EMAR 147 approval.

c. Audit preparation

After receipt of the application package and the internal quality system audit report (if requested by the NMAA) and they are deemed acceptable, the lead auditor may initiate the on-site audit in accordance with Section B of EMAR 147, associated Acceptable Means of Compliance (AMC) & Guidance Material (GM) and relevant NMAA procedures.

The NMAA should request that the MTO provide any necessary administrative support for the audit.

The lead auditor should:

- Liaise with the MTO for scheduling the audit;
- Prepare and notify the MTO of the audit programme.

Note:

The NMAA shall be informed by the MTO of any modification to the initial application (revised EMAR Form 12), before the audit takes place.

d. On-site audit

The on-site audit should start with an opening meeting with the MTO's management and when possible with the Accountable Manager. The following points should be considered when carrying out this meeting:

- Introduction of the audit team;
- Clarification/confirmation of practical details (e.g. confidentiality, local rules, availability of resources requested by the audit team);
- Confirmation of the audit schedule including objectives and scope of the audit;
- Confirmation of the required interviews/availability of the personnel involved in the EMAR 147 process;
- Explanation of the audit methodology (e.g. classification and reporting of findings, sampling within all applicable EMAR 147 & EMAR 66 requirements);
- Confirmation of the applicable EMAR requirements;
- Any interaction with the quality system of the MTO (e.g. daily debriefing, follow up of the audit by quality personnel, etc.).

The Accountable Manager and all EMAR Form 4 holders should be met and interviewed by the audit team during the audit. As an example, the question set used by the FR MAA (DSAÉ) for Accountable Manager and Form 4 holders can be found in Annex 1.

The audit team should review the audit findings and evidences collected against the current/intended scope of work, agree on findings levels and corrective action time scales and prepare the audit conclusions for presentation to the MTO. When a level 1 finding is suspected, it is strongly recommended that the lead auditor consults with the NMAA management level before informing the MTO.

The audit team should attend a simulation of a theoretical training course and a simulation of an examination or a practical assessment.

It is considered good practice to debrief the quality manager of the findings and conclusions of the audit in order to ensure there are no misunderstandings and that they are accepted by the quality manager of the MTO before the closing meeting. It gives the quality manager the opportunity to discuss any non-compliance and timeframes.

A closing meeting chaired by the lead auditor should be held to present a summary of the audit findings and the conclusions to the MTO's management, and when possible with the Accountable Manager, in order to ensure that they are understood and accepted.

The audit report (e.g. EMAR Form 22) should be sent by the NMAA to the MTO. As an example, the EMAR 147 Audit report used by the FR MAA (DSAÉ) can be found in Annex 2.

Should the initial audit lead to significant and/or numerous findings, this would show insufficient understanding/compliance by the MTO and a lack of effectiveness of the quality system. In that case the NMAA may take the decision and inform the MTO accordingly:

- Should the MTO wish to re-apply for an EMAR 147 approval a new application has to be submitted to the NMAA;
- To limit the requested scope of work;
- Not to accept the proposed EMAR Form 4 holders.

Findings issued during the audit process should be managed by the audit team in accordance with Section B of EMAR 147 and associated AMC & GM.

Failure to close the audit findings during the agreed period without adequate justification could lead the NMAA to terminate the application.

Depending on the extent and nature of the findings and the delay of corrective actions implementation, an additional audit might be taken into account.

Note:

Should the audit lead to NIL finding, an audit report is still to be sent to the MTO.

e. Recommendation

Once the MTO's compliance with EMAR 147 has been established and all findings are addressed as required by the NMAA, the lead auditor should make a recommendation to the NMAA to issue the EMAR 147 approval to the MTO, which should include:

- The precise scope of work (e.g. class, MAML category, Type/model of aircraft (category B & C licences), limitations, in accordance with EMAR Form 11);
- The identification reference of the MTOE to be approved;
- The EMAR Form 4 management personnel to be approved.

Note:

For the identification of the aircraft Type/model to be endorsed on the EMAR 147 training certificate, the lead auditor shall refer to the Type/model mentioned in the Military Type Certificate and/or Military (Supplemental) Type Certificate, including engines.

There should be a global consistency of the scope of work between the received Form 12, the MTOE, the lead auditor recommendation and the approval certificate to be issued. In case that part of the requested scope of work is not approved, it should be clearly justified in the lead auditor recommendation (e.g. level 1 finding).

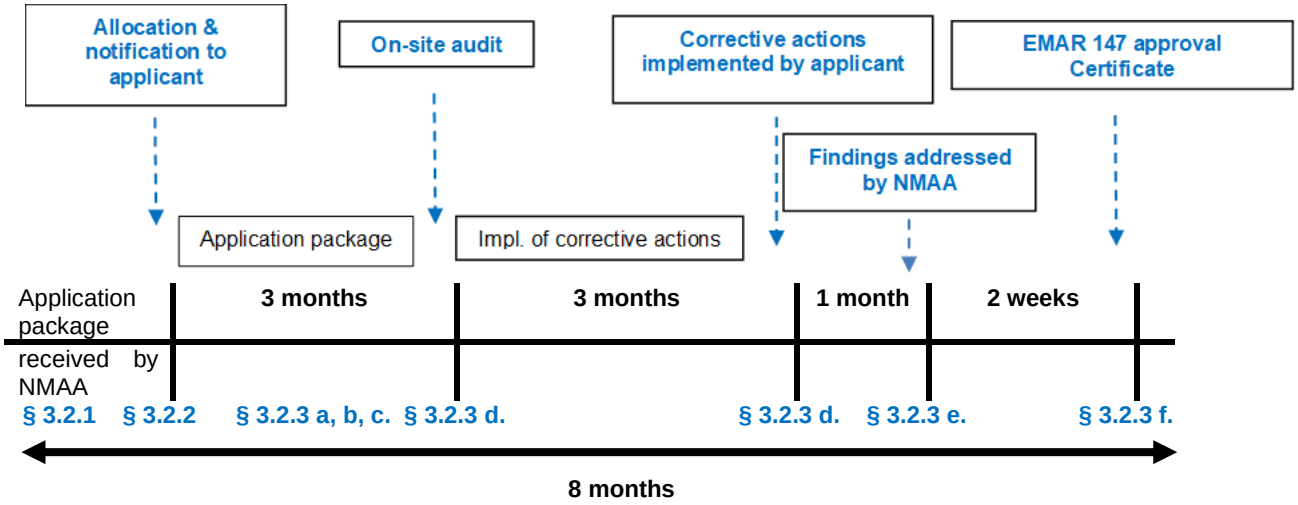
f. Issuance of approval

The recommendation received from the lead auditor is reviewed by the NMAA for compliance and accuracy. Once satisfied the NMAA should prepare the following documents for signature by an authorized NMAA person, as applicable:

- The EMAR 147 approval certificate EMAR Form 11;
- The approval letter of the MTOE;
- The acceptance of EMAR Form 4s.

3.2.4. Time frame

A typical time frame to process an EMAR 147 approval is about 8 months from the reception of the complete application package. However, the amount of time taken is largely dependent on the ability of the MTO to produce the documentation required and to rectify any finding that may be identified during the approval process.



Timeline is for reference purpose only.

3.2.5. Initial approval flow chart

The flow chart for an initial EMAR 147 approval is identical to the flow chart for an initial EMAR 145 approval described in the EMAR 145 implementation guide for NMAA.

3.3. Continuing Oversight

3.3.1. Continuing oversight principles

a. Frequency of visits and number of auditors

As per EMAR 147.A.155 the approval shall be issued for an unlimited duration. The approval is to be continued every 24 months and each EMAR 147 MTO shall be audited as a minimum as once in this period. Nevertheless, it is considered as a good practice that the EMAR 147 MTO is audited by the NMAA once a year. In all the cases, all the EMAR 147 requirements applicable to the scope of work shall be audited by the NMAA on the 24 months period.

However, the number of intermediate audits as well as the number of auditors may be adapted by the NMAA depending on the following criteria:

- Complexity of the MTO (e.g. scope of work, contracting of practical training);
- Number and location of sites to be audited;
- Size of the MTO;
- Previous EMAR 147 audits results;
- Any additional reason deemed necessary by the NMAA and justified by a specific situation.

The oversight period to be considered starts from the date of issuance of the approval certificate or from its last continuation date. Possible changes of the approval certificate do not modify the continuation date of an approval.

It should be noted that an audit for change of the EMAR 147 MTO does not replace an intermediate audit but both may be combined.

Moreover, the NMAA may require additional audit(s) for the following reasons (other inputs):

- EMAR 147 MTO has shown weaknesses when formerly dealing with serious and / or numerous findings;
- EMAR 147 MTO has shown difficulties to close former findings within the expected time frame;
- EMAR 147 MTO is facing frequent changes of his management personnel which could jeopardize the EMAR 147 MTO stability;
- The NMAA is informed about events that may affect the training or the examination process;
- Any information coming from CAA audits of MTOs having both PART 147 & EMAR 147 approvals;
- Any information coming from other open sources.

b. Allocation of the oversight audit team

It is preferable that the continuing oversight of an approval is performed by the all or most of the team assigned for the initial audit or for the previous oversight cycle.

It is considered as good practice that the NMAA provides the EMAR 147 MTO with a PoC who will be in charge of the oversight management of the approval (e.g. management of findings, changes, audit plan).

3.3.2. Oversight audit

a. Audit process

The audit process for a continuing oversight is identical to the initial audit process described in the chapter 3.2.3 “audit process” of this guide.

During each on-site audit, the audit team should attend a theoretical training course and an examination or a practical assessment. In this framework, a simulation is considered as acceptable.

The process to manage the level 1 and level 2 findings is described in the following paragraphs.

b. EMAR 147 audit product

The NMAA should establish a policy and processes to sample the output of the EMAR 147 MTO including an audit product survey plan to validate the proper operation of the entire system, where appropriate. Audit product sampling is most effectively completed during routine oversight audits. As an example, an audit product typically consists of the assessment of all the process that led to the issuance of a selected EMAR 147 Training certificate.

The NMAA should establish the competence of its auditors undertaking audit product samples to ensure that they are able to make judgements about the compliance of the training and examination/assessment system reviewed.

c. Level 1 finding

In case of Level 1 finding, it is strongly recommended that the lead auditor consults with the NMAA management level before informing the EMAR 147 MTO due to the direct impact on the approval. When the level 1 finding is confirmed, the NMAA should formally notify the EMAR 147 MTO with the finding(s) using the EMAR Form 22 together with the decision against the approval.

It is the responsibility of the EMAR 147 MTO to take the appropriate and immediate corrective action as specified in the chapter 3.9 “Limitation, suspension and revocation of an approval” of this guide.

According to EMAR 147.B.130 (a), when the EMAR 147 MTO cannot meet the timescales specified for Level 1 findings, the NMAA shall suspend in whole or part the approval.

d. Level 2 finding

Level 2 findings are notified to the EMAR 147 MTO by the NMAA.

The corrective action period granted by the NMAA depends on the nature and the gravity of the finding. In any case the initial due date should not exceed the date agreed with the NMAA.

The NMAA oversight PoC should monitor that the EMAR 147 MTO provides:

- Within 1 month after the receipt of the finding notification or within the finding due date, whichever is the earlier date: an acknowledgement of the findings, a corrective action plan and confirmation that a root cause analysis has been started together with the associated proposed timescales;
- Corrective action evidence as per the agreed corrective action plan to allow the review by the NMAA oversight PoC within the finding due date. Findings made during the oversight cycle should be managed by the NMAA oversight PoC in accordance with Section B of EMAR 147 and associated AMC / GM.

Should the EMAR 147 MTO need an extension of the initial due date agreed for a finding, such an extension shall be justified and requested in writing to the NMAA oversight PoC. Such a justification shall consist in a corrective action plan detailing the corrective action(s) with the associated time frame and any intermediate actions as necessary. The NMAA oversight PoC should notify his decision to the EMAR 147 MTO. Such an extension is not systematically granted (AMC 147.B.130 (b)).

According to EMAR 147.B.130 (b), when the EMAR 147 MTO cannot meet the timescales specified for Level 2 findings and no request for an extension has been made, the NMAA can decide to suspend in whole or part the approval.

e. Corrective action

To be acceptable a proposed corrective action shall address at least the following issues for each finding:

- The results of the root cause(s) analysis;
- Corrective action based upon the identified root cause(s) which shall detail:
  - Immediate or short-term corrective action;
  - Long term corrective action preventing reoccurrence of such non-conformity.

The implementation of the whole corrective action shall not exceed the time frame agreed with the NMAA to close the finding. This implies that the NMAA oversight PoC has received the agreed corrective actions and the relevant evidence[1] with enough anticipation to review them as necessary and to formally close the related findings at the due date.

An on-site audit by the NMAA may be needed to ensure the effectiveness of corrective action(s) implemented prior to formal closure of the related finding(s). When the NMAA oversight PoC is satisfied with the corrective action(s) that have been implemented by the EMAR 147 MTO, the NMAA oversight PoC notifies in writing the EMAR 147 MTO that the finding(s) is(are) closed.

Note:

A voluntary reduction of the scope of approval cannot be systematically considered as an appropriate corrective action to a finding.

[1] Promises, drafts, statements, wishes, hopes, plans, etc. cannot be accepted as evidence

3.3.3. Recommendation for continuation

Every 24 months the NMAA oversight PoC should summarize the oversight performed and if satisfied, should recommend the NMAA to continue the approval. For that purpose, he should prepare a recommendation (e.g. EMAR Form 22) and an oversight plan for the new cycle. The oversight plan may be sent by the NMAA oversight PoC to the EMAR 147 MTO upon request. At the time of the continuation recommendation, recent level 2 findings having not yet reached their deadline may be still open. In this case the EMAR 147 MTO must provide the NMAA oversight PoC with an acceptable corrective action plan for those findings that are still open. The formal corrective action plan submitted by the EMAR 147 MTO must be formally accepted by the NMAA oversight PoC. Findings issued during the oversight cycle should be managed by the NMAA oversight PoC in accordance with Section B of EMAR 147 and associated AMC & GM.

3.3.4. Continuation of approval

At the end of each oversight cycle, the approval needs to be continued according to EMAR 147.B.120 provision. The continuation of an approval is a process not requiring any application from the approval holder and it is entirely managed by the NMAA with the support of NMAA oversight PoC. As a consequence, considering that the approval is valid for an unlimited duration under the provision of EMAR 147.A.155, the NMAA is not supposed to issue any formal continuation communication to the EMAR 147 MTO.

3.3.5. Continuing oversight flow chart

The flow chart for the continuing oversight of an approved EMAR 147 MTO is identical to the flow chart for the continuing oversight of an approved EMAR 145 MO, described in the EMAR 145 implementation guide for NMAA.

3.4. Audit plan by NMAA

The NMAA should establish an audit plan in order to match the workload with its available resources and the readiness of the MTOs.
When rolling out the audit plan over a large number of MTOs/EMAR 147 MTOs this plan should be staggered. This rollout plan shall be agreed between the NMAA and the MTOs//EMAR 147 MTOs with sufficient notice (e.g. 6 months). Therefore, a good communication should be established between the MTOs and the NMAA.

3.5. Management of changes

3.5.1. Application

This chapter applies only once the approval is granted. All changes as detailed in EMAR 147.A.150 require an EMAR Form 12. An application for change of an EMAR 147 MTO shall be made in accordance with Section A of EMAR 147 by using the EMAR Form 12 and its associated filling instruction. This application Form shall be sent to the NMAA.
In order to keep the administrative workload at a reasonable level and to minimize the possible associated costs, the EMAR 147 MTO is recommended to combine change requests as much as possible instead of submitting several requests in the same short period of time (e.g. several applications within one month).

3.5.2. Audit team

The allocation of the audit team for a change of approval is identical to the initial audit process described in the chapter 3.2.2 “Audit team” of this guide.

3.5.3. Audit team composition

The audit team composition for a change of approval is identical to the initial audit process described in the chapter 3.2.3 “Audit team composition” of this guide.

