



---

中国民用航空局

航空器评审组(AEG)

# 737-8 恢复运行特别航空器评审报告

日期: 2021 年 12 月 3 日

航空器制造厂家: 波音公司

---

## 批准页

编制:

王瑾

航空器评审处

中国民用航空局飞行标准司

朱恒宇

航空器评审中心 FSB 飞行员

中国民用航空局航空安全技术中心

审核:



薛世俊

副司长

中国民用航空局飞行标准司

批准:



韩光祖

司长

中国民用航空局飞行标准司

## 目录

批准页 .....	1
目录 .....	2
前言 .....	4
<b>第 1 节 波音为恢复运行采取的措施.....</b>	<b>5</b>
1.1 设计更改.....	5
1.2 飞行程序改进.....	5
1.3 飞行机组训练改进.....	6
1.4 其他受影响领域.....	6
<b>第 2 节 驾驶员型别等级和资格规范.....</b>	<b>7</b>
2.1 说明与解释.....	7
2.2 驾驶员型别等级和执照签署 .....	7
2.3 ODR 和 MDR .....	7
2.4 训练规范.....	8
2.5 检查规范.....	10
2.6 经历规范.....	10
2.7 飞行模拟训练设施规范 .....	10
<b>第 3 节 维修人员资格规范.....</b>	<b>11</b>
3.1 说明与解释.....	11
3.2 维修人员执照签署.....	11
3.3 培训规范.....	11
<b>第 4 节 主最低设备清单.....</b>	<b>12</b>
4.1 说明与解释.....	12
4.2 中国民用航空局补充内容.....	12
<b>第 5 节 计划维修要求.....</b>	<b>13</b>
5.1 说明与解释.....	13
5.2 中国民用航空局补充内容.....	13
<b>第 6 节 运行和持续适航文件.....</b>	<b>14</b>
6.1 说明与解释.....	14
6.2 737-8 飞机的运行和持续适航文件清单.....	14
<b>第 7 节 其他评审项目.....</b>	<b>16</b>
7.1 前向观察员座椅.....	16
7.2 飞行机组睡眠区.....	16
7.3 电子飞行包.....	16
7.4 应急撤离演示.....	16

## 737-8 恢复运行特别航空器评审报告

---

附件 1: 恢复运行要求的飞行训练包线.....	17
附件 2: 恢复运行相关的波音服务文件清单.....	18
附件 3: 联系人.....	19
A: CAAC AEG 737-8 恢复运行特别评审组.....	19
B: 波音联系人.....	19

## 前言

737-8 型飞机由于两起关联机动特性增强系统 (MCAS) 的致命事故后被宣布停飞。为确保该型飞机安全恢复运行, 波音公司 (以下简称波音) 从设计、运行、建议的训练和维修更改等方面采取了一整套措施。

针对波音采取的恢复运行措施, 中国民用航空局除由适航审定司开展针对设计更改的适航审定工作之外, 航空器评审部门还从 2019 年 4 月至 2021 年 9 月开展了特别运行评审工作。

本报告为上述特别运行评审工作的结论, 需要注意的是:

(1) 本报告仅用于支持中国航空运营人已引进 737-8 型飞机的恢复运行, 考虑到可能的产品和服务持续改进, 不适用于后续引进的飞机。

(2) 本报告基于中国民用航空局适航指令 (AD) CAD2021-B737-19 要求完成的设计更改, 目的是为中国航空运营人准备恢复运行提供必须的信息, 但不应当视为运行批准。

(3) 中国航空运营人基于本报告表明成功恢复运行之后, 报告中适用于后续引进 737-8 型飞机的通用要求将纳入正常的《737 系列飞机航空器评审报告》(AER)。

在中国航空运营人所有停飞 737-8 型飞机完成恢复运行工作之后, 本报告自动失效。

注释: 一些 737MAX 机队共用文件存在标注不统一的情况, 例如, MMEL 标注 737MAX, 但附标题注为 B-737-8/-8200/-9; MRBR 标注为 737-7/-8/-8200/-9/-10。由于目前中国民用航空局适航审定司仅认可了 737-8 型, 因此, 尽管本报告涉及的某些文件使用了“737MAX”, 但仅其中适用于 737-8 的内容有效。

## 第 1 节 波音为恢复运行采取的措施

### 1.1 设计更改

为确保运行安全和满足适航标准，737-8型飞机采取了下述设计更改：

- 按照服务通告SB 737-22A1342RB将飞行控制计算机（FCC）软件升级至版本12.1.2.
- 按照服务通告SB 737-31-1860R01将MAX显示系统（MDS）软件升级至BP1.5.1。
- 按照服务通告SB 737-27-1320，安装失速警告系统抖杆断路器按键（带有颜色的键帽）

