


<b>SAFETY INFORMATION AND ADVISORY NOTICE (SIAN)</b>		 Transport Malta Civil Aviation Directorate Safety and Compliance Unit Transport Malta Centre Triq Pantar Lija LJA 2021 Malta aviationsafety.tm@transport.gov.mt
SIAN Number: <b>01/23</b>	Issue Date: <b>11/01/2023</b>	
Subject: <b>Guidance on the Design of Checklists</b>		

## 1.0 INTRODUCTION

- 1.1 Transport Malta Civil Aviation Directorate (TM-CAD) Personnel Licensing Unit (PEL Unit) has published guidelines intended to further reinforce the need for good human factors principles in the design of checklists applied for aircraft and helicopters.
- 1.2 This guidance material is not intended to be prescriptive and various design solutions can meet the high-level elements being mentioned in this document.

## 2.0 APPLICABILITY

- 2.1 This Notice is to be disseminated to all personnel, and people who have interests relating to the design and use of checklist within aviation operations.

<b>Aerodromes:</b>	Not primarily affected.
<b>Air Traffic:</b>	Not primarily affected.
<b>Airspace:</b>	Not primarily affected.
<b>Airworthiness:</b>	Not primarily affected.
<b>Flight Operations:</b>	All Operators and General Aviation (GA) Operators.
<b>Licenced/Unlicenced Personnel:</b>	ATOs, GA and Microlight Community.

## 3.0 RECOMMENDATIONS AND INSTRUCTIONS

- 3.1 By design checklists must be adequately structured to take account of other variables present in the flying environment such as turbulence, workload, fuel remaining and time available.
- 3.2 The checklist must be a controlled document with the appropriate date and amendment status and/or list of effective pages clearly visible. Ideally, a statement that this publication forms part of the operator's OM should be included.
- 3.3 Any changes to the checklist drills from the last amendment should be visibly displayed.
- 3.4 Further details are provided in the "Guidance on the Design of Checklists" document in Appendix I of this SIAN.

## **4.0 FURTHER INFORMATION**

- 4.1 Research project EASA.2012/1: "Principles and guidelines relative to the design and checklists and working methods in the cockpit"

<https://www.easa.europa.eu/en/document-library/research-reports/easa20121>

## **5.0 CANCELLATION**

- 5.1 This SIAN will remain in force until further notice.

**Safety and Compliance Unit**

# Appendix I

# Guidance on the Design of Checklists

**Issue 01 Rev 01**

11<sup>th</sup> January 2023

TM-CAD (PEL Unit)

## Table of Contents

<b>Scope .....</b>	<b>1</b>
<b>The Philosophy of Checklist Design .....</b>	<b>1</b>
Titles .....	1
Memory Items .....	2
Start & Finish of a Checklist .....	2
Checklist Continuation.....	2
Decision Items .....	3
Cross-Referencing.....	3
<b>Characteristics of Checklists .....</b>	<b>3</b>
Size of Document .....	3
Binding/Spine .....	4
Cover .....	4
Tabs and Dividers.....	4
Font Type.....	5
Print Size .....	5
Margins .....	5
Emphasis and Differentiation .....	5
Contrast and Colour .....	6
Contents List or Index .....	6
Page Numbering.....	7
Electronic Checklists .....	7
<b>References .....</b>	<b>8</b>

## Scope

There have been many incidents and accidents where the use of checklists has been a contributory factor.

These guidelines are intended to further reinforce the need for good human factors principles in the design of checklists and are to be applied in the design of a checklist for aircraft and helicopters.

They are not intended to be prescriptive and various design solutions can meet the high-level elements being mentioned in this document.

## The Philosophy of Checklist Design

By design, checklists must be adequately structured to take account of other variables present in the flying environment such as turbulence, workload, fuel remaining and time available.

Ensure that the number of operations required in a drill are kept to a minimum especially in abnormal and emergency checklists.

The checklist must be a controlled document with the appropriate date and amendment status and/or list of effective pages clearly visible. Ideally, a statement that this publication forms part of the operator's OM should be included.

Any changes to the checklist drills from the last amendment should be visibly displayed, e.g. some operators use a short vertical line (change bar).