3.5.4. Audit process

The audit process for a change of approval as listed in EMAR 147.A.150 is identical to the initial audit process described in the chapter 3.2.3 “audit process” of this guide. However, the followings peculiar points shall be considered:

- The internal quality audit shall cover at least all areas impacted by the requested change(s);
- Changes cannot be implemented prior to the NMAA formal approval;
- Should the audit for change lead to significant and/or numerous discrepancies, this would show insufficient understanding /compliance of the EMAR 147 MTO and a lack of effectiveness of the quality system. In that case the NMAA should terminate the application for change and raise a finding against the quality system. In that case the requested change shouldn’t be approved and moreover, such a lack of effective implementation of quality system could lead the NMAA to limit or suspend the current approval;
- All findings that have an impact on the requested change must be listed and addressed prior to the NMAA oversight PoC making the recommendation for the approval of the change to the NMAA. The other findings, not directly related to the change, should be managed as part of the on-going regular oversight cycle;
- Changes of management personnel may not necessarily require an on-site audit and can be managed in accordance with the EMAR Form 4 instructions;
- For an evolution in the training course, the audit team should attend a simulation of a theoretical training course and a simulation of an examination or a practical assessment. In any case, these simulations cannot replace the attendance to a theoretical training course, to an examination or a practical assessment.

In addition to the guidance contained in EMAR GM 147.B.110 “*Procedure for approval and changes to the approva*l”, the following changes to the MTO should be considered as major amendments:

- Changes affecting the name of the MTO:
    - As the name of the MTO is written on the EMAR 147 approval certificate, the NMAA would need to issue a new approval certificate.
- Changes affecting the training location(s) of the MTO:
    - e.g. Address change, removal and/or additional training locations of the MTO (including EMAR 145 MOs when the practical Type training is contracted by the EMAR 147 MTO).
- Changes affecting the Accountable Manager:
    - The new Accountable Manager has to sign his EMAR 147 commitment statement in the MTOE.
- Changes affecting the Management personnel:
    - Change of the MTO’s managers (e.g . Training Manager, Examination Manager, Quality Manager).
- Major changes affecting the Means, Procedures, Scope of work or Training staff that may impact the MTO’s approval:
    - Major changes in MTO’s scope of work:

      Any change in the scope of work specified in the MTO’s approval certificate and/or in the chapter 1.9 of the MTOE
    - Major changes in MTO’s means:

- Significant modification in the examinations' system;
- Unavailability of training facilities;
- Contracting of a training module that was previously trained internally and/or internal training of a module that was previously contracted;
- Change concerning non-approved contractor(s);
- Transfer, increase/decrease concerning training facilities;
- Significant increase/decrease or suppression of training staff for a given site/scope of work.

o Major changes in MTO's procedures:

- Significant change in the content of the training and/or examination materials concerning a given topic (e.g. module in case of Basic Training or ATA chapter in case of Type Training).

o Major changes in MTO's training staff:

- Departure of the last instructor, examiner or practical assessor for a given Basic Training module or Type Training.

Any other changes to the MTO should be considered as minor amendments.

3.5.5. Time frame

The time frame related to the approval of a change is highly variable depending on the nature of the change. The time frame provided in § 3.2.4 for the process of initial approval may be considered as the upper limit.

3.5.6. Management of changes flow chart

The flow chart for the management of changes of an approved EMAR 147 MTO is identical to the flow chart for the management of changes of an approved EMAR 145 MO, described in the EMAR 145 implementation guide for NMAA.

3.6. Findings management

3.6.1. General

The finding level should be defined in accordance with EMAR 147.A.160.

It may be necessary for the NMAA to ensure that all impacted trainees receive additional training and/or re-examination/re-assessment, dependent upon the nature of the finding.

Where the MTO/EMAR 147 MTO has not implemented the necessary corrective action within the period agreed by the NMAA it may be appropriate to accept a further period requested by the MTO/EMAR 147 MTO.

3.6.2. Drafting methodology

The way of drafting a finding is crucial as a finding shall be understandable by anybody (and not only by the redactor), clear, concise, factual (based on evidences, no sensation nor impression, etc.), explained and justified with regard to the EMAR 147 and/or EMAR 66 requirement and/or the MTOE procedure impacted. Therefore, the NMAA auditors should be trained to draft findings.

It is considered as a good practice to use the following drafting methodology for findings:

Drafting of findings, the Key points & Key words:

- **Structured**: clear and comprehensible presentation;
- **Factual & documented**: a clear evidence, no subjectivity;

- **Reminder of the impacted requirement and/or MTOE procedure**: an audit is a compliancy check regarding a reference frame;
- **Concise & understandable to anybody at first reading**: avoid using acronyms or make them explicit, avoid calling the audit team back for additional information.

Therefore, the drafting of any finding should be structured as follows:

- **Reminder of the impacted requirement** (and/or any MTOE procedure);
- **Description of the non-compliance found** (e.g. the MTO … is not able to demonstrate compliance with…);
- **Evidence**: describe what was found…;
- **Conclusion**: (e.g. … noncompliance with EMAR 147.A.XX and/or EMAR 66.A.XX and/or MTOE § Y.Y).

Note:

Reporting a finding means that there is an impacted requirement and a related evidence. In case of lack of one of these two elements (requirement and/or evidence), there is no finding to report.

3.7. Record keeping

The present guide does not provide further guidance for record keeping considering that the EMAR 147.B.20 and associated AMC & GM are sufficiently clear.

3.8. Exemptions for an EMAR 147 MTO

3.8.1. Introduction

There may be occasions when the EMAR 147 MTO is unable to comply with the EMAR 147 requirements and/or MTOE procedures. In such circumstances, a requirement/MTOE procedure exemption may be applied for, to seek the granting of exemptions from extant requirements and/or MTOE procedures. When granting an exemption, the NMAA must be satisfied that any consequences of non-compliance have been fully considered and assessed.
Exemptions from extant requirements and/or MTOE procedures may be employed at the request of an EMAR 147 MTO within the regulated environment and when agreed by the NMAA. Exemptions should be periodically reviewed by the NMAA.
Exemptions should be approved or rejected at the appropriate level within the NMAA. This signatory level should be dependent upon type, complexity or whether the request is novel and/or contentious.

3.8.2. Process

When the need for a requirement and/or MTOE procedures exemption is identified, an application should be made to the NMAA. It is suggested that the application should include the following material as a minimum:

- The details of any previous exemption, if relevant;
- The requirement and/or MTOE procedure that causes difficulty for compliance and a description of why the application for an exemption is sensible;
- A risk assessment and mitigation measures;
- Supporting comments and documents should be annotated as references;
- An overall statement about the request; this may be not required if it is a simple request, but if there are multiple issues it can help to clarify the detail.

The application should be approved by the Accountable Manager.

3.8.3. Initial Action

When the NMAA receives an application, it should be allocated a reference number and this number should be forwarded to the originator to confirm receipt. The NMAA should then establish if the exemption contains the required information to progress the application.
It is recommended that from the time of receipt of all the required information to releasing a response back to the originator should take no longer than 30 working days. If it is likely that the 30-day timescale should not be met, then the originator should be informed and regularly updated until the exemption is approved and issued or rejected.

3.8.4. Closure Action

The exemption should ultimately be approved/rejected. Once completed, the NMAA's response should be sent to the originator with details of the agreement and any conditions/requirements such as enhanced recording/monitoring activity.

3.8.5. Validity of exemptions

NMAA exemptions should be valid for the stipulated timescale. If a renewal is required, then this should be applied for at least 1 month before the exemption expiry date. Submission of an exemption request does not constitute compliance or guarantee that it will be approved. EMAR 147 MTOs no longer requiring an exemption should submit a cancellation request to the NMAA.

Exemptions should remain valid unless the specified conditions/requirements change.

3.9. Limitation, suspension and revocation of an approval

3.9.1. Notification of NMAA decision

Based upon a recommendation to limit, suspend or revoke the approval of an EMAR 147 MTO, the NMAA should make a decision in relation to the approval and formally notify the maintenance training approval holder about:

- The NMAA decision to limit, suspend or revoke the EMAR 147 approval;
- The audit report (e.g. EMAR Form 22) showing the level 1 and level 2 finding(s).

3.9.2. MTO action and response

The MTO is expected to:

- Acknowledge receipt of the letter, confirming that the MTO has put in place the restrictions required by the NMAA;
- Take immediate corrective action to the level 1 finding(s) based upon the results of the root cause analysis and informed the NMAA accordingly;
- Identify - if applicable - the EMAR 147 training certificates signed that are relevant to the significant non-compliance (e.g. Basic and/or Type Training);
- Ensure - when necessary - that all impacted trainees received additional training and/or re-examination/re-assessment, dependent upon the nature of the finding;
- Inform - when necessary - the impacted trainees, the relevant organisations and any concerned Airworthiness Authority (e.g. NMAA, CAA, etc.) about the significant non-compliance and the results of the associated non-compliance investigation;
- Propose the NMAA with a corrective action plan (CAP) for the level 2 findings within the defined time frame. This CAP can include the long-term corrective action related to the level 1 finding(s).

Where the EMAR 147 MTO fails to comply with any of the above-mentioned actions, the NMAA should reevaluate the impact on the EMAR 147 approval (e.g. revocation of the EMAR 147 approval).

In case of revocation of an approval, the MTO shall immediately send the original approval certificate back to the NMAA.

4. EMAR 66 licensing activities

4.1. General

The scope of this chapter is to enable an NMAA to process EMAR 66 licence applications and allocate resources as necessary in order to carry out the assessment, issuance of an EMAR 66 licence and the management of its changes, following a satisfactory recommendation.

This chapter describes how a NMAA could handle the issuance of EMAR 66 licences.

The licence shall be delivered in accordance with the requirements of EMAR 66 Section A and Section B.

Rights and obligations from applicable national regulations and arrangements (e.g. Bilateral/ Multilateral arrangements for Mutual Recognition) should be taken into account.

Note:

In order to save time for licence staff when assessing the licence application package, it is advised that NMAAs publish additional guidance for the applicants to an EMAR 66 licence, notably to address the following aspects:

- Applications to be sent to the NMAA directly by applicants or by their employing MOs. Indeed, if all applications are processed through MOs, it would standardize and facilitate the procedure and would allow NMAAs to deal only with MOs instead of many individuals, which would be easier and more efficient;
- Paper and/or electronic application (e.g. if the NMAA use an IT system that allow the applicant to make an on line application (e.g. EMPIC,…), it shall be precised how to proceed,…);
- List of Type/model of aircraft to be endorsed on the EMAR 66 licence shall be established by the NMAA, be consistent with the military aircraft register and refer to the Type/model mentioned in the Military Type Certificate and/or Military (Supplemental) Type Certificate, including engines. It shall also be consistent with the scope of work of the EMAR 145 MO where the applicant works (e.g. to be checked for Industry,…);
- Way to present supporting evidences/documents for grandfather rule applications (e.g. clear link between each evidence/document provided and the grandfather rule criteria to be satisfied, text for the “limitations” to be reported on the licence (if applicable), …) as well as examples of evidences/documents considered as acceptable by the NMAA;
- How to apply for a change to a licence (e.g. new Category, new Type rating,…).

4.2. Initial issuance of a licence

4.2.1. Application

A new application for an EMAR 66 licence shall be made in accordance with Section A of EMAR 66 by using the EMAR Form 19. This application form shall be sent directly to the NMAA.

The NMAA should acknowledge receipt of the application. The NMAA should check the application and its eligibility. When incorrect or incomplete information is supplied, the NMAA should notify the applicant as soon as possible detailing the omissions and errors. In case of refusal of an application, the NMAA should notify this decision in writing to the applicant together with the reasons thereto.

An application package should include:

- The EMAR Form 19;
- A copy of the applicant's ID;
- A copy of the EMAR 147 certificate demonstrating successful completion of the Basic Training, including any extension. For category C applied through the academic route, the academic degree in a technical discipline. For grandfather rule applications, all evidences justifying similar Basic Training relevant to the category of EMAR 66 licence applied;
- For EMAR 66 licences categories B & C, a copy of the EMAR 147 certificate demonstrating successful completion of the Type Training, including appropriate On the Job Training (OJT) or for grandfather rule applications, all evidences justifying similar Type Training;
- All evidences demonstrating the practical maintenance experience of the applicant;
- For grandfather rule applications, any other evidences demonstrating compliance with additional criteria requested by the NMAA (e.g. Human Factor training, national EMAR regulation, …) and eventual non compliances to EMAR 66 training syllabus (e.g. limitations).

4.2.2. Resources

The NMAA should nominate competent licence staff to carry out the licence process.

The composition of the licence staff (e.g. number, experience, skills, licensing IT system) should be appropriate and based on the following criteria:

- Number, size and complexity of the MOs to be EMAR 145 approved (e.g. aircraft maintenance scope of approval (rating A), Military and/or Industry MOs, etc.);
- Number of licences to be issued;
- Number of licences to be issued under grandfather rule regime (require deeper and longer assessment) vs licences to be issued under EMAR 147 regime (end state).

4.2.3. Licence process

a. On desk Review

EMAR Form 19:

The licence staff should ensure that the documents provided in the application package are consistent with the information mentioned in EMAR Form 19 (e.g. category of licence, Type/model of aircraft, limitations, extensions,…).

Grandfather rule licences:

The licence staff have to check all the documents/evidences as regards each of the criteria of the NMAA's grandfather rule. The amount and diversity of the supporting evidences/documents that are to be received by the NMAA require a longer and deeper assessment by the licence staff.

In accordance with EMAR 66 Section B Subpart D, the licence staff also have to establish a conversion report to demonstrate how the licences or other qualifications owned by the applicant can be transformed in an EMAR 66 licence, including any limitations to be reported. Refer to chapter 6.1.3 of the present guide for further information about the drafting of a conversion report.

Licences under EMAR 147 regime:

The assessment process is simpler and faster as the licence staff just need to check:

- The EMAR 147 training certificates that justify the successful completion of the Basic Training & Type Training (for licences category B & C) in an EMAR 147 MTO, as well as any mandatory OJT (On the Job Training) performed in an EMAR 145 MO.
- The compliancy of the documents justifying the practical maintenance experience of the applicant, with EMAR 66.A.30 requirements.

b. Recommendation

Once the compliance of the application package with EMAR 66 and/or NMAA's grandfather rule has been established, the licence staff should make a recommendation to the NMAA to issue the EMAR 66 licence to the applicant, which should include:

- The identification number of the licence under following format: [participating Member State Code].EMAR66.[XXXXXX];
- The category/subcategory of the licence to be issued;
- The precise Type/model of aircraft, including engines (licences category B & C) to be endorsed on the licence;
- Any limitations to be reported on the licence;
- Any extension to be reported on the licence;
- For grandfather rule licences, the conversion report.

It is considered as good practice that a print of the licence to be issued is joined to the recommendation package as the licence has to be signed by the NMAA.

Note:

There shall be a global consistency of the scope of the licence between the received Form 19, the list of Type/model of aircraft and limitations/extensions mastered by the NMAA, the licence staff recommendation and the EMAR 66 licence to be issued.

c. Issuance of licence

The recommendation received from the licence staff is reviewed by the NMAA for compliance and accuracy. Once satisfied the NMAA should prepare the EMAR 66 licence (EMAR Form 26) for signature by an authorized NMAA person.

4.3. Management of changes

4.3.1. General

The process for a change to a licence is identical to the initial licensing process described in the chapter 4.2.3 "*licence process*" of the present guide.

The NMAA that issued the initial licence is the only one authorized to amend it.

In order to prevent any fraud, the licensing staff should check, when receiving the original of the licence, that all the information contained (e.g. category, Type rating, limitations, extensions, address, number of the licence,…) is in line with the data recorded by the NMAA since the licence was issued.

4.3.2. Addition of a new category/subcategory

An application package for the endorsement of a new category/subcategory of licence should include:

- The EMAR Form 19;
- The original of the licence concerned by the change;

- A copy of the EMAR 147 certificate demonstrating successful completion of the Basic Training, including any extension, for the new category/subcategory that is applied. For grandfather rule applications, all evidences justifying similar Basic Training;
- Copy of all evidences demonstrating the practical maintenance experience of the applicant appropriate to the new category/subcategory applied, as requested by Appendix IV to EMAR 66. For grandfather rule applications, all evidences justifying similar practical maintenance experience.

4.3.3. Addition of a new Type rating (licence categories B & C)

An application package for the endorsement of a new Type rating on the licence should include:

- The EMAR Form 19;
- The original of the licence concerned by the change;
- A copy of the EMAR 147 certificate demonstrating successful completion of the Type Training that is applied. For grandfather rule applications, all evidences justifying similar Type Training.

Note: Where Military Aircraft Type Training includes military-specific systems, the licence staff shall also ensure that the applicant shall have gained the relevant 50-series modules (or sub-modules) of EMAR 66 Appendix I, in accordance with point 1. of Appendix III to EMAR 66.