此外，恢复运行之前还需要完成下列服务通告：

- SB 737-54A1056 R01 完成吊架整流罩防电磁效应（EME）检查和更换
- SB 737-11A1337 安装Kathon警示标牌
- SB 737-27-1318 R02 线路分离(包括相关的替代符合性方法AMOC 01、AMOC 02和AMOC 03)
- SB 737-00-1028 AOA传感器测试

完成上述服务通告之后，需要按照服务通告SB 737-00-1028和飞行运行技术通告FOTB 737-20-01中的指引完成运行准备飞行。

### 1.2 飞行程序改进

为提供正确的操作指南，波音改进了下列飞行机组程序：

- 仅适用737-8，涉及FCC 12.1.2设计更改而更新的非正常检查单（NNC）如下：
  - SPEED TRIM FAIL
  - STAB OUT OF TRIM
- 为强化非正常情景下操作而更新的另外5个非正常检查单（NNC）如下，其同时适用于737NG系列和737-8型飞机（部分还适用于737CL和JR机队）：
  - Runaway Stabilizer
  - Stabilizer Trim Inoperative
  - ALT DISAGREE
  - AOA DISAGREE
  - Airspeed Unreliable

### 1.3 飞行机组训练改进

为确保驾驶员接受充分的训练，波音改进了737 NG和MAX型别等级训练提纲，以反映上述设计更改和NNC改进，同时重新考虑了737NG和MAX之间的训练差异。

### 1.4 其他受影响领域

对应上述设计更改，波音还修订了MMEL、维修培训手册、计划维修要求以及其他受影响的持续适航文件。

## 第 2 节 驾驶员型别等级和资格规范

### 2.1 说明与解释

本节表明中国民用航空局航空器评审部门（AEG）已经针对波音 737-8 型飞机恢复运行开展了驾驶员资格规范（PQS）评审，评审参考了 FAA 发布的飞行标准化委员会报告（FSBR）第 18 版，其中包括了 FAA 针对 737-8 型飞机恢复运行对于飞行机组训练、检查和近期经历的结论。

注释：即使参考了 FAA 的 FSBR，中国民用航空局的航空器评审部门在波音的技术支持下开展了独立评审，并且有些结论不同于 FAA。

针对 737-8 型飞机恢复运行，本节内容应当作为中国航空运营人修订各自驾驶员资格要求和训练大纲的基础。

FAA FSBR 文件可由以下链接获取：

<http://fsims.faa.gov/PICResults.aspx?mode=Publication&doctype=FSB%20Reports>

### 2.2 驾驶员型别等级和执照签署

不影响。

### 2.3 ODR 和 MDR

波音修订了从 737-800 到 737-8（以及反向）的运营人差异要求（ODR），737-600，-700，-800，-900，-900ER 和 737-8 型飞机的主差异要求（MDR）修订如下：

注释：ODR 表可以联系波音获取。

MDR 表

		从飞机					
		737-600	737-700	737-800	737-900	737-900ER	737-8
至 飞 机	737-600	-- 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	B/B
	737-700	A/A 1*2*3*4*	-- 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	B/B
	737-800	A/A 1*2*3*4*	A/A 1*2*3*4*	-- 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	B/B
	737-900	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	-- 1*2*3*4*	A/A 1*2*3*4*	B/B
	737-900ER	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	-- 1*2*3*4*	B/B
	737-8	C/C 5*	C/C 5*	C/C 5*	C/C 5*	C/C 5*	-- 5*



### 注释:

1\*: 从 EFIS 到 PFD/ND 的差异为 C/B。

2\*: 从 PFD/ND 到 EFIS 的差异为 D/C。

3\*: EDFCS (增强数字飞行控制系统) 自动着陆失效需要按照差异 C/C 完成额外的训练检查和经历要求。

4\*: 因 737-8 型飞机恢复运行涉及了 737NG 某些关键 NNC 的改进, 即使不飞 737-8 飞机, 737NG 的驾驶员在下次复训时仍需完成各 NNC 改进的更新训练。

5\*: 本差异基于 737-8 型飞机的恢复运行措施, 所有 737-8 驾驶员, 即使已经具备该型机资格, 在恢复运行之前必须完成该差异训练。

## 2.4 训练规范

波音为恢复运行编制了《737MAX恢复运行训练大纲》(737 MAX Return to Service (RTS) Training Program) 和《737NG到737MAX差异训练大纲》(737 NG to 737 MAX Differences Training Program), 上述文件必须作为运营人恢复运行完善各自训练大纲的基础。