## Titles

The title shall be displayed at the start of each drill.

The title shall be meaningful, prominently displayed and clearly distinguishable from the action items or other notes in the drill.

In the case of abnormal or emergency checklists a short explanation, if required, of the symptoms associated with that drill can help the crew with the confirmation that the correct drill has been selected.

## Memory Items

Memory or Recall items are actions that are carried out immediately following the onset of an abnormal situation. They relate to situations where the safety of the aircraft is compromised.

Pilots are trained to memorise the immediate actions and carry them out without reference to the checklist. However, under stressful conditions memory recall can be poor and error-prone therefore they should be strictly limited to only those actions necessary to stabilise the situation.

- Memory items should normally be at the start of a drill.
- Memory items shall be clearly indicated. e.g. by colour shading, or by 'boxing'. An explanation in the OM or Philosophy Notes showing how these memory items are indicated should be included.
- The number of steps in a memory item should be kept to a minimum (preferably no more than six for multi-crew operations; single pilot operations may require a greater number of steps).
- Simple mnemonics can be used as an aid.

Memory items can also include items dealing with normal operations such as general data (e.g. Aircraft dimensions) and flying speeds (e.g. Best Glide speed, Vne, Va, etc).

## Start & Finish of a Checklist

Checklist drills shall have a clearly defined start and finish.

The start of the drill shall be indicated by a clearly defined and meaningful title.

The end of the drill shall be indicated by either an 'end of drill' statement, or graphical symbol indicating completion. Completion of a drill may occur in several places. These must all be clearly defined.

A completion call should be clearly defined by company SOPs.

## Checklist Continuation

Some checklist drills may be long and are unable to fit on a single page. When this is the case, the long checklist drill should be separated into logical sections where each section is contained within a page

If a drill runs onto a second (or further page) it must be clearly marked as incomplete and requiring to be continued. This indication should be at the bottom of the page.

A clear indication should be provided at the top of a continued page together with the drill title.

## Decision Items

Complicated decision items in a checklist drill should be avoided, particularly those with embedded items.

The following techniques can be used effectively to deal with decision choices:

- Different style of bullets.
- Choice directive (e.g. 'choose one').
- Highlight choices using underline.
- Indent to group items together.

## Cross-Referencing

Cross-referencing should be minimised where possible.

If steps need to be repeated within a drill, then they should be duplicated. Internal cross-referencing should be used only if drills become too lengthy to handle.

## Characteristics of Checklists

The checklist should not be a direct copy or photocopy of the AFM or FCOM or equivalent documentation.

The Emergency and Abnormal Checklists should be differentiated clearly from Normal checklists, ideally by a separate and self-contained document, or contained in a QRH.

Alternatively, emergency and abnormal drills may be contained in a separate section in the flight deck checklist as long as this section is clearly differentiated from the remainder of the document.

The checklist document should be robust enough to withstand normal handling by flight crew.

## Size of Document

The size of the document should be appropriate to the stowage space and workspace available.



Consideration should be given in the use of the document in situ to avoid interference with controls or obscure the displays.

## **Binding/Spine**

The binding should ideally allow pages to be opened through 360°, to enable pages to be folded back onto themselves.

The binding should be such that all the text on a page/card can be read.

The binding should allow for replacement pages to be inserted easily whilst secure enough to prevent pages becoming loose.

Rugged spiral or ring side binding is recommended.

## **Cover**

The cover of the Emergency and Abnormal Checklist should be sufficiently robust to protect the pages or cards within.

The cover of the Emergency and Abnormal Checklist should be of a suitable colour, to allow the document to be easily located and distinguished (from all angles) from other documents.

The title of the checklist and the aircraft to which the checklist is applicable should appear on the front of the cover and, where appropriate, on the spine too.

## **Tabs and Dividers**

The use of tabs is recommended to assist in the location of specific drills or groups of drills associated with sub-systems.

Tabs may utilise printed titles, numbers and/or colour to assist with this task, as long as the titles, numbering and/or colour usage is consistent throughout the document (and, ideally, consistent in checklist documents throughout the fleet).

The index and the tabs should be clearly and logically linked.

Tabs should be wide enough for a thumb to be placed upon them, without mis-referencing.