4.3.4. Addition of extensions and/or removal of limitations

An application package for the endorsement of an extension on a licence or for removing a limitation on the licence should include:

- The EMAR Form 19;
- The original of the licence concerned by the change;
- A copy of the EMAR 147 certificate demonstrating successful completion of the Basic Training extension (modules 50 to 55 of Appendix I to EMAR 66 refers). For grandfather rule applications, all evidences justifying similar Basic Training on modules 50 to 55 topics (Military Specific Systems);
- A copy of the EMAR 147 certificate demonstrating successful completion of the Basic Training on the module/submodule concerned by the limitation. The NMAA may also, accept any evidences justifying a training delivered by a MO, a Type Training or a maintenance experience on the topic concerned by the limitation.

4.4. Record keeping

The present guide does not provide further guidance for record keeping considering that EMAR 66.B.20 and associated AMC 66.B.20 are sufficiently clear.

4.5. Exemptions for an EMAR 66 licence

There may be occasions when the holder of an EMAR 66 licence is unable to comply with EMAR 66 requirements. In such circumstances, a requirement exemption may be applied for, to seek the granting of exemptions for the licence (e.g. validity period of a Basic or Type Training, nature and duration of the maintenance experience gained for applying to a licence, privileges of the licence,…).
It is considered as good practice that such exemptions are applied through the EMAR 145 MO that employs the licence holder. The process for the management of exemptions for an EMAR 66 licence is identical to the "*Exemptions for an EMAR 145 MO*" process described in the EMAR 145 implementation guide for NMAA.

4.6. Suspension, limitation and revocation of a licence

4.6.1. Notification of NMAA decision

Based upon a safety issue identified by the NMAA (e.g. EMAR 145 audits, Airworthiness Reviews,…) or any other organisation (e.g. MO, CAMO,…) or if it has clear evidence that the person has carried out or been involved in one or more of the activities described in EMAR 66.B.500, the NMAA shall suspend, limit or revoke the EMAR 66 licence and formally notify the licence holder as well as his employing EMAR 145 MO about:

- The NMAA decision to limit, suspend or revoke the EMAR 66 licence;
- The evidences that support this decision (e.g. photos, extracts of CRS/Aircraft technical log, answer to Work Package,…) demonstrating the issue.

4.6.2. Licence holder and EMAR 145 MO action and response

The licence holder is expected to:

- Acknowledge receipt of the letter, confirming that he has put in place the restrictions required by the NMAA;

The EMAR 145 MO employing the licence holder is expected to:

- Identify - if applicable - the EMAR 145 maintenance release certificates signed by the licence holder and that are relevant to the safety issue (e.g. line maintenance XX on aircraft YY);
- Ensure - when necessary - that additional maintenance or re-certification of all affected aircraft maintenance is accomplished;
- Inform - when necessary - the relevant CAMO/Operating Organisation and any concerned Airworthiness Authority (e.g. NMAA, CAA, etc.) about the safety issue and the results of the NMAA investigation and decision;
- Propose the NMAA with a corrective action plan and/or mitigation measures to address the safety issue.

Where the EMAR 145 MO fails to comply with any of the above-mentioned actions, the NMAA should reevaluate the impact on the EMAR 145 approval (e.g. revocation of the EMAR 145 approval).

In case of revocation of an EMAR 66 licence, the holder shall immediately send the original licence back to the NMAA, preferably through his employing EMAR 145 MO.

5. EMAR 147 specific activities

5.1. Course approval Form

It is considered good practice that NMAAs request that MTOs present their Basic and/or Type Training syllabus (theoretical & practical training) in the format of a Course approval Form. This Form should summarize how the MTO teach each topic required by EMAR 66 syllabus (e.g. training duration, number of questions,…).

The Course approval Form that EASA requests from foreign PART 147 MTOs when they present for approval their EMAR 66 Basic and/or Type Training syllabus may be considered by NMAAs. These Course approval Forms, specific for each category of licence, can be found on the EASA web site under Foreign Part-147 Organisations / Useful documents (e.g. FO.CAO.00098 Course Approval B2 Basic for a B2 licence for Basic Training, FO.CAO.00105 Course Approval B1.1 Type for a B1.1 licence for Type Training,…).

5.2. Theoretical Training

5.2.1. Basic training

As there is no unique/mandatory source reference for the drafting of Basic Training material, it is considered good practice that the references used are mentioned (e.g. books,…).

5.2.2. Type training

Most of the time, the source reference for the drafting of Type Training material is the Aircraft Maintenance Manual (AMM), including all documents applicable to the aircraft Type and especially the mandatory ones (e.g. ADs, SB,…). In this context, it is considered good practice that the NMAA ensures that the MTO uses the latest up to date AMM edition.

Note:

The depth/level of the Type Training material/courses is mainly driven by the AMM content. For particular aircraft (e.g. latest generation of aircraft equipped with integrated systems for troubleshooting and/or maintenance,…) it may happen that for a given topic, the level of maintenance "authorized" by the aircraft/AMM is lower than the level of knowledge required by EMAR 66 Appendix III. In this case, if the level of knowledge teached is lower than the one required by EMAR 66 Appendix III, it shall be dully justified by the MTO with appropriate references to the AMM.

5.3. Examinations/practical assessment

5.3.1. Knowledge examinations

When assessing the examinations questions for a given topic, the NMAA should ensure by sampling, that their level of knowledge is appropriate to the level of knowledge of the training material/course taught and compliant with the level required by EMAR 66 Appendix I (Basic Training) or Appendix III (type Training).

When assessing the duration of the theoretical training examinations, the NMAA should ensure by sampling, that their duration is:

- Compliant with EMAR 66 appendix II (Basic Training): e.g. number of questions per module, time allowed per module,…;
- Compliant with EMAR 66 appendix III (Type Training): e.g. number of questions per hour of instruction, average of 90 seconds per question,…

5.3.2. Practical assessment

When assessing the practical Basic Training (EMAR 147.A.200 d) refers), NMAA auditors should consider the following principles:

- EMAR 66 / Appendix I modules 7, 11 to 17 and 50 series should be covered by the practical training programme of the MTO (only for applicable modules in link with the MTO's scope of work);
- EMAR 66 / Appendix I modules 1 to 10 (except 7) do not need to be covered by the practical training programme of the MTO.

When the EMAR 147 MTO contracts the practical Type Training to another organisation (e.g. EMAR 145 MO,…), the NMAA should ensure that this organisation is audited by the Quality system of the MTO.

5.3.3. EMAR 147 auditors training

A tailored training (including theoretical and, when available, practical parts) for NMAA auditor team should cover at least the following topics/activities:

- Knowledge and ability of assessment of the content and conformity of a training course/syllabus as regards EMAR 66 Appendix I (Basic Training) & EMAR 66

Appendix III (Type Training): e.g. level of knowledge of topics, completeness, links with source documents such as AMM,…;

- Knowledge and ability of assessment of the content and conformity of a knowledge examination as regards EMAR 66 Appendix II (Basic Training) & EMAR 66 Appendix III (Type Training): e.g. links between the training courses delivered and the related questions (same level of knowledge, answer to the question given in the course,…), number of questions and duration of the examination as regards category of licence,…;
- Knowledge and ability of assessment of the content and conformity of a practical Basic Training programme;
- Knowledge and ability of assessment of the content and conformity of a practical Type Training programme as regards EMAR 66 Appendix III;
- Knowledge and ability of assessment of a "practical assessment" performed by a MTO or MO;
- Knowledge and ability of assessment of the content and conformity of an "On the Job Training" (OJT) as regards EMAR 66 Appendix III;
- Knowledge and ability of assessment of the content and conformity of MCQ & Essay Questions as regards EMAR 66.

5.4. Standards for the qualification & experience of Instructors, Examiners & Assessors

5.4.1. Introduction

EMAR 147.A.105 (f) Personnel requirements quotes: "*The experience and qualifications of instructors, knowledge examiners and practical assessors shall be established in accordance with criteria published by the NMAA or in accordance with a procedure and to a standard agreed by the NMAA.*".

Therefore, it is advised that each NMAA develops the appropriate criteria in close cooperation with their regulated community (e.g. Training Command, Military Personnel/Human Resources Command,…) so that these criteria are realistic and therefore applicable by MTOs. To this effect, the criteria proposed in Tables 3 to 6 (see Annex 3) should assist NMAAs to fill in the qualification & experience Table 1 for Basic Training (see Annex 3) and the qualification & experience Table 2 for Type Training (see Annex 3). If needed, NMAAs may also define additional criteria for Tables 3 to 6.

Some more detailed criteria for Basic & Type Training could also be found in the EASA's "*Foreign Part 147 approvals - User Guide for the qualification and experience of instructors, knowledge examiners and practical assessors UG.CAO.00154-002*".

5.4.2. Instructors

To be deemed as competent, the instructors should be:

- Fully knowledgeable about the EMAR 66 elements that are assigned to their scope of instruction, but also about the rules and specific procedures (MTOE, etc.) governing the teaching in a controlled environment (EMAR 147 MTOs);
- Pedagogic, and should know how to organize a lesson and how to efficiently deliver a course that clearly highlights the fundamental points; they should also be able to adapt his communication to a particular audience, what may require efforts to bypass, for instance, the language barrier or the very variable profiles of trainees in a same class (in terms of preexisting knowledge/ experience…);
- Convincing, and therefore should have the required experience proving that he has a good command of the subjects taught, at least sufficient to convince trainees that for instance may themselves have a pre-existing experience of the aircraft types to be

taught. He should be in a position to understand, and possibly answer, a number of questions asked by trainees, and should be able to expose the links between the academic training delivered to the trainees and the actual maintenance tasks that these will have to accomplish all along his career. The instructor should also keep and promote the “appropriate attitude” towards regulations and procedures, and in particular the strict adherence to approved maintenance practices and quality standards that can only be acquired through his own experience in a regulated (or governed) aviation environment;

- Proficient, and in particular should be familiar with the tools or the training techniques used by the training organization to support the lessons (STDs etc..); they should also have a good command of the languages used in aviation literature such as aircraft maintenance instructions and that will be used by trainees in an EMAR 145 environment.

5.4.3. Examiners

To be deemed as competent, the knowledge examiners should be:

- Fully knowledgeable about the EMAR 66 elements that are assigned to their scope of examination, but also about the rules and specific procedures (MTOE, etc.) governing the organisation & performance of exams in a controlled environment (EMAR 147 MTOs);
- Trained to examination techniques. The examiner should be fully aware of the aim of the examination and conduct an examination in such a way that the true abilities of the candidate are demonstrated. These involve technical knowledge, but through the essay questions the examiner should also determine the ability for the candidate to satisfactorily cope with the necessary “documentary phase” of a maintenance action (ability to fully understand maintenance entries such as task requests or maintenance reports, and to report in an understandable and complete manner the tasks performed or decision taken (e.g. troubleshooting). The examiner should remain neutral at all times, and behave in a manner that will not influence or prejudice the final result of the examination, for example by providing undue assistance or clarification to a candidate;
- Proficient, and in particular should be familiar with the tools or the examination techniques used by the MTO to perform the exams (paper system, computerized systems.).

5.4.4. Assessors

To be deemed as competent, the practical assessors should be:

- Fully knowledgeable in order to build a solid judgment regarding the abilities of the assessed trainees, the assessor should have the required knowledge and experience of the tasks to be assessed. He should also be able to determine if the trainee accomplishes the tasks iaw current regulations, utilizing approved procedures, maintenance practices etc… He should additionally be knowledgeable about the rules and specific procedures (MTOE, etc.) governing performance of assessments in a controlled environment (EMAR 147 MTOs);
- Trained to assessment techniques. The assessor should be fully aware of the aim of the assessment and conduct a practical assessment in such a way that the true abilities of the candidate are demonstrated. These involve technical abilities but also the ability for the candidate to satisfactorily perform the tasks in an actual maintenance environment where basic principles of human factors apply (such as work performed under stressful conditions e.g. time or management’ pressure, etc.). Therefore, the assessor should remain neutral at all times, and behave in a manner that will not influence or prejudice the final result of the assessment, for example by providing assistance to a stressed candidate;

- Proficient, and in particular the assessor should be familiar with the tools or the techniques used by the training organisation to assess the practical abilities of trainees (maintenance simulators, mock up etc..).

5.4.5. "Grandfathering" of instructors/examiners/assessors

The "grandfathering" of instructors/examiners/assessors should be considered by the NMAA.

Indeed, instructors, examiners and assessors accepted prior to the entry into force of EMAR 147, and exercising their activities, or part thereof, are considered as fulfilling the knowledge and experience requirements. However, a documented gap analysis between their current experience, knowledge and qualifications and those described in the present chapter and the MTOE should be completed and any shortfall addressed with additional training or limitations on their authorized scope of work (e.g. limitation of topics an instructor may be authorized to teach). Records should be retained for audit and continuous improvement purposes and where necessary, a competence development plan should be generated and completed within an appropriate timescale.

5.5. Standards for drafting EMAR 66 Questions for examination purpose

The principles/standards exposed in Annex 4 should be applied by NMAAs (also applicable to EMAR 147 MTOs) when writing EMAR 66 Multiple Choice Questions and Essay Questions for examination purpose, whilst complying with EMAR AMC 66.B.200 "*Examination Standards*".

5.6. EMAR 147 "delta course"

EMAR 66 has provisions for NMAAs to recognize PART 66 licence and/or PART 66 Type Training, to fulfil EMAR 66 requirements. These provisions are notably useful for Industry employing PART 66 Certifying Staff (CS) & Support Staff (SS) and performing maintenance on military aircraft but are obviously limited to civil certified aircraft.

Anyhow, some military aircraft derive closely from a civil certified aircraft (e.g. Falcon 900, DHC6 Twin Otter, many AH helicopters like AS 555 Fennec deriving from civil AS 355 Ecureuil or EC 725 Caracal deriving from the civil EC225/H225M, …) and have limited military systems (e.g. communication, IFF, flares, machine gun, …).

Therefore, it is likely that NMAAs may decide/approve whether some "delta course" training, with limited military specific content:

- has to be delivered by an approved EMAR 147 MTO (like any other Type training), or;
- may be delivered by non-approved EMAR 147 MTOs (e.g. EMAR 145 MO,…), if considered acceptable by the NMAA.

Indeed, in the second case, provided that a satisfactory assessment on the concerned military specific systems is performed, that appropriate mitigation measures are foreseen and that the EMAR 145 MO employing these CS & SS work with appropriate military maintenance data (that include these military systems), this situation, similar to a Grandfather Rule environment, may be acceptable for the NMAA.

If the acceptance of a non-approved EMAR 147 "delta course" for these limited delta training is not possible, the consequence for Industry would be that future C/S and S/S, already PART 66 licensed, would need to pass the "delta course" in an approved EMAR 147 MTO, which maybe not exist or is not yet approved on this very limited/particular military scope. Furthermore, this principle is not limited to Industry personnel and may also concern military one. Indeed, for those military aircraft that are very close to the civil version, some pMS may choose to send their mechanics to follow the Type Training in an approved PART 147 MTO and to perform the training on the "delta" (military specificities) in non-EMAR 147 MTOs.

5.7. Fraud reporting and any other input

The NMAA should assess any event reported or any other input in order to determine if any further action is necessary (e.g. audit, etc.).

6. EMAR 66 specific activities

6.1. Standards for establishing a "Grandfather Rule"

6.1.1. General

EMAR 66.A.70 "*Conversion provisions*", so-called "*Grandfather Rule*" (GFR), allow NMAAs to issue an EMAR 66 licence to an individual who holds a licence/other qualification for the maintenance of aircraft or undergoing a process to gain such licence/other qualification, prior to the entry into force of EMAR 66.

The principle behind the concept of "Grandfathering" legacy licences/qualifications is that if current aircraft maintenance Certifying Staff (CS) & Support Staff (SS) are deemed to be appropriately qualified within pre-EMAR regulatory systems, a change of regulations does not make them incompetent overnight.

6.1.2. Drafting principles/criteria

As GFR criteria will concern various individuals from the regulated community, it is highly advised that before being published, the GFR criteria will be defined, discussed and agreed in close cooperation between the NMAA and the concerned Command(s) (e.g. Human Resources/Personnel Command, MTO/MO Command,…).

Indeed, it is of utmost importance that these criteria are clear, realistic, pragmatic, broad and flexible enough to cover all individual cases in order to ensure that nobody will be excluded from the licensing process while ensuring that the proper functioning of EMAR 145 MOs will not be hampered. In this regard, the setup of any duration/deadline affecting the application and/or issuance of a GFR licence should also be agreed in close collaboration and properly communicated to the concerned personnel and maintenance organisations of the regulated community.