注释 1: 上述训练大纲包含针对恢复运行的 737NG 系列和 737MAX 飞机的型别等级训练和差异训练。

注释 2: 对于 737-8 型飞机恢复运行的地面训练, 波音已经开发了可供运营人直接使用的 CBT 课程。

注释 3: 对于 737-8 型飞机恢复运行的飞行训练, 应当使用 737 MAX 全动飞行模拟机 (FFS) 开展且:

- 如果适用于 737NG NNC 改进的更新训练还没有完成, 训练应当覆盖附件 1 要求的全飞行训练剖面。
- 如果适用于 737NG 的升级训练 NNC 改进已经完成, 只需完成 MCAS 作动的演示。

注释 4: 上述型别等级训练大纲或 CBT 可联系波音获取。

对于 737-8 型飞机的恢复运行训练, 应当在航空运营人训练大纲中落实下列训练领域的特别关注事项:

### 地面训练:

- 速度配平系统: MCAS 功能和相关系统, 关联 FCC 软件版本 12.1.2 的设计差异。
- 人工安定面配平操作: 人工安定面配平时的技巧和人工配平操作时空速和气动载荷对操作的影响。

- 可靠空速的判定：识别不可靠空速状态的驾驶舱响应（FDE），俯仰和推力设置的记忆项目，可靠空速指示的判定。

### 全剖面飞行训练

- 每一名驾驶员的MCAS作动演示，包括：
  - 临近失速（或完全失速）状态下MCAS作动和光洁构型下人工飞行时的恢复演示。
  - MCAS作动时安定面配平响应的演示：
    - 在失速状态下，高于临界AOA时MCAS的作动，在机头向下方向的安定面配平响应。
    - 在恢复状态时，低于临界AOA时MCAS的作动，在机头向上方向的安定面配平响应。
- 在安定面失控的状态下要求驾驶员使用人工控制配平：
  - 安定面失控非正常检查单（NNC）需要的识别和及时操纵。
  - 演示驾驶杆的功能及其对安定面失控状态的影响。
  - 强调在安定面配平切断电门（STAB TRIM）选择关闭位之前需要去除驾驶杆力。
- 进近、复飞和平飞期间使用人工安定面配平
  - 程序要求在正常和非正常状态下适当使用主电配平和人工安定面配平。
  - 不同的人工配平技巧。
  - 空气载荷对安定面的影响以及由此产生的机头向上和机头向下的配平力。

注释：关于人工配平技巧，建议参考波音飞行运行技术通告FOTB 737-20-04。
- 交叉FCC配平监控作动演示：着陆期间或者中止起飞期间必须终止以演示升级的STAB OUT OF TRIM 灯的功能。
- 起飞过程中错误的高迎角（AOA）会导致空速不可靠状态的发生：
  - 演示当前相关故障下的驾驶舱响应（如听觉、视觉和触觉）
  - 起飞程序中故障的发生
  - 复飞程序中错误的高迎角状态：当按压起飞/复飞（TO/GA）电门后飞行指引将会消失。

注释：开展空速不可靠NNC训练时，除演示复杂程序和记忆项之外，机组操作需要特别关注下列要点：

- 避免进近期间着陆襟翼超速卸载导致不稳定进近（可以参考波音FOTB 737-13-2 Rev 1）。
- 起飞后，在低高度执行记忆项目时确保越障性能（可以参考波音 737NG/MAX FCTM 第8章，8.29）。

### 2.5 检查规范

对于737-8型飞机恢复运行训练，应对每个驾驶员作为主飞行（PF）时检查相应的训练特别关注事项。

### 2.6 经历规范

不影响

### 2.7 飞行模拟训练设施规范

对于737-8型飞机恢复运行训练和检查，要求使用737MAX全动飞行模拟器（FFS）。

注释：要求使用737MAX FFS的原因是737NG的FFS没有MCAS功能。

## 第 3 节 维修人员资格规范

### 3.1 说明与解释

本节表明中国民用航空局航空器评审部门（AEG）已经在波音支持下，对 737-8 型飞机恢复运行开展了维修培训评审（MTE）。

本节内容应当作为航空运营人为 737-8 型飞机恢复运行修订维修人员资格和训练大纲的基础。

### 3.2 维修人员执照签署

不影响。

### 3.3 培训规范

波音建议的维修培训提纲（737 MAX Master Minimum Maintenance Type Training Syllabus）已经修订至版次 E，须作为航空运营人修订完善维修培训大纲的基础。