## Font Type

Font types (such as Helvetica, Times New Roman, Gill Medium or Arial), which have clear differentiation between characters are recommended.

Only sans serif fonts shall be used.

Font type shall be consistent throughout the checklist.

The use of upper case for headings is desirable.

Italics should not be used for drill actions. Use italics for comments, notes, or supporting information is acceptable, although use of italics should be avoided for large blocks of text.

## Print Size

The drill should be legible at distance of 600 mm.

The font size does vary between font types and sizes given in this paragraph are approximate based upon arial font type.

The recommended type size for headings is 14pt (with a minimum of 12pt).

The recommended type size for normal text is 12pt (with a minimum of 10pt).

A larger font size is recommended for smoke-related procedures (and those procedures which may follow on).

Bold type may be used to improve legibility.

Note: it may be more important for a drill to be contained on one page, in which case a type size smaller than 12pt may be appropriate (but no smaller than 10pt).

## Margins

There should be a margin to permit:

- a) binding without hiding text; and
- b) holding the list using the thumb as cursor.

## Emphasis and Differentiation

The presentation of the checklist can be improved by using numbers, lower case text and bolding the text:

The following techniques provide effective methods of emphasising or differentiating information on a checklist. They should be used sparingly to maximise the effect:

- Bold type
- Larger type
- Underlining
- Boxing text on a white or coloured background

## Contrast and Colour

Black text on a yellow background is recommended, with black text on a white background as an acceptable alternative.

Coloured text is not recommended because of difficulties in reading colours in some lighting conditions.

Use of colour to describe the alerting cues is recommended where the colour is the same as the warning caption on the aircraft.

Pink or red pages are not recommended.

If colour is used for tabs/borders to distinguish between the Normal, Abnormal and Emergency Checklist, red should be reserved for emergencies, and orange/amber for abnormal procedures.

Despite the above, whatever colours are in use the ability to differentiate Normal, Emergency and Abnormal Checklists under night lighting conditions should be checked.

## Contents List or Index

The Emergency and Abnormal Checklist should have a tabbed contents list at the front.

The contents list for each checklist category (Normal, Abnormal & Emergencies) should not exceed a single page, if possible.

The contents list should follow the same order as the drills whether in alphabetical order or critical system failure order.

Critical drills may be highlighted in bold to aid recognition e.g. Fire and Smoke.

If the Emergency and Abnormal Checklists form part of the main flight deck checklist, the contents list for the emergency and abnormal procedures should be:

- i. at the front of the document; and
- ii. on the tab or divider which separates the two parts of the normal checks from the emergency/abnormal drills.

## Page Numbering

All pages should be numbered consistently, including tab pages.

If a page is blank it should have 'INTENTIONALLY BLANK' printed on it.

The number should be clearly presented at the top or bottom of the page.

Large font should be used for page numbers.

The dedicated page numbering is to ensure that the correct page can be located from the index and that the correct pages are replaced when the checklist is updated.

## Electronic Checklists

Electronic versions of checklists as developed by the aircraft manufacturer and approved by TM-CAD are allowed. However, a hard copy of the checklist shall be available as a back-up on the aircraft if assessed as a requirement by TM-CAD.

## References

Burian, B. K. (2006). Design Guidance for Emergency and Abnormal Checklists in Aviation. San Jose, CA, USA.

Degani, A., & Wiener, E. L. (1993). Cockpit Checklists: Concepts, Design and Use. San Jose, CA, USA.

Degani, A., & Wiener, E. L. (1994). Philosophy, Policies, Procedures and Practices: The Four 'P's of Flight Deck Operation. Hants, England.

EASA (2012). Research Project 2012/1: Principles and guidelines relative to the design of checklists and working methods in the cockpit.

FAA (1995). Human Performance Considerations in the use and design of Aircraft Checklists.

Salas, E., & Maurino, D. E. (2010). Human factors in aviation. Amsterdam: Academic Press/Elsevier.

UK Civil Aviation Authority. (2006). CAP 676: a Guidance on the Design, Presentation and Use of Emergency and Abnormal Checklists. London, England.

Wickens, C. D. (1992). Engineering Psychology and Human Performance.