It is considered as good practice that a GFR should be drafted based on the following criteria:

a. Basic Training

The NMAA should request the licence applicant to:

- demonstrate the successful completion of a Basic Training related to the concerned EMAR 66 category of licence, or an equivalent Basic training recognized by the NMAA, and;
- provide supporting documents detailing the concerned Basic Training with the EMAR Form 19 (e.g. Basic training certificate, examination credit report, details of the Basic Training syllabus, …).

Note:

The NMAA may also setup a validity date for the Basic Training to be converted (e.g. not older than X years from the licence application date,…).

b. Type Training (only for licences cat. B & C)

The NMAA should request the licence applicant to:

- demonstrate the successful completion of the Type Training related to the EMAR 66 Type rating to be endorsed on the licence, or an equivalent Type training recognized by the NMAA, and;

- provide supporting documents detailing the concerned Type/model of aircraft with the EMAR Form 19 (e.g. Type training certificate, details of the Type Training syllabus, …).

Note:

The NMAA may also setup a validity date for the Type Training to be converted (e.g. not older than X years from the licence application date,…).

c. Maintenance experience on aircraft

The NMAA should request the licence applicant to:

- demonstrate an appropriate maintenance experience on aircraft related to the concerned EMAR 66 category of licence, or an equivalent aircraft maintenance experience recognized by the NMAA, and;
- provide supporting documents with the EMAR Form 19 (e.g. individual log book, maintenance records detailing the maintenance experience, …).

Note:

The duration of the required maintenance experience should be based on the concerned category of EMAR 66 licence.

The NMAA may also setup a validity date for the maintenance experience to be converted (e.g. not older than X years from the licence application date,…).

d. National Military Airworthiness system/regulations Training

The NMAA should request the licence applicant to:

- demonstrate the successful completion of a training on the military airworthiness system/regulations applicable nationally, or an equivalent training recognized by the NMAA, and;
- provide supporting documents with the EMAR Form 19 (e.g. training certificate, …).

Note:

The NMAA may base the syllabus for such training on the module 10 of Appendix I to EMAR 66.

e. Human Factor Training

The NMAA should request the licence applicant to:

- demonstrate the successful completion of a Human Factor training, or an equivalent training recognized by the NMAA, and;
- provide supporting documents with the EMAR Form 19 (e.g. training certificate, …).

Note:

The NMAA may base the syllabus for such training on the module 9 of Appendix I to EMAR 66.

6.1.3. Conversion report for licences/qualifications

EMAR 66.B.300 quotes that the issuance of a licence through GFR shall be based on a Conversion Report, developed and/or approved by the NMAA. This report aims to demonstrate how the legacy licence/qualification held by the applicant was converted in an EMAR 66 licence, with or without limitations.

As an example, a model of Conversion Report that could be used by a NMAA for the issuance of a GFR licence, can be found in Annex 6.

6.1.4. Principles for licence limitations

It is likely that legacy licences/qualifications will not entirely align with the EMAR 66 categories A, B1 and B2 aircraft trades and therefore limitations may need to be added to any EMAR 66 licence issued).

NMAAs would need to complete a gap analysis between any legacy licence/qualification and the comparable EMAR 66 licences. This analysis should examine the training syllabi, examination standards and experience requirements, identifying differences in the aircraft systems covered, with a view to identifying whether a limitation should be applied to the EMAR 66 license basic category, on conversion. The gap analysis should compare the EMAR 66 categories A, B1 and B2 syllabi with those of the legacy licence/qualification systems, including the depth / training duration for each subject.

It is considered good practice that this gap analysis is made in close cooperation between the NMAA and the concerned Command(s) (e.g. Human Resources/Personnel Command, MTO/MO Command,…).

Limitations are mainly due to a lack of Basic Training between the legacy licence/qualification to be converted and the Appendix I to EMAR 66. Nevertheless, it is advised that any additional experience gained by the applicant (e.g. aircraft maintenance experience, Type Training, Task Training,…) should also be taken into account, when performing the gap analysis, to compensate for a lack of Basic Training, in order to avoid adding a limitation on the licence. Indeed, licence limitations will impact the authorized certification scope of the holder and will generate issues within EMAR 145 MOs.

In order to avoid different interpretations from various individuals/MOs, it is considered good practice that the NMAA manage and master the list of the limitations that can be endorsed on a licence (e.g. ATA codes, generic sentences,…).

When identifying the limitations that may be added to a GFR licence, the NMAA should also consider the measures to remove these limitations, after the licence is issued.

Depending on the nature/depth of the limitation, on the holder's experience and qualifications and on the NMAA policy these limitations may be removed:

- after satisfactory examinations, on the topic subject of the limitation, in an EMAR 147 MTO (preferred option when practicable), or;
- after satisfactory training, on the topic subject of the limitation, in an environment recognized by the NMAA (e.g. EMAR 145 MO,…), or;
- after gaining satisfactory maintenance experience, on the topic subject of the limitation, in an environment recognized by the NMAA (e.g. EMAR 145 MO,…).

6.2. Examination credits for Basic Training

6.2.1. General

EMAR 66.A.25 (c) quotes that an applicant may apply to the NMAA for full or partial examination credit to the basic knowledge requirements for:

- basic knowledge examinations that do not meet all EMAR 66 requirements, and;
- any other technical qualification considered by the NMAA to be equivalent to the knowledge standard of EMAR 66.

The main purpose is to recognize some previous Basic training gained in order to grant credits to avoid passing additional EMAR 66 examinations on the recognized topics.

6.2.2. Examination credit methodology

For the performance of an examination credit, the training programme of the technical qualification held (all topics and their level of knowledge) is compared to the reference

programme in Appendix I to EMAR 66, for a given licence category, with a view to establishing the compliance, or not, with the concerned EMAR 66 modules/submodules.

Depending on the result of the comparison, the holder of the technical qualification may benefit from a total or partial exemption of EMAR 66 examinations. Indeed, the technical qualification topics that will be validated through an examination credit will be granted to the applicant without further examinations to demonstrate basic knowledge (EMAR 66.A.25(a) refers). Therefore, only those modules/submodules of Appendix I to EMAR 66 that are not validated by the examination credits of the technical qualification will be subject to EMAR 66 examinations.

6.2.3. Examination credit report

Examination credits can only be granted on the basis of a credit report either developed or approved by the NMAA (EMAR 66 - section B - Subpart E refers).

For the given category/subcategory of the licence, the complete syllabus of the technical qualification held is compared with the programme in Appendix I to EMAR 66 by establishing a compliance matrix (see example in Annex 5). This matrix allows the verification that the parts of the qualification programme held cover the programme set out in Appendix I to EMAR 66 (completeness of the programme & compliance of levels of knowledge).

For each compared topic, the matrix should identify one of the following status:

- **Validation (V)**: the reference topic in Appendix I to EMAR 66 is covered by a part of the programme being compared, at an equal or higher level of knowledge, or;
- **Gap (G)**: the reference topic in Appendix I to EMAR 66 is not covered by a part of the programme being compared or is covered at a lower level of knowledge. The concerned programme part, if any, should be precisely identified.

As an outcome of this exhaustive cross-check the credit report summarizes all comparison made and should clearly mention the parts of EMAR 66 Appendix I that are proposed to be validated by examination credit

Particular attention should be paid to the identification of the technical qualification programme subject of the report (version, implementation dates, etc.) as well as the EMAR 66 version/edition used as reference.

Preparing an examination credit report is a complex and time-consuming activity that should not be performed by individuals. Therefore, it is considered good practice that such activities are reserved to:

- NMAAs, or;
- EMAR 147 MTO (Basic training), or;
- Organisations in accordance with EMAR 66 B.15.

NMMAs should also consider examination credit reports issued by CAAs in order to take them into account.

As an example, an examination credit report used by FR can be found in Annex 5.

6.2.4. Assessment/approval of examination credit report by NMAA

When receiving the credit report, the NMAA should assess its content focusing on the topics/submodules/modules of Appendix I to EMAR 66, proposed to be validated by examination credits. This work is similar to the NMAA assessment of an EMAR 66 Basic training programme during the on-desk review phase of an EMAR 147 approval audit. To this effect, the NMAA should request the applicant to:

- Provide relevant samples, selected by the NMAA, of the training programme proposed for validation, (e.g. training material of relevant submodules proposed for validation,…);

- The choice of the samples should be driven by the modules that are likely to be recognized (e.g. modules containing many submodules proposed for validation,…).

In order to simplify the process and to avoid that various isolated topics and/or submodules are recognized by examination credits, it is considered good practice that:

- a NMAA recognize only complete modules of Appendix I to EMAR 66, by examination credits;
- a minimum of 80% of the topics of the module should be validated by examination credits to recognize the complete module.

When satisfied by the content of the credit report & compliance matrix, the NMAA should complete the reserved frame "*Modules or submodules recognized by examination credits*" of the credit report, sign the credit report, return it to the applicant and then archive it.

Note:

All changes to the training programme of the technical qualification compared and/or Appendix I to EMAR 66 may impact the results of examination credits previously granted. Therefore, NMAAs should check them regularly to ensure they remain valid or if they need to be amended.

6.3. IT System

NMAAs should use a dedicated IT system for their EMAR 66 licensing activities, indeed, the use of an IT system would allow to:

- Register and print the EMAR 66 licences;
- Manage the licences identification/numbering;
- Manage all the licence changes;
- Archive all the licences issued as well as their supporting documents;
- Manage the list of the Type/Models of aircraft (cat. B & C licences) to be endorsed on the licence;
- Manage the list of the extensions to be endorsed on the licence
- Manage the list of the limitations (GFR licences) to be endorsed on the licence;
- …

Pending on the NMAA's licensing process and the IT system used (e.g. EMPIC software allows online applications,…), some NMAAs may allow the applicant (EMAR 145 MO and/or individuals) to register directly the licence information/data in the system, thus saving time for NMAAs.

6.4. Exemptions

NMAA's could develop special arrangements that may be agreed for candidates with learning difficulties or special needs when sitting licensing examinations. Exemptions may be issued to an individual or, more efficiently, as a general standing arrangement, to allow additional time, the use of laptops, reading aids or other equipment, coloured paper or large print where a candidate can prove that this is necessary to be able to complete the examination. The application process and required proof that the condition is present should be defined. As a guide, candidates with dyslexia are typically allowed an additional 25% of time to complete.

7. List of annexed/referenced documents

Many available documents (e.g. best practices, check-lists, etc.) originate from various sources (e.g. EASA, CAAs, NMAAs, etc.). Given the associated workload and, as a first step for the Edition 1.0 of the present Guide, it was considered that the most pragmatic way was to annex and/or reference them, as benchmarks/examples, in this chapter.
The following documents are examples:

- FR question set for Accountable Manager & Form 4 holders: refer to Annex 1;
- FR audit report for EMAR 147: refer to Annex 2;
- Standards for the qualification & experience of Instructors, Examiners & Assessors: refer to Annex 3;
- Standards for drafting EMAR 66 Questions for examination purpose: refer to Annex 4;
- Examination credits report (national example): refer to Annex 5;
- Conversion Report for Grandfather Rule licence (national example): refer to Annex 6.

Annex 1 - FR question set for Accountable Manager & Form 4 holders

1. Interview of the Accountable Manager

A. Conduct the interview

The objective of the interview is to ensure that the Accountable Manager (AM) is aware of the commitments he/she made through the application for an EMAR 147 approval.

After reminding the mission entrusted to the NMAA (the safety of military/state owned aircraft), the NMAA lead auditor (usually accompanied by the NMAA Airworthiness Director (AD) or his Deputy) should discuss with the AM the commitments he/she endorses in accordance with the MTOE.

B. Participants to the interview

The interview of the AM could take place as follow:

- Interview between the NMAA lead auditor/AD and the AM eventually accompanied by the EMAR Form 4 nominated managers (Training Manager, Examination Manager, Quality Manager, etc.);
- This interview could provide the opportunity for the NMAA to debrief the audit that has been carried out and to have confirmation that the AM requests effective actions from its management team and has a message in line with his/her commitment.

C. Presentation

The NMAA should briefly present its role and organization, but it should not be forgotten that it is up to the AM to present and explain how he/she intends to comply with EMAR 147/EMAR 66 requirements as regards to the MTO's mission. So, beware of the trap to focus the interview on the NMAA; the presentation of the NMAA should only be introductory, the rest of the interview must be focused on the MTO.

D. Topics to be addressed

Without wanting to put the AM in trouble, it is up to him/her to demonstrate to the NMAA that he/she masters the commitments he/she has made and therefore that he/she has a global understanding of the main areas of the EMAR 147/EMAR 66 requirements, in accordance with the scope of work of his/her MTO, namely :

- Responsibilities of the AM;
- Responsibilities of the Training Manager, Examinations Manager, Quality Manager, nominated managers,… (EMAR Form 4 holders);
- Quality system (Quality manager, AM annual review & management review...);
- Maintenance Training Organisation exposition (MTOE);
- Maintenance Training (theoretical & practical);
- Examinations;
- Human Resources;

Indeed, EMAR 147 requires that the AM should demonstrate that he has a global overview of the EMAR 147/EMAR 66 and that he has the power/levers to allow the MTO to meet the EMAR 147/EMAR 66 requirements. It is therefore the responsibility of the NMAA to discuss potential topics not covered by the AM in order to ensure that he is well informed of all the commitments incumbent upon him.

E. Questions to be asked

As mentioned above, this interview is not conducted on the basis of a NMAA checklist but by deeper discussions on points that have not been addressed. The following questions address, in a non-exhaustive way, the points that should lead to clear answers from the AM:

- What are the implications of the implementation of EMAR 147/EMAR 66 on the operation and the mission of your MTO?

- What management tools have you put in place to ensure your relationships with your nominated managers (EMAR Form 4 holders)?
- How is the Quality system implemented and what is your involvement in the follow-up of actions? corrective and preventive measures (indicators, management review, etc.)?

The NMAA has no particular information to provide to the MTO for the preparation of the AM interview, except for the framework of the meeting (meeting with the AM following initial approval request or continuing oversight), the names and functions of the NMAA interviewers.

2. Interview of EMAR Form 4 holders

A. Interview of the Training Manager

The AM is responsible for the means to be implemented to meet the EMAR 147/EMAR 66 requirements, while the Training Manager (TM) is responsible for their implementation. The TM should report to the AM any difficulties he encounters in maintaining compliancy towards the requirements.

The TM should particularly demonstrate to the NMAA:

- How he/she reports to the AM on the functioning of the MTO;
- The management tools he/she has implemented to monitor the activity of the MTO;
- How he/she monitors the implementation of the corrective actions he/she is in charge of (correction of findings from internal Quality system and/or NMAA audits).

It is the responsibility of the TM to master the main lines of the EMAR 147 scope of work covered by the MTOE and to demonstrate to the NMAA his/her involvement in the following topics:

- Maintenance Training Organisation Exposition;
- Facilities;
- Training courses & materials;
- Training planning;
- Examination and/or practical assessment process;
- Practical Training;
- EMAR 66 training syllabus.

B. Interview of the Quality Manager

The Quality Manager (QM) is not responsible for the implementation of the EMAR 147 requirements, but his/her role is to control that these requirements are met and, if necessary, to inform the AM of any dysfunction within the MTO.

The interview should highlight the direct link between the QM and the AM.

The QM should demonstrate how he/she ensures the independence of the Quality system, in particular, he/she should focus on the following topics:

- Two-year internal audit planning to cover all the EMAR 147 requirements linked to the scope of work of the MTO;
- Information feedback to the AM (management review, quality review, etc.);
- Monitoring of the follow-up of corrective actions;
- Monitoring of contractors (if any).

Annex 2 - FR audit report for EMAR 147

Type *Type:* Continuing oversight audit	**Référence de l'agrément** *Reference of approval:* EMAR/FR-147-004
Référentiel règlementaire *Regulation:* Instruction N°500557/DEF/DSAE du 18 février 2016 EMAR (FR);	***Organisme(s)*** *Organisation(s):* Navy Air Command - Maintenance Training Organisation.
Thème(s) *Topic(s):* **EMAR/FR 147**: A.100 - A.105 - A.110 - A.115 - A. 120 - A.125 - A.135 - A.140 - A.145 - A.150 - A.160	**Site(s) audité(s)** *Audited site(s):* Navy Base - LANDIVISIAU **Périmètre(s)** *Scope(s):* Type Training : **Rafale M, B & C**
Date début d'audit *Start audit date:* 27/01/20 **Date fin d'audit** *End audit date:* 31/01/20	**Catégorie(s)** *Category(ies):* - B1 - B2 - C

Responsable d'audit *Lead Auditor:* Major DUPONT Jacques

Auditeur(s) *Auditor(s):* DURAND Pierre & DELACROIX Charles

Interlocuteur(s) *Interlocutor(s):*

- Navy base accountable manager
- Navy base Quality manager
- Navy base Quality department
- Navy base Maintenance Training Organisation.

Nombre de constats *Number of findings* Constatation(s) niveau 1: 0 *Level 1 finding(s): 0* Constatation(s) niveau 2: 02 *Level 2 finding(s): 02*	**Plan d'action accepté le:** *Corrective Action Plan accepted on:* *Visa Responsable d'audit* *Lead Auditor visa* **CRIS clos le:** *Audit report closed on*: *Visa Responsable d'audit* *Lead Auditor visa*
Acceptation des constats par l'audité le: *Findings acceptance by the audited organisation:* *Nom / Fonction* *Name/rank/function* *Visa / date*	**Signature du Responsable d'audit:** *Lead Auditor visa :* *Nom / Fonction* *Name/rank/function* *Visa / date*

Constat *(finding)* **n° 1:** level 2 *Délai de traitement :* *Time limit for resolution:* *Extension du délai:* *Extended time limit for resolution:*	**Action(s) corrective(s)** *Corrective(s) action(s)*	**Traitement** *Progress*
REFERENCES: **EMAR/FR 147.A.145:** "(b) *Training, knowledge examinations and practical assessments may only be carried out at the locations identified in the approval certificate and/or at any location specified in the MTOE.* " **FINDING:** The practical Type Training site of Istres AFB, mentioned in OP 21.1.01 AERO LANDIVISIAU in the chapter "Premises dedicated to theoretical and practical Type Training of the training site", is not listed in the mapping of §" 1.6.2. Practical training sites of Type Training organisation" of PI N° 21.1.00/ALAVIA/AG-RH/PRH/NP - Edition 09 - Index A of ALAVIA (IP 21.00 MTOE) and of OP 21.1.00/AERO LANDIVISIAU/CDT/CSF/NP - Version 08 Index A. **NON-COMPLIANCE:** The list of practical Type Training sites is incomplete in the MTOE & its Annex.		*Date de clôture* *Closing Date* *Visa / date*
Commentaire(s) *Comments:*		

Constat *(finding)* **n° 2:** level 2 *Délai de traitement Time limit for resolution:* *Extension du délai Extended time limit for resolution:*	**Action(s) corrective(s)** *Corrective(s) action(s)*	**Traitement** *Progress*
<u>REFERENCES</u>: **EMAR/FR 147.A.130:** "(a) *The MTO shall establish procedures acceptable to the NMAA to ensure proper training standards and compliance with all relevant requirements in this EMAR*" **IP N° 21.1.00/ALAVIA/AG-RH/PRH/NP** - *Édition 09 - Indice A* *a) 1.3.2.3. The head of the local QUALNAV office: He ensures that local procedures comply with the MTOE and EMAR/FR 147 and reports to the Quality Director"* **OP 10.01 AERO LANDIVISIAU/CDT/BQN/NP** – *Version 04 - Ind A dated 05/11/18* *3 Definition of Editorial Responsibilities* *If local MTOs draft a document relating to EMAR/FR 147, the local executive concerned as well as the Airworthiness Quality Office, are secondary verifiers.* **<u>FINDING:</u>** On the "Intradef" network, the documentary reference for BAN de Landivisiau site is: - OP 21.1.01 /AERO LDV/AU/COMAEQ/SF/NP of 31/10/19 up to date of mod.1 of 15/01/2020 - OP 21.0.01/AERO LDV/RLF/NP of 23/01/20 - OP 21.0.03/AERO LDV/COMAEQ/SF/NP of 18/12/2018 These three OPs do not have the local Airworthiness Quality signature. **<u>NON-COMPLIANCE:</u>** The MTO cannot demonstrate compliance of local procedures with MTOE and EMAR/FR 147/66.		Date de clôture *Closing Date* *Visa / date*
Commentaire(s) *Comments*:		

Conclusion(s) et proposition de décision: *Conclusion(s) and draft decision*

No major non-compliance likely to hamper the EMAR/FR 147 approval held was detected during this audit.

The audit took place in excellent conditions, and the audited staff demonstrated a very good involvement in the consideration of EMAR/FR 147 regulation.

Discussions were very constructive and were conducted in a transparent manner from both sides. The BAN site in Landivisiau showed a strong commitment to maintain its approval.

The protocol linking the Rafale CFR in Mont de Marsan and the SIT at Landivisiau has to be re-assessed quickly. This re-assessment should enable the 2 MTOs to refine their practices and exchanges.

Therefore, the lead auditor recommends to maintain the validity of the EMAR/FR 147-004 approval of the "FORCE D'AERONAUTIQUE NAVALE ALAVIA", on the Rafale M, B and C scope.

Annex 3 - Standards for the Qualification & Experience of Instructors, Examiners & Assessors

Table 1 - Qualifications & Experience requirements of Instructors, Examiners & Assessors - Basic Training

Personnel	Qualification/ experience			
	Specialty Knowledge (SK) see criteria in Table 3	**Pedagogical Skills (PS)** see criteria in Table 4	**Other Knowledge (OE)** see criteria in Table 5	**Specialty Experience (SE)** see criteria in Table 6
Instructors (Theoretical knowledge)	SK1 or SK2 or SK3 or …	PS1 or PS2 or PS3 or PS4 or PS5 or PS6 or …	OE1 and OE2 and OE3 or …	SE1 or …
Instructors (Practical knowledge)				
Examiners (Theoretical knowledge)				
Assessors (Practical assessment)				

Table 2 - Qualifications & Experience requirements of Instructors, Examiners and Assessors - Type Training

Personnel	Qualification/ experience			
	Specialty Knowledge (SK) see criteria in Table 3	**Pedagogical Skills (PS)** see criteria in Table 4	**Other Knowledge (OE)** see criteria in Table 5	**Specialty Experience (SE)** see criteria in Table 6
Instructors (Theoretical knowledge)				
Instructors (Practical knowledge)				
Examiners (Theoretical knowledge)				
Assessors (Practical assessment)				

Table 3 - Specialty Knowledge (SK) Criteria

Category	Description
SK1	Preferably hold an EMAR 66 licence applicable to the relevant category/subcategory/topics to be taught.
SK2	Provide evidence of previous employment as a technical training instructor.
SK3	Hold an academic engineering degree in a technical discipline consistent with the modules/submodules/topics to be taught.
SK4	…

Table 4 - Pedagogical Skills (PS) Criteria

Category	Description
PS1	Instructor certificate acceptable to the NMAA to a national recognised standard, where the instructor will exercise his/her privileges.
PS2	Evidence completion of a “Train the trainer course” to a nationally recognised standard.
PS3	Assessment performed and documented by MTO’s Training Manager (if himself appropriately qualified as practical instructor and iaw an MTOE procedure) and be acceptable to the NMAA, following an in-situ audit in actual training conditions.
PS4	Instructional techniques training course
PS5	Academic teaching qualifications **Note:** For individuals nominated to teach Modules 1-6 and 8-10 only.
PS6	…

Table 5 - Other Knowledge (OE) Criteria

Category	Description
OE1	Comprehensive understanding of the EMAR 66 and 147 requirements
OE2	Practical working knowledge of the Maintenance Training Organisations Exposition (MTOE) and associated training procedures
OE3	…

Table 6 - Specialty Experience (SE) Criteria

Category	Description
SE1	1 year of relevant experience in a military/civil aviation environment for those instructors nominated to teach modules 11-17. 1 year of relevant experience in a military aviation environment for those instructors nominated to teach modules/submodules 50-55. 3 years of relevant experience in military/civil aviation maintenance environment, or acceptable equivalent, for those instructors nominated to teach module 7. **Note:** No additional requirement has been defined for instructors nominated to teach the remaining Modules of EMAR 66 Basic Training syllabus.
SE2	…

Annex 4 - Standards for drafting EMAR 66 Questions for examination purpose

1. Question design

1.1. Formal construction at computer compatible questions

1.1.1. Standard question elements

For each question the following construction is defined as standard:

- Element 1: Header (General data)
- Element 2: Question (Type)
- Element 3: Annex(es) (to the specific question)
- Element 4: Statistics / Feedback

Question System Elements	
Header	Annex(es)
Question (-type)	Statistics / Feedback

1.1.1.1. Question Header

The header of a question describes all existential information behind the question (and answer) text. They are necessary for an effective and time saving administration of larger data bases.

Examples are …

- Question ID,
- Creation Date,
- Last update Date,
- Status flag,
- Reference to learning objective,
- Reference to module and syllabus paragraph / subparagraph, Level, Category,
- Scheduled working time,
- Difficulty Level.

1.1.1.2. Question Types

Following question types are allowed to be used:

- Multiple-choice question with 3 answers and 1 correct answer
- Essay questions

1.1.1.3. Annex(es)

In this context, an Annex refers to a document that is needed to solve the question(s). One or more Annexes may be needed to solve a particular question[2].

Annexes should not be larger than A4 and in good clear quality and suitable for the purpose of solving the question. They can be used as prints as well as digitized documents in the format jpg, gif or png for computer-based examinations.

1.1.1.4. Feedback information (Quality circle)

(a) Automatic report (Self-assessment of questions)

The future of examining is in computer-based examinations, which will also make possible the reporting back of candidates' inputs as an automatic and ongoing procedure. Each time a question appears in an examination the software will create a new entry in the feedback list. With this function, it can be recognized if the question fulfils the expected value (for example, not too easy and not too difficult, or if the question has a misleading

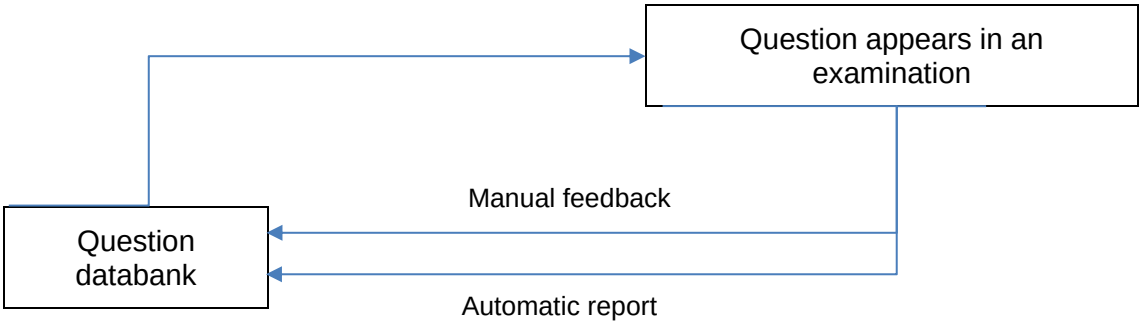
[2] Please refer to chapter 5 'Use of Diagrams' for more details

nature). If the software in use supports the functions, the feedback can lead to an automatic assessment of the questions.

(b) Manual feedback

As an additional function, it is possible to enable candidates to type in comments concerning the unsuitability of the current question. This would enable to access the candidates' comments in this regard.

(c) Overview feedback quality circle



2. Standards

2.1. Principal standards

(a) Questions must be written in Aviation language.

(b) Questions that require specialized knowledge of specific aircraft types should not be asked in a basic licence examination.

(c) Multiple-choice question must have at least 3 alternative answers of which only one must be the correct answer and the candidate must be allowed a time per module which is based upon a nominal average of 75 seconds per question for Basic training examinations and a nominal average of 90 seconds per question for Type training examinations.

(d) The primary purpose of essay questions is to determine that the candidate can express themselves in a clear and concise manner and can prepare a concise technical report for the maintenance record, which is why only a few essay questions are required. The candidate must be allowed a time per essay question of 20 minutes.

(e) The examination should measure clearly formulated goals. Therefore, the field and depth of knowledge to be measured by each question must be fully identified.

(f) For pass mark purposes, the essay questions should be considered as separate from the multiple-choice questions.

(g) For a better descriptiveness and in order to remain close to reality, the use of diagrams is particularly suitable. The use of diagrams in questions should follow to the guidance of the chapter 5 "Use of Diagrams".

(h) Calculators are not allowed during examination. Therefore, all calculations should be feasible without a calculator. Where a question involves calculations not feasible without a calculator, such as $\sqrt{10}$, then the question should specify the approximate value of $\sqrt{10}$.

(i) The use of abbreviations, and acronyms should generally be avoided. However, where needed, only internationally recognized abbreviations, acronyms should be used. In case of doubt use the full form, e.g. angle of attack = 12 degrees instead of a= 12°. This means, for example, that only abbreviations commonly employed in the specialist field are used, without an additional spelled-out explanation in brackets.

(j) The use of units must follow the international rules and style conventions[3].

(k) Questions must be referred to the syllabus, the category and the learning objectives.

(l) The layout of question should be homogenous. Only one font may be used for the question and the answer text. For the better optical distinction the additional elements like statements, situations or scenarios should be distinguished homogeneously by using different colors. The direct question text should be of course identifiable. It should be separated from opening text by an empty line, always begin at a new line and positioned at the end of the question text.

2.2. Ongoing Quality Circle

Before a question appears in an examination it should be checked by one or more module experts and by trainees in the advanced stage. Their judgment guarantees the clear understanding of the meaning of a question and its reply.

The steps below show a standard quality process workflow:

1. Author(s) write questions
2. Experts review questions
3. Experts decide and release the question when it is ok
4. Question appears in exam
5. Examination/Question feedback:
    - If the question is ok => question stays in the bank
    - If the question is not ok => go back to steps 1 and 2

2.3. Analysis of examination results

The examination results should be analyzed by the organisation as part of the quality control and review of all examination records. The analysis of examination results of completed training course should include the calculations for all examination phases as summarized below:

- Invalid questions
- Invalid answers
- Low passing rate calculation
- Trainees passing rate
- Course passing score
- Trainees critiques summary
- Notables Trainees comments
- Course overall rate

In case the organisation identifies invalid questions and/or answers generated from question database, corrective action is required. The affected invalid questions and/or answers will be corrected, modified or removed from the database, under responsibility of examination manager.

Low passing rate calculation: 75% or more of trainees answered incorrectly to particular question may state that:

- The question is ambiguous;
- The issue has not been addressed in the course;
- The question is too difficult;
- Model answer is incorrect.

In case the organisation identifies low passing rate by trainees in any of examination phases, corrective action is also required. The examination manager should review low passing rate affected questions and should make decision which question to be corrected, modified or removed from the database; however, the results of this review will not be changed.

[3] A PDF file of units of measurement can be found at http://ts.nist.gov/WeightsAndMeasures/Metric/upload/EUMetricDirective2010.pdf
Refer also to SI Unit rules and style conventions, National Institute of Standards and Technology (NIST),

2.4. Question Review Checklist

The main purpose of the question review checklist is to help evaluating existing question against the basic standards described in this methodology. Most existing questions are likely to be reviewed by using software on a personal computer which allows a more comfortable working method compared with paper-based working. But if no such system is available this checklist can support the evaluation process.

Hereafter an example for EMAR 66:

EMAR 66 Question Review Check List									
Name:							Module:	Date:	
Question Number	Relevance to EMAR 66 Syllabus	Conformity with EMAR 66 Level & Category	Content check & Justification of False answers	Conformity with EMAR 66 Formal Question Standard	Conformity with EMAR 66 Wording Question Standard	Simplicity & correctness of the English language	**Remark**	**Proposal**	**Validation**
1	□	□	□	□	□	□			□
2	□	□	□	□	□	□			□
3	□	□	□	□	□	□			□
4	□	□	□	□	□	□			□

3. Setup Multiple-choice Questions

3.1. Preface

Multiple-choice questions are not a panacea. They have advantages and limitations just as any other type of question. Authors of questions need to be aware of these characteristics in order to use multiple-choice questions effectively. Multiple-choice questions are appropriate for use in each syllabus[4], and can be used to measure a great variety of educational objectives. They are adaptable to the learning objectives[5], from simple recall of knowledge to more complex levels, such as the applicants' ability to:

- analyze phenomena,
- apply principles to new situations,
- comprehend concepts and principles,
- discriminate between fact and opinion,
- interpret cause-and-effect relationships,

[4] Example: refer to EMAR 66 - Appendix I & Appendix III
[5] Example: refer to EMAR 66 - Appendix I 1 Appendix III

- interpret charts and graphs,
- judge the relevance of information,
- make inferences from given data,
- solve problems.

The difficulty level of multiple-choice questions can be ensured by rephrasing the answers and/or changing the order of the alternatives.

3.1.1. Validity

In general, it takes much longer to respond to an essay test question than it does to respond to a multiple-choice question, since the composing and recording of an essay answer is such a slow process. A candidate is therefore able to answer many multiple-choice questions in the time it would take to answer a single essay question. This feature enables to test a broader sample of the syllabus in a given amount of testing time. Consequently, the test is likely to be more representative of the candidates overall achievement.

Ultimately, the validity (and reliability) of the examination depends on the quality of the individual questions. Questions are most likely to be suitable for use in an examination when they fulfil the criteria below. The following principles should be observed when developing multiple-choice questions.

A question will contribute to the validity of the examination, if following conditions are considered:

(a) The chosen subject matter of the questions is relevant to the practical work. Splitting hairs should be avoided, as should be trivialities.

(b) The level is correct. An examination which is primarily intended to test the understanding and application competence of knowledge should not consist of questions that merely require the availability of memorized individual facts.

(c) It focuses on a clearly defined content or problem and is a self-contained entity.

(d) There is clearly one true solution. Content on which there are controversial scholarly opinions are unsuitable for the multiple-choice method, unless a specific scholarly opinion is expressly asked for.

3.1.2. Difficulty of Construction

Good multiple-choice questions are generally more difficult and time-consuming to write than other types of questions. Coming up with plausible alternative answers require a certain amount of skill. This skill, however, may be increased through study, practice, and experience.

3.2. Writing Multiple-choice Questions

These instructions describe the methodology to be followed when writing multiple choice questions. Behind a description of general rules, correct phrasing and avoidance of unintended cues, the instructions are illustrated as far as possible with question examples. Whenever necessary an example will illustrate the use of the relevant rule, by comparison of a poor solution with a better solution. Please do not use any of the example questions for a real examination. The used examples in this guidance manual are only designed to show the principles of the relevant rule. It needs to be emphasized here that the present instructions neither replace experience nor do they save the time commitment required to produce good multiple-choice elements. New authors are recommended to learn writing and revising multiple-choice elements at a workshop lasting at least one day. Ideally, authors should furthermore be regularly kept up to date about the results of their reviewed questions so that they are able to learn from their mistakes (see also 1.1.1.4.). Producing questions takes time: even practised authors take at least one hour to produce a multiple-choice question (see also 5.).

3.2.1. Anatomy of a Multiple-choice Questions

A multiple-choice question consists of two basic parts:

- The question text, which can be just a question or a problem (situation/scenario). The problem may be in the form of either a direct question or an incomplete statement.

- The list of answers. It has one true answer and two incorrect answers.

Multiple-choice Question:

"*The valve which allows oil to either flow through or by-pass a serviceable engine oil cooler is:*

a. pressure activated => False

b. pneumatically activated => False

**c. temperature activated"* => True

3.2.2. Multiple-choice question types

Multiple-choice "1 from 3" can be raised as

- Positive single choice out of three answers to choose from
- Negative single choice out of three answers to choose from Often the positive form of multiple-choice questions is as well suited as the negatively phrased type, with regard to validity as well as reliability.

3.2.3. Principals of writing Multiple-choice Questions

When devising multiple-choice elements as a part of a multiple-choice question the questions thus produced should, as a rule, test more than mere factual knowledge and be largely free from formal errors. They should be good enough to ensure the validity and reliability of an examination

If multiple-choice questions are to test more than factual knowledge, complex problems need to be presented which contain several pieces of information that need to be interpreted and integrated. Good questions therefore frequently require an elaborate core. The following principals should be observed when developing multiple-choice questions.

3.2.3.1. Specifications to write Multiple-choice Question Text

(a) In multiple-choice questions, answers will often have to be weighed. In almost all cases, this is only possible if they are short and clear. The question formulation (statement, situation, scenario) may be long, but the answers should be short!

- Good structure: long core with information part and question, short answers
- Bad structure: short core or question, long answers

(b) Questions and answers should be formulated as simply as possible: the examination is not a test of language. Complex sentences, unusual grammar and double negatives should be avoided. Questions should not deliberately be made complicated or intentionally designed as trick questions. When phrasing questions you should ensure that the question text:

- contains all the information required for the answer so that no additional information needs to be given in the answer,
- does not, as a rule, contain superfluous information: The exception is a question intended to test the ability to filter out relevant information. But otherwise precious time would be wasted by including unnecessary text,
- should always be phrased positively: Negative questions are not desirable from a validity point of view. A negative phrasing of the question text will invariably result in confusing double negatives.

(c) The difficulty of a question should be determined by the complexity of the underlying problem, the level (understanding, problem solving), and the subtlety of the required differentiation (proximity of the possible answers to each other). It is unfair and certainly contrary to the intention of the test to use formal tricks in order to make a simple question more difficult.

What does the subject matter of the question aim at?

The syllabi specify the topics on which questions must be written. Questions should always refer to a narrow aspect, i.e. at the lowest level. This avoids questions that are too abstract.

If the following question is asked on an EMAR 66 Module 1 subject:

"Which of the following statements about percentage calculation applies?"

The subject is certainly too broad and too heterogeneous for a multiple-choice question.

Relevant questions within a topic are derived mainly from the detailed aspects

- a maintenance technician is most frequently faced with,
- where errors may have grave consequences,
- where erroneous views are widespread.

To check the relevance of the intended topic one may ask the question:

"How important is it that the candidate is able to solve this problem independently or answer the resulting question correctly?"

Starting from your own experience or from a specific non-binding request from a non-specialist can produce extremely application-based and relevant questions.

However, care should be taken not to pick "interesting" special cases.

It is important to use textbooks to verify and document the factual accuracy of a question and the true answer(s). Textbooks may also be helpful for finding good false answers. However, their usefulness as a source of inspiration for questions is limited. Although, whenever the intention is to test theoretical knowledge in the narrower sense (basic knowledge), textbooks do have a place in assisting to phrase or copy questions to test learning objectives. However, this procedure often produces purely academic questions, the suitability of which for testing competence is doubtful.

Check the relevance of the intended topics to the application by asking the question:

"Will an applicant be faced with this problem/question in practice?"

Question texts can consist of a single question:

"*Which of the following item influences the operation of an automatic fuel control unit on a turbojet engine*?"

Or a statement:

"*The active clearance control (ACC) portion of an EEC system increases turbine engine efficiency by*:"

Although it is possible to test relevant knowledge using such texts, they merely test factual knowledge as a rule.

But multiple-choice questions can be and should be also used to test the ability to interpret and to integrate information, and to apply theoretical knowledge to a specific problem.

For this, the question texts should present information about a problem. This, for example, could be a technical case study (fault, repair measures to be taken, etc.).

The concrete short question follows separately:

"*You find that there is exterior damage to a light-alloy propeller blade. The damage consists of slight indentations and notches caused by stones.*

What is the correct assessment?"

The information section can contain illustrations, e.g. photographs, graphics, or checklists etc.

3.2.3.2. Specifications to write Multiple-choice Answer Text

Badly chosen and/or phrased answers in a relevant problem situation frequently result in entirely unsuitable questions. To contribute to the validity and reliability of a test, finding the right answer should only depend on whether the knowledge to be tested is available, if possible. To achieve this, the possible answers need to meet a series of content, formal and linguistic criteria.

(a) A question should comprise one complete positive answer.

(b) The correct answer should be absolutely correct and complete or, without doubt, the most preferable. Responses that are so essentially similar that the choice is a matter of opinion rather than a matter of fact should be avoided. The main interest in multiple-choice

questions is that they can be quickly performed: this is not achieved if doubt exists about the correct answer. The right answer should definitely be the only correct one.

(c) Each possible answer should be short and only contain one statement.

(d) All possible answers should fall into the same category, i.e. they should be homogenous in content (e.g. all measurement units, all diagnoses, all causes, all steps/measures, etc.).

(e) There should be good reasons for any false answer. For example, these may be frequent erroneous opinions, wrong concepts, outdated views, etc. There should at least be a clearly understandable relationship with the question subject matter. A justification for each false answer should be written.

(f) Even bad candidates will be able to immediately exclude such implausible, trivial or totally nonsensical false answers. This increases the chance to guess the right answer. It makes no sense at all to provide an absurdity as a false answer.

(g) Overlapping answers should only be used if the underlying problem requires it. They should not be used to intentionally make a question more difficult.

(h) Phrases such as “All the above” or answers such as “Both B as well as C are right” should not be used. If this is the intended right answer, then more than one right answer exists and a matching question should be taken in mind.

(i) The false alternatives should seem equally plausible to anyone ignorant of the subject. All of the alternatives should be clearly related to the question and of similar vocabulary, grammatical construction and length. In numerical questions, the incorrect answers should correspond to procedural errors such as corrections applied in the wrong sense or incorrect unit conversions: they should not be mere random numbers.

False answers do not need to differentiate themselves from the right answer in an obvious way. It is possible to ask candidates to weigh up various different shades of grey.

(j) The answers should be randomised in an individual examination[6].

3.2.3.3. Formal aspects

Formal criteria are mainly about avoiding any unintended hints at the solution, the “cues”. Cues enable MC experienced candidates to identify the correct answer even without any specialist knowledge, or to eliminate incorrect answers thus improving their chance of guessing the correct one. The second objective is to minimize the influence of particular answering trends by candidates. The following examples will illustrate the most important and most frequent cues by these nonsense questions. Therefore, do not attempt to answer the following questions with regard to the content:

(a) False answers should be almost of the same length and have the same level of differentiation as the correct answer.

Example of an incorrect phrasing:

“*How often can a locknut with fibre ring be used?*

a. twice

b. always once only

c. four times”

Authors are obviously focused on the correct answer and they try to phrase this as precisely as possible. Little attention is paid to the false answer, which is perceived as a mere “background noise”. Candidates who are experienced in tests would have a good chance of success by selecting answer “b.”. It is not always possible to produce answers that are of equivalent length and complexity. However, authors should ensure that the correct answer does not stand out.

[6]This means, the same question will have a different sequence in any individual examination it appears. Even when printing a paper & pencil examination pattern it can be generated with randomized answer.

(b) All answers should fit the question text grammatically.

Example of an incorrect phrasing:

"*The information is part of an:*

a. Annex

b. Book

c. Picture "

For reasons of grammar (an Annex, a Book, a Picture, a Video), only (a.) can be the correct answer. It probably happens rarely that two answers can be eliminated, but it will frequently happen that some will not be considered. To check, authors should read each answer together with the question when checking consistency.

(c) Avoid verbal associations between question text and correct answer.

Example of an incorrect phrasing:

"*The characteristic of a T-tail unit is…*

a. Rudder and elevator form a U

b. Rudder and elevator form a T

c. Rudder and elevator form a Y"

Since the letter T appears in both (question text and answer b.), it will increase the likelihood of it being the correct answer. The guessing can be avoided by re-phrasing it or by adding an illustration:

Example of a better presentation of the question:

"*The tail unit of the shown aircraft is ...*

a. a cross tail unit

b. a T-tail unit

c. a V tail unit"

(d) Hidden clues to the right answer should be avoided.

Example of an incorrect phrasing:

"*A connection screw can be installed in two different positions. Which location is correct from safety point of view?*

a. The nut must be installed at the bottom, because the bolt will not fall out even when the nut is lost.

b. The nut must be installed at the top, because it is easier to tighten it.

c. The nut can be installed as desired, depending on the working position."

Answer (a.) will be identified as right even without specialist knowledge since it comes complete with a safety reason.

(e) Absolute terms such as "never", "always" should not be used in order to make statements clearly false. Such absolutes often enable false answers to be identified intuitively. The desired statement is usually clear even without the addition of absolutes.

Example of an incorrect phrasing:

"*a. The nut must be installed at the bottom.*

b. The nut must always be installed at the top.

c. The nut may be installed as desired."

3.2.3.4. Measuring Higher-Level Objectives with Multiple-choice Questions

Multiple-choice questions are frequently used to measure lower-level objectives, such as those based on knowledge of terms, facts, methods, and principles like knowledge level 1[7]. The real value of multiple-choice questions, however, is their applicability in measuring higher-level objectives, such as those based in comprehension, application, and analysis like knowledge level 2 and 3 of EMAR 66[8].

(a) Comprehension

Objective: Identifies the effect of changing a parameter (rule using).

"A pendulum consists of a sphere hanging from a string. What will happen to the period of the pendulum if the mass of the sphere is doubled? (Assume that the effects of air friction and the mass of the string are negligible, and that the sphere traces an arc of 20° in a plane as it swings.)

a. It will increase.

b. It will decrease to half of it.

**c. It will remain unchanged."*

(b) Application

Objective: Identifies the correct application of principle (problem solving).

"[Diagram to be included here.]

In the diagram above, parallel light rays pass through a convex lens and converge to a focus. They can be made parallel again by placing a:

a. Concave lens at point B.

b. Second convex lens at point B

**c. Second convex lens at point C"*

(c) Analysis

Objective: Analyzes manual text and identifies patterns and relationships.

"[Manual text to be included here.]

The chief purpose of statement XY is to:

a. show relation between part 7 and instruction XY

**b. show relation between part 9 and instruction XY*

c. show relation between part 10 and instruction XY".

3.2.4. Examples

3.2.4.1. Example 1: Positive single choice from three answers to choose from

Definition: Three possible answers or additions to a question or incomplete statement, from which the only right answer should be selected.

Question:

"*In an aircraft with an empty weight of 2100 lbs and an empty weight CG position of +32.5 inches the following changes were made:*

a. Two 18 lbs passenger seats at station +73 were removed.

b. A modification to the structure was performed at station +77 which increases the weight by 17 lbs.

c. A seat including safety belt weighing a total of 25 lbs were installed at station +74.5.

d. An additional NAV device weighing 35 lbs was installed at station +95."

...and the appropriate question in the form of a question:

"*What is the new empty weight CG?*"

[7] Refer to EMAR 66 Appendix I (1.)
[8] Refer to EMAR 66 Appendix I (1.)

... or an alternative statement:

"*The new empty weight CG is…*"

There is only one right answer amongst the three answers to choose from. The other two serve as false answers.

"*a. 30.01*

b. 33.68

c. 34.65"

3.2.4.2. Example 2: Negative single choice from three answers to choose from

Definition: A question or incomplete statement is followed by three answers or additions from which to choose the exception or the least applicable. The negation should be either bolded or underlined.

This question type can be used in those rare cases where knowledge of an important exception is essential. What is actually being tested is the knowledge of the three positive answers. The "right" answer is merely a by-product of the solutions.

However, you should always ask yourself whether a positively formulated question, e.g. knowledge of key (facts/important regulations, right results, most likely consequences) might not be more relevant and more in line with actual use.

Question:

"*In an aircraft with an empty weight of 2100 lbs and an empty weight CG position of +32.5 inches the following changes were made:*

1. Two 18 lbs passenger seats at station +73 were removed.

2. A modification to the structure was performed at station +77 which increases the weight by 17 lbs.

3. A seat including safety belt weighing a total of 25 lbs were installed at station +74.5."

...and the appropriate question in the form of a question or a statement:

"*Which item is NOT relevant?"*

… or alternative:

"*NOT relevant is:"*

There is only one true answer amongst the three answers to choose from. The other two serve as false answers.

"a. 1

b. 2

c. 3"

"*Which of the following is NOT a good argument in a conflict situation about the correct repair?*

**a. "I am the chief, follow my instructions!"*

b. "Follow the instructions of the textbook!"

c. "Ask a colleague to get more information!"

For most educational objectives, candidate's achievement is more effectively measured by having him or her identify a correct answer rather than an incorrect answer. Just because the candidate knows an incorrect answer does not necessarily imply that he or she knows the correct answer. For this reason, questions of the negative variety are not recommended for general use. Occasionally, negative questions are appropriate for objectives dealing with safety issues, where knowing what not to do is important. In these situations, negative questions should be carefully worded to avoid confusing the candidate. The negative word should be placed in the question text, not in the alternatives. In addition, each of the alternatives should be phrased positively to avoid forming a confusing double negative with the question text.

Poor Example:

"*All of the following are correct actions for putting out a fire in a pan on the stove EXCEPT:*

a. Do not move the pan.

**b. Pour water into the pan.*

c. Slide a fitted lid onto the pan."

Better Example:

"*All of the following are correct actions for putting out a fire in a pan on the stove EXCEPT:*

a. Leave the pan where it is.

**b. Pour water into the pan.*

c. Slide a fitted lid onto the pan."

3.2.4.3. Example 3: Each question assess a single written objective

Questions that are not written with a specific objective in mind often end up measuring lower-level objectives exclusively, or covering trivial material that is of little educational worth. Often a situation is the foundation of the question. After reading the situation, the candidate should know exactly what the problem is and what he or she is expected to do to solve it. If the candidate has to infer what the problem is, the question will likely measure the candidate's ability to draw inferences from vague descriptions rather than his or her achievement of a module objective.

Objective: Applicant knows the chief difference between production of lift of helicopters and airplanes.

Poor Example:

"Helicopters:

**a. Need a rotor.*

b. Need wings.

c. Need a long runway."

Better Example:

"In order to fly there is a difference in principle between helicopters and airplanes to produce lift. What is the correct answer ?

a. Helicopters use a rotor system; airplanes use vertical jet propulsion.

b. Helicopters use a rotor system; airplanes use a vertical propeller system.

**c. Helicopters use a rotor system; airplanes use wings."*

3.2.4.4. Examples 4: Direct Question

As illustrated in the following examples, the questions may consist of either a direct question or an incomplete sentence, whichever presents the problem more clearly and concisely.

"In the vast majority of civilian airplanes in which seat does the pilot in command sit?

**a. Left-hand.*

b. Right-hand.

c. Preferred seat."

If the question is opened by a statement or a scenario the direct question should be separated clearly from the preliminary information by a following empty line. The direct question should begin in a new line and should – if possible – appear in a different color.

Poor Example:

"For most FMS the Fuel prediction function, which computes the remaining fuel along the flight plan, takes into account the following situations:

1- the additional drag resulting in a flight carried out with the landing gear extended.

2- the current wind computed or the resulting ground speed.

3- the additional drag resulting in a flight carried out with the flaps stucked, partly extended. What is the correct combination?"

Better Example:

"For most FMS the Fuel prediction function, which computes the remaining fuel along the flight plan, takes into account the following situations:

1- the additional drag resulting in a flight carried out with the landing gear extended.

2- the current wind computed or the resulting ground speed.

3- the additional drag resulting in a flight carried out with the flaps stucked, partly extended.

What is the correct combination?"

3.2.4.5. Example 5: Incomplete Sentence

"The pilot in command sits in the vast majority of civilian airplanes in?

**a. the Left-hand seat.*

b. the Right-hand seat.

c. the Back seat."

3.2.4.6. Example 6: Optimization of question text phrasing

Excess material in the question text that is not essential to answering the problem increases the reading burden and adds to candidate's confusion over what he or she is being asked to do.

Poor Example:

"Suppose you are a mathematics professor who wants to determine whether or not your teaching of the unit on probability has had a significant effect on your candidates. You decide to analyze their scores from a test they took before the instruction and their scores from another exam taken after the instruction.

Which of the following t-tests is appropriate to use in this situation?

**a. Dependent samples.*

b. Independent samples.

c. Heterogeneous samples."

Better Example:

"When analyzing your candidates' pre-test and post-test scores to determine if your teaching has had a significant effect, an appropriate statistic to use is the t-test for:

**a. Dependent samples.*

b. Independent samples.

c. Heterogeneous samples."

The question text of the poor example above is excessively long for the problem it is presenting. The question text of the better example has been reworded to exclude most of the irrelevant material, and is less than half as long.

3.2.4.7. Example 7: Optimization of answer text phrasing

Include as much of the question as possible in the question text, but do not include irrelevant material.

Rather than repeating redundant words or phrases in each of the alternatives, place such material in the question text to decrease the reading burden and more clearly define the problem in the question text.

Poor Example:

"If the pressure of a certain amount of gas is held constant, what will happen if its volume is increased?

a. The temperature of the gas will decrease.

**b. The temperature of the gas will increase.*

c. The temperature of the gas will remain the same."

Better Example:

"*If you increase the volume of a certain amount of gas while holding its pressure constant, its temperature will:*

a. Decrease.

**b. Increase.*

c. Remain the same."

Notice how the underlined words are repeated in each of the alternatives in the poor example above. This problem is fixed in the better example, where the question text has been reworded to include the words common to all of the alternatives.

3.2.4.8. Example 8: Keep the answers mutually exclusive

Answers that overlap create undesirable situations. Some of the overlapping answers maybe easily identified as false answers. On the other hand, if the overlap includes the intended answer, there may be more than one answer that can be successfully defended as being the answer.

Poor Example:

"If an 80 ohm coaxial cable is connected to an 80 ohm dipole aerial, resistance would be:

a. more than 60 ohm

b. less than 160 ohm

c. 80 ohm"

Better Example:

"If an 80 ohm coaxial cable is connected to an 80 ohm dipole aerial, resistance would be.

a. 60 ohm

b. 160 ohm

c. 80 ohm"

In the poor example above, all the answers overlap. In the better example, the answers have been rewritten to be mutually exclusive.

3.2.4.9. Example 9: Keep the answers homogeneous in content

If the answers consist of a potpourri of statements related to the question text but unrelated to each other, the candidate's task becomes unnecessarily confusing. Answers that are parallel in content help the question present a clear-cut problem more capable of measuring the attainment of a specific objective.

Poor Example:

"Boeing 747 is widely known as:

**a. The airplane called "Jumbo-Jet".*

b. The airplane with a good reliability.

c. Best-selling airlines airplane."

Better Example:

"Boeing 747 is widely known as:

**a. "Jumbo-Jet".*

b. "Walrus-Jet".

c. "Elephant-Jet".

The poor example contains answers testing knowledge of maintenance aspects (reliability), market position (bestselling) and nicknames. If the applicant misses the question, it does not tell the examiner in which of the four areas the candidate is weak. In the better example, all of the answers refer to nick names, so if the candidate misses the question, it tells the examiner that the candidate has a weakness in that area.

3.2.4.10. Example 10: Keep the grammar of each answer consistent with the question text

Candidates often assume that inconsistent grammar is the sign of a false answer, and they are generally right.

Poor Example:

"A word used to describe a noun is called an:

**a. Adjective.*

b. Conjunction.

c. Pronoun."

Better Example:

"A word used to describe a noun is called:

**a. an adjective.*

b. a conjunction.

c. a pronoun."

3.2.4.11. Example 11: Keep the answers similar in length

An answer noticeably longer or shorter than the other is frequently assumed to be the answer, and not without good reason.

Poor Example:

"If the static source of an altimeter becomes blocked during a descent the instrument will:

**a. continue to display the reading at which the blockage occurred.*

b. gradually indicate zero.

c. under-read."

Better Example:

"If the static source of an altimeter becomes blocked during a descent the instrument will:

**a. continue to display the reading at which the blockage occurred.*

b. gradually indicate zero shortly after which the blockage occurred.

c. under-read shortly after which the blockage occurred."

Notice how the answer stands out in the poor example above. The false answers have been reworded in the better example to make the answer lengths more uniform.

3.2.4.12. Example 12: Avoid the use of specific determiners

When words such as never, always, and only are included in false answers in order to make them false, they serve as flags to the alert candidate.

Poor Example:

"A lead-acid battery is considered to be fully charged

a. always when the SG reaches 1.180.

**b. always when cells begin to gas freely.*

c. when SG and voltage never remain constant."

Better Example:

"A lead-acid battery is considered to be fully charged when the

a. SG reaches 1.180.

**b. cells begin to gas freely.*

c. SG and voltage remain constant."

In the poor example above, the underlined word in each of the false answers is a specific determiner. These words have been removed from the better example by rewording both the question text and the false answers.

3.2.5. General Checklist Multiple-choice Question

It is recommended to use a check-list when drafting a multiple-choice question.

EMAR 66	General Checklist Multiple-choice
Item	**Check**
Learning Objective(s)	□ Identification of the assigned learning objective(s)
Relevance to EMAR 66 Appendix 1 & Appendix III syllabus	□ Consistency between proposed question and EMAR 66 Module/Topic □ Consistency between Module/Topic and licence category □ Conformity with Appendix I & Appendix III examination levels
Conformity with question standard	□ Wording of the question in compliance with the setting up methodology □ Format of the question in compliance with the setting up methodology □ Abbreviations in compliance with the setting up methodology □ The use of unit in compliance with international and national rules and style conventions[9]
Clarity and correctness of the language	The specification ASD-STE-100 (Aerospace and Defence, Industries Association of Europe) European Community Trade Mark No. 004901195) may be used. http://www.asd-europe.org http://www.asd-stan.org/sales/asdocs.asp

[9] A PDF file of units of measurement can be found at:
http://ts.nist.gov/WeightsAndMeasures/Metric/upload/EUMetricDirective2010.pdf
- Refer also to SI Unit rules and style conventions, National Institute of Standards and Technology (NIST),

3.2.6. Wording Checklist Multiple-choice

EMAR 66	Wording Checklist Multiple-choice
Item	**Check**
Content	□ Is the question really relevant? □ Is the knowledge level adequate? □ Is the content indisputable? □ Is the information sufficient? □ Is the wording clear and unequivocal? □ Are all abbreviations, technical terms and foreign words known by the target group?
Question	□ Can one find the correct answer without reading the alternative answers? □ Are negations highlighted? □ Isn't the question a catch question?
Answers	□ Is the true answer clearly recognizable? □ Are the false answers plausible and justified? □ Are the choice answers homogeneous with regard to text length and grammar? □ Are double negations avoided? □ Are absolute statements avoided ("always", "all", never")? □ Are word repetitions avoided from the problem description?
Embedded diagrams (If necessary)	□ Are all graphics available in the correct version? □ Are all graphics in readable conditions?
Annexes (If necessary)	□ Are all annexes available in the correct version? □ Are all annexes in readable conditions?

4. Set up Essay question

The organisation responsible for drafting Essay questions shall ensure their compliance with EMAR 66 Appendices I & II (Basic Training) and Appendix III (Type Training). The use of Essay questions is mandatory for Basic Training examinations of modules 7, 9 and 10 of EMAR 66 Appendix I (EMAR 66 Appendix II § 1.4 refers) and optional for Type Training examinations.

4.1 Objectives

The objective of Essay questions is to assess the trainee's ability to interpret a question on a specific topic and to express himself/herself clearly and concisely in the form of a written answer in the practical application of a maintenance scenario.

4.2 Drafting standards

Essay questions should be developed using the Forms provided in Appendices I & II to the present Annex.

The question should:

- deal with practical cases of aircraft/system/component maintenance and the answer shall demonstrate understanding about:
  - what is a satisfactory or degraded condition of the aircraft/system/component;
  - human factors;
  - airworthiness regulations.
- avoid topics that are too infrequently encountered in practice;
- avoid ambiguities and generate a broad response rather than limiting the scope of the response;
- be written according to the Essay Question Form in Appendix I to the present Annex, following a logical sequence (introduction, development and conclusion) and contain the technical vocabulary appropriate for the response;
- have a model answer that will address the different response options and contain the list of the expected “key points” as well as their respective maximum scoring, as presented in the Draft Essay Question Form in Appendix II to the present Annex;
- be adapted to the licence category and level of knowledge required by EMAR 66;
- avoid, as far as possible, the use of diagrams or sketches to illustrate the answer.

4.3 Assessment standards

The answer should demonstrate the candidate's ability to write. It must be legible and grammatically correct. It should include an introduction, follow a logical progression and lead to a conclusion.

Where the answers relate to inspections/tests of a system, the answer should describe the nature of the inspection and not say that the system should be inspected.

Each "key point" should be scored according to its importance and the scale specified, using a scale that totals 60% to 80% of the final score of the response (precise % to be set by the NMAA). “Key points" are important items that may be based on knowledge or experience and include factors specific to maintenance such as safety precautions or regulatory practices, if applicable.

Given the difficulty of scoring a response using only "key points", it should also be necessary to consider the "drafting" aspect of the response. This is why the response should also be analysed in terms of clarity and presentation. For this purpose, a dedicated scale needs to be specified and it is considered good practice that it should represent 20% to 40% of the total score, even if not an EMAR 66 requirement as such. This percentage shall be set in consistency with the percentage chosen for the key points and the combination of both shall not exceed 100%.

Variants or alternative answers that were not foreseen may assist the examiner for scoring in the future. If these are appropriate, the model answer should be amended to include these new elements.

An example of an Essay Question scoring Form is provided in Appendix III to the present Annex.

Note:
The example of essay Question presented in Appendices I, II and III to the present Annex describe a 60% ratio for the key points and a 40% one for the drafting aspect.

4.4 Checklist for Essay Question

It is recommended to use a check-list when drafting an Essay question.

	Checklist for writing Essay questions
□	Could the item be better assessed with a different kind of assessment?
□	Is the essay question aligned with the intended learning outcome?
□	Is the essay question too long and should it rather be split up into several relatively short essay questions?
□	Does the essay question contain a clear and delimited task and a specific problem situation (if necessary)
□	Is the question worded and structured in such a way that it will be clear to the trainees what they are expected to do?
□	Is the task presented to trainees reasonable?
□	If there is a problem situation included in the essay question, is it a novel situation?
□	Do the trainees know the recommended time for completing their answer?
□	Do the trainees know how many points the essay is worth?
□	Have you avoided the use of optional questions?
□	Have you written a model answer and outline of major points (key points) that should be included in the answer? Is the model answer aligned with the intended learning outcome and the essay question?
□	Did you have a person knowledgeable in the subject critically review the essay item for clarity and for alignment with the intended learning outcome and the model answer?

Appendix I - Essay Question Form

Logo	**Answer sheet:** **Essay Question N° XX-XXX**	**Applicant's Name:**	(Full name should be filled in after weighting has been finished)
EMAR 66 Topic:	10.3 EMAR 145 (detailed understanding)	**Time:** 20 minutes	**Date:**
EMAR 66 Module:		Attachment 1:	no
Category		Attachment 2:	no
Question	**Referring to facility requirements for an EMAR 145 Maintenance Organisation, please explain what requirements shall be met in respect to hangars, workshops and storage facilities?**		
Note for trainee:	You may earn additional points by giving appropriate examples and linking the theory with practice. Your mark will reflect both the combination of the technical element (max. 60%) and the report style element (max. 40%).		
Model answer:	- An EMAR 145 MO shall ensure that facilities are provided appropriate for all planned work, ensuring in particular, protection from the weather elements. Specialised workshops and bays are segregated as appropriate, to ensure that environmental and work area contamination is unlikely to occur. - For base maintenance of aircraft, aircraft hangars shall be both available and large enough to accommodate aircraft on planned base maintenance. - For component maintenance, component workshops should be large enough to accommodate the components on planned maintenance. - Aircraft hangar and component workshop structures should prevent the ingress of rain, hail, ice, snow, wind and dust etc. Aircraft hangar and component workshop floors should be sealed to minimise dust generation. - For line maintenance of aircraft, hangars are not essential but access to hangar accommodation is recommended for usage during inclement weather for minor scheduled work and lengthy defect rectification. - Secure storage facilities shall be provided for components, equipment, tools and material. Storage conditions ensure segregation of serviceable components and material from unserviceable aircraft components, material, equipment and tools. The conditions of storage are in accordance with the manufacturer's instructions to prevent deterioration and damage of stored items. Access to storage facilities is restricted to authorised personnel. - Storage facilities for serviceable aircraft components should be clean, well ventilated and maintained at a constant dry temperature to minimise the effects of condensation. Manufacturer's storage recommendations should be followed for those aircraft components identified in such published recommendations. - Storage racks should be strong enough to hold aircraft components and provide sufficient support for large aircraft components such that the component is not distorted during storage. - All aircraft components, wherever practicable, should remain packaged in protective material to minimise damage and corrosion during storage.		
Notes for assessors:	References: EMAR 145.A.25 – Facility requirements, § (a) and (d) AMC 145.A.25(d) – Facility requirements		

Appendix II - Draft Essay Question

Logo	**Draft Essay Question N°** XXX	**Author's Name**:
Last update date:	14/04/2020	**Learning Objectives (Level: 2)** The candidate should be able to: ... explain general facility requirements for line & base maintenance in EMAR 145 MOs, ... demonstrate understanding of the importance of hangar availability in case of bad weather conditions for line maintenance, ... explain the conditions for storage facilities, including components, equipment, tools & material
EMAR 66 Module:	Module 10 - AVIATION LEGISLATION	
Topic N°:	10.3 (Approved Maintenance Org.)	
Category:	Basic Training	
Time:	20 minutes	
Attachment 1:	no	
Attachment 2:	no	

Question text:
Referring to facility requirements for an EMAR 145 Maintenance Organisation, please explain what requirements shall be met in respect to hangars, workshops and storage facilities?

Note for trainee: You may earn additional points by giving appropriate examples and linking the theory with practice. Your mark will reflect both the combination of the technical element (max. 60%) and the report style element (max. 40%).

N°	**Key Points List**	**Maximum Points** (equals to global %)	**Remarks / Alternatives**
1	Availability of facilities appropriate for all planned work	**10**	Exact wording not necessary, but demonstration of understanding should be evident
2	Protection from the weather elements	**5**	
3	Segregation of workshops and bays, to prevent that environmental and work area contamination	**5**	additional 2 points if examples given
4	Hangars for aircraft base maintenance	**5**	
5	Aircraft hangar & component workshop structures should prevent the ingress of rain, hail, ice, snow, wind and dust, etc.	**4**	
6	In line maintenance, in case of adverse weather condition, for lengthy work and defect rectification hangar should be available	**5**	may be replaced by an unexpected, but relevant answer element
7	Secure storage facilities shall be provided for components, equipment, tools and material	**6**	additional 2 points if examples given
8	Storage conditions ensure segregation of serviceable components and material from unserviceable aircraft components, material, equipment and tools	**5**	additional 2 points if examples given
9	Storage conditions in accordance with manufacturer's instructions	**4**	
10	Access to storage facilities restricted to authorised personnel only	**3**	may be replaced by an unexpected, but relevant answer element
11	Storage facilities to be kept clean, dry and temperature controlled	**5**	
12	All aircraft components should remain packaged in protective material to minimize damage and corrosion during storage	**3**	may be replaced by an unexpected, but relevant answer element
	Total Key Points	**60**	

Appendix III - Essay Question scoring Form

Logo	**Scoring sheet** Essay Question N° XXX	**Trainee's Name**: (Full name should be filled in after weighting has been finished)	
EMAR 66 Module:	Module 10 - Aviation Legislation	Time:	20 minutes
Topic N°:	10.3 (Approved MO)	Attachment 1:	no
Category:	Basic Training	Attachment 2:	no
Question text: **Referring to facility requirements for a Part-145 organisation, please explain what requirements shall be met in respect to hangars, workshops and storage facilities?**			
Note for trainee: You may earn additional points by giving appropriate examples and linking the theory with practice.			

N°	**Key Points List**	**Max. Points**	**Scoring**	**Remarks / Alternatives**
1	Availability of facilities appropriate for all planned work	**10**	**10**	Exact wording not necessary, but demonstration of understanding should be evident
2	Protection from the weather elements	**5**	**5**	
3	Segregation of workshops and bays, to prevent that environmental and work area contamination	**5**	**5**	additional 2 points if examples given
4	Hangars for aircraft base maintenance	**5**	**5**	
5	Aircraft hangar & component workshop structures should prevent the ingress of rain, hail, ice, snow, wind and dust, etc.	**4**	**0**	
6	In line maintenance, in case of adverse weather condition, for lengthy work and defect rectification hangar should be available	**5**	**0**	may be replaced by an unexpected, but relevant answer element
7	Secure storage facilities shall be provided for components, equipment, tools and material	**6**	**6**	additional 2 points if examples given
8	Storage conditions ensure segregation of serviceable components and material from unserviceable aircraft components, material, equipment and tools	**5**	**0**	additional 2 points if examples given
9	Storage conditions in accordance with manufacturer's instructions	**4**	**4**	
10	Access to storage facilities restricted to authorised personnel only	**3**	**3**	may be replaced by an unexpected, but relevant answer element
11	Storage facilities to be kept clean, dry and temperature controlled	**5**	**5**	
12	All aircraft components should remain packaged in protective material to minimize damage and corrosion during storage	**3**	**3**	may be replaced by an unexpected, but relevant answer element
	Total Key Points (60%)	**60**	**46**	**Passed if ≥ 45 points** (≥ 75% of total key points and no significant error related to required key points, if any defined in the model answer)
Structure	Introduction-main-conclusion, Logical sequence, Technical report style & format	**20**	**0**	
Grammar & Language	Communication level, Clarity, Readability & Grammar	**10**	**0**	
Terminology & Techn. Lang.	Occurrences, Relevance	**10**	**10**	
	Total Style Points (40%)	**40**	**10**	**Passed if ≥ 15 points**
Report Style	Comment:			
	Total Points	**100**	**56**	**Passed only if Key points element ≥ 45 points**
Assessor 1	Name:			
Assessor 2	Name:			
Date approved		**Comment:**		

5. Use of Diagrams

5.1. General

Due to the technical content of all modules, the use of diagrams for examinations makes sense. For the evaluation of technical components next to a technical test procedure an optical testing is very important. In this respect the use of sketches, abstracts, engine element drawings, diagrams and photos as part of examination questions for certifying staff is an adequate mean of knowledge verification.

It is not always decisive if the exercise can only be solved by interpretation of the used graphic(s). In many cases diagrams are an indicator for achieving a higher clarity of a relevant problem.

5.2. Diagram Types In principle diagram types can be differentiated between:

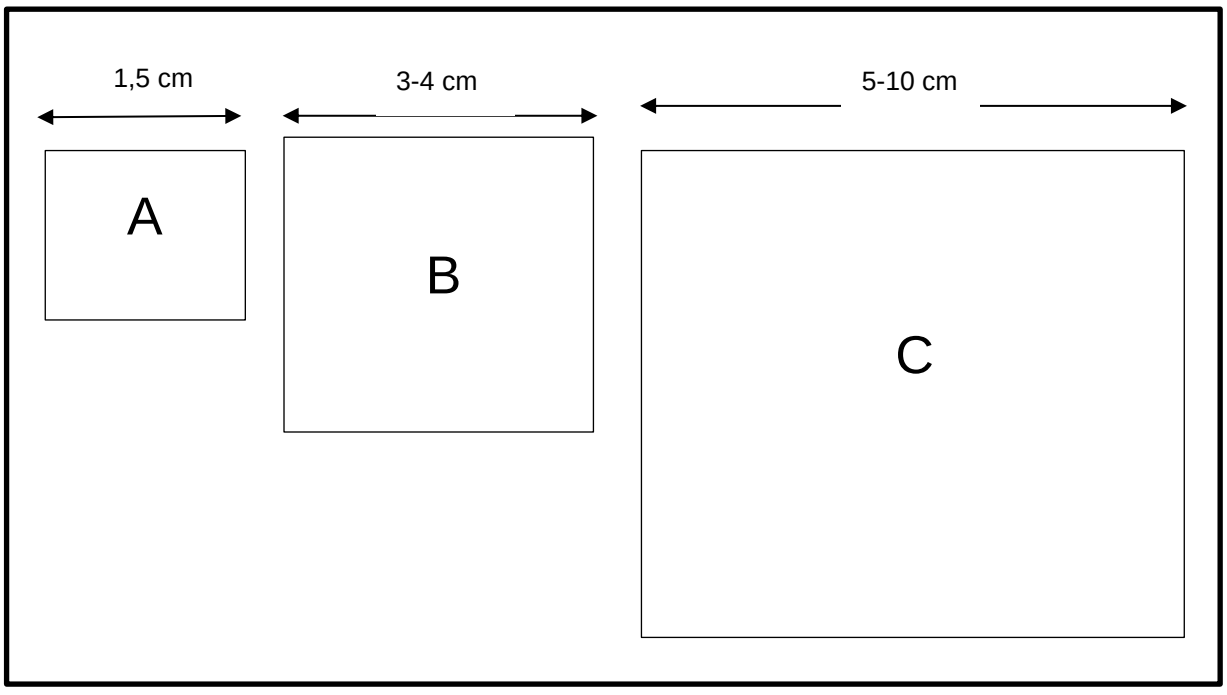
- Black and white drawings.
- Black and white photos.
- Coloured drawings.
- Coloured photos.

5.3. Set Up of diagrams

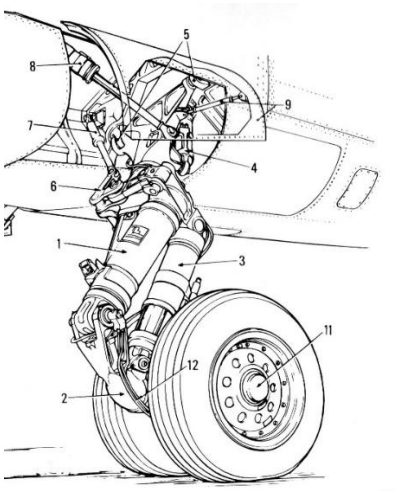
- Copying
- Own photos
- Self-generation or edition of drawings, photos, etc.

Standardization of graphic sizes According to content and purpose of used graphics and images certain size ranges can be defined. When saving graphics defined size ranges shall be kept. The use of certain sizes should not cause blurring. The consideration of certain widths proved of value. The respective height depends on according content. If graphics are directly located on the exercise text they are called embedded graphics.

Following illustration shows different size ranges for embedded graphics.



Bigger diagrams, f. e. phantom drawings, are saved as attachments (annex). Such diagrams are shown in a separate page at the end of paper & pencil examinations.



Only for examination purposes

5.4. Check list "Using diagrams"

NMAA	Checklist Diagrams
□	Copyright conditions?
□	Does the graphic match the question?
□	Are all relevant elements clearly identifiable?
□	Sufficient labelling?
□	Flawless quality of display?
□	If a diagram is attached: does the question include an appropriate note?

Annex 5 - Examination credits report (national example)

Examination Credit Report (extract)

This report establishes the correspondence, by topic and level of knowledge, between the following programmes:

Programme: **Basic training for B 1.1 licence - Turbine powered aeroplanes**

Defined in: **Appendix 1 to EMAR 66**

Version: **[Edition date]**

on the one hand, and :

Programme: **211522 – Certifié Elémentaire Vecteur**

Delivered by: **Ecole de Formation des Sous-Officiers de l'Armée de l'Air**

Version: **approved on [date] - implemented as of [date]**

referred to as the Candidate Programme (CP), on the other hand.

This report presents in an Appendix X a compliance matrix (see example below) showing the correspondence between the two programmes by comparing the level required by the different topics of the relevant EMAR 66 programme with the level of knowledge achieved by the CP topics dealing with the subject.

The levels of knowledge are referred to as 1 (Initial knowledge), 2 (General knowledge) and 3 (Detailed knowledge).

When the correspondence is established between the EMAR 66 Basic training topic and the CP course part, the comparison status shall be indicated as V (Validated). The topic is thus considered to have been acquired by examination credit for every person who has successfully completed the CP.

Where the comparison cannot be established, the comparison status is indicated as G (Gap). In this case, the CP course part(s) does not reach a sufficient level for the corresponding EMAR 66 topic to be considered as acquired. Only EMAR 66 examinations or additional training may allow validation of the concerned EMAR 66 topic.

The results of the comparison are summarised as follows:

Modules or submodules gained by examination credits (to be completed by NMAA):

- **Module 5** Digital Techniques/Electronic Instrument Systems": **fully**;
- **Module 6** « Materials & Hardware »: **submodules 06.01, 06.02, 06.05 & 06.07 to 06.11;**
- **Module 9** « Human Factors »: **fully**;
- **Module 10** « Aviation Legislation »: **fully**;
- **Module 11.A** « Turbine Aeroplane Aerodynamics, Structures & Systems »: **submodules 11.A.03 & 11.A.07 to 11.A.18**;
- **Module 17** « Propeller »: **fully.**

Approval of Examination Credits Report	
Maintenance Training Organisation	NMAA
Signature of Accountable Manager	Signature of Approving authority

Appendix X of Examination Credit Report / Compliance matrix (extract)

EMAR 66 (Ed. 1.0) Licence Category sought: B1.1

Technical Training compared: 211522 « Certifié Elémentaire Vecteur » (applic. 2010-10)

Status Type: V - Validated by Examination Credits

G - Gap to compensate by EMAR 66 examinations or additional training

Appendix I EMAR 66 Ed. 1.0 dated…						**Progr. 211522** (appl. 2010-10)			
Mod.	Submod.	Subject	Topic	Level required	Status	Level reached	Course Ref.	Course	Title
4 - Electronic Fundamentals									
	4.1 - Semiconductors								
		4.1.1 - Diodes							
			Diode symbols	2	V	2	23.271	3.2.1.1	TH-04-01-01 Diodes
			Diode characteristics and properties	2	V	2	23.271	3.2.1.1	TH-04-01-01 Diodes
			Diodes in series and parallel	2	V	2	23.271	3.2.1.1	TH-04-01-01 Diodes
			Main characteristics and use of silicon controlled rectifiers (thyristors), light emitting diode, photo conductive diode, varistor, rectifier diodes	2	V	2	23.271	3.2.1.1	TH-04-01-01 Diodes
			Functional testing of diodes	2	G	1	23.271	3.2.1.1	TH-04-01-01 Diodes
		4.1.2 - Transistors							
			Transistor symbols	1	V	1	23.272	3.2.1.2	TH-04-01-02 Transistors
			Component description and orientation	1	V	1	23.272	3.2.1.2	TH-04-01-02 Transistors
			Transistor characteristics and properties	1	V	1	23.272	3.2.1.2	TH-04-01-02 Transistors

Annex 6 - Conversion Report for Grandfather Rule licence (national example)

Conversion Report

(for EMAR 66 licence issued with Grandfather Rule)

Initial licence Change to licence [1]

1/ BIO DATA

Family NAME : [2] First NAME : [3]

Date & place of birth : [4] Nationality : [5]

Specialty of applicant : [6] Operating Organisation : [7]

Name & address of demanding organisation : [8]

Applicable EMAR 66 Regulation : [9]

Applicable GFR : [10]

Category of licence applied : [11] Type Rating applied : [12]

PART 66 licence : Yes / No [13] PART 66 licence number: [14]

PART 66 Type Rating owned & licence category :

Type Rating(s) [15]	Category(ies) [16]

2/ BASIC TRAINING : [17]

Category applied	Training/Qualification	Delivered by	Dates	Supporting document(s)

3/ TYPE TRAINING : [18]

Aircraft Type	Training/Qualification	Delivered by	Dates	Supporting document(s)

4/ MAINTENANCE EXPERIENCE (on aircraft) : [19]

Function/position - Nature	Dates / Duration	Supporting document(s)

5/ HUMAN FACTOR TRAINING :

[20]

6/ MILITARY AVIATION LEGISLATION TRAINING :

[21]

7/ LICENCE LIMITATION(S) :

[22]

8/ LICENCE EXTENSION(S) : [23]

Extension applied	Supporting document(s)

9/ ADDITIONAL INFORMATION :

[24]

1 : Strike out if not applicable
2 : Indicate Family NAME of the applicant in capital letters.
3 : Indicate First NAME of the applicant.
4 : Indicate date & place of birth (City/Country).
5 : Indicate nationality of the applicant.
6 : Indicate specialty/trade of the applicant (e.g. airframe / powerplant / avionics / armament / …).
7 : Indicate name of the Operating Organisation employing/in link with the applicant.
8 : Indicate name & address of the Maintenance Organisation.
9 : Indicate applicable EMAR Edition used as a basis for the application .
10 : Indicate applicable GFR version used as a basis for the conversion
11 : Indicate Category of licence applied (A / B1 / B2 / C).
12 : Indicate Type Rating(s) applied.
13 : Strike out if not applicable .
14 : If the applicant owns a PART 66 licence, indicate its number.
15 : If applicable, indicate PART 66 Type Rating(s) owned : aircraft & engine(s).
16 : Indicate PART 66 category(ies) associated with the Type Rating.
17 : Details of trainings of the applicant & indicate nature of supporting documents.
18 : Details of trainings of the applicant & indicate nature of supporting documents .
19 : Details of maintenance experience on aircraft of the applicant, appropriate to the category of licence applied, precise durations.
20 : Indicate supporting documents provided (e.g. training certificate) & date of the training.
21 : Indicate supporting documents provided (e.g. training certificate) & date of the training .
22 : If applicable, precise the limitations proposed to be endorsed on the licence. Any limitations on PART 66 licence are to be reported on the licence to be issued.
23 : If applicable, precise the extensions proposed to be endorsed on the licence & provide appropriate supporting documents.
24 : Indicate any complementary information to be taken into account to issue the licence. In particular, if a training was acquired in a non-approved PART or EMAR 147 MTO. Provide precise content of the training delivered.