注释 1：上述培训提纲符合咨询通告 AC-66-FS-009 的规范，该文件针对 737-8 型飞机，同时包含从 737NG 到 737MAX 的差异培训。

注释 2：对于 737-8 型飞机的恢复运行，航空运营人或 CCAR-145 批准的维修单位可以参考波音建议的相应培训资料自行组织培训。

注释 3：维修培训提纲和培训资料可以联系波音获取。

## 第 4 节 主最低设备清单

### 4.1 说明与解释

本节表明中国民用航空局航空器评审部门（AEG）已经针对波音 737-8 型飞机恢复运行开展了 MMEL 评审，评审基于 FAA 发布的 737MAX 主最低设备清单（MMEL）第 3 版，该版次明确了 FAA 关于恢复运行之后 737-8 型飞机哪些项目可以不工作的结论。

针对 737-8 型飞机恢复运行，上述 FAA 批准波音 737MAX MMEL 版次中删除或者修订项目必须落实到航空运营人经批准的主设备清单（MEL）中。

**FAA MMEL 文件可由以下链接获取：**

<http://fsims.faa.gov/PICResults.aspx?mode=Publication&doctype=MMEL>

737 系列飞机 MMEL 同时也在波音 MyBoeingFleet 网站发布。

### 4.2 中国民用航空局补充内容

不适用。

## 第 5 节 计划维修要求

### 5.1 说明与解释

本节表明中国民用航空局航空器评审部门（AEG）已经针对 737-8 型飞机恢复运行开展了计划维修要求（SMR）评审，评审基于 FAA 发布的 2021 年 2 月版波音 737MAX 维修审查委员会报告（MRBR），其中包含了 FAA 关于 737-8 型飞机恢复运行之后对于最低计划维修要求的结论。

注释1：对于737-8型飞机恢复运行，除上述MRBR包含的按照MSG-3逻辑过程产生的新任务之外，FCC软件升级到P12.1.2版还产生了新的CMR任务。

注释2：由于737-8型飞机恢复运行之前可能处于非正常的长期封存，波音已经制订了飞机存放维修大纲（ASMP D626A015），提供了封存和解封建议任务清单，并由FAA MRB认可列为MRBR的附录M。

对于737-8型飞机恢复运行，上述FAA批准的737-8 MRBR版次中新的MRBR任务和新的CMR任务必须落实到航空运营人经批准的维修方案中，并且波音ASMP可以在制订解封任务工作包时作为参考。

注释：除上述内容之外，在737-8型飞机恢复运行之前，CAD2020-MULT-19（参考FAA AD 2020-06-01）发布的适用于CFM LEAP-1B发动机的适航限制项目修订版次中的任务，即使未包含在波音的RTS措施之内，也应当落实到运营人经批准的维修方案中。

#### **FAA MRBR 分发：**

可由波音 MyBoeingFleet 网站获取。

### 5.2 中国民用航空局补充内容

不适用。

## 第 6 节 运行和持续适航文件

### 6.1 说明与解释

本节表明中国民用航空局航空器评审部门（AEG）已经针对 737-8 型飞机恢复运行开展了运行和持续适航文件的评审，评审基于 FAA 相关评审工作和结论。

针对 737-8 型飞机恢复运行，中国民用航空局航空器评审部门（AEG）认可了下列列出的运行和持续适航文件（OCAI）。

上述认可并不能确保各文件内容的精准和适用性。当发现文件中的任何缺陷和偏差时，航空器所有人或者运营人有责任向航空器制造厂家报告，或者通过网址向中国民用航空局航空器评审部门（<http://aeg.caac.gov.cn/>）报告。

#### 运行和持续适航文件的分发：

运行和持续适航文件可由波音 MyBoeingFleet 网站获取。发动机制造厂家直接向航空运营人分发发动机手册。

### 6.2 737-8 飞机的运行和持续适航文件清单

下列运行和持续适航文件已由波音修订，应当作为 737-8 型飞机恢复运行后正确使用和维护的必要参考：

Manual	Reference No.	Description	Revision
FCOM/QRH	D6-27370-MAX	Flight Crew Operations Manual (FCOM)/Quick Reference Handbook (QRH)	01 December, 2021
DDG	D639A001-01	Dispatch Deviations Guide	30 April, 2021
AMM	D633AM101	Airplane Maintenance Manual	15 September, 2021
SDS	D633AM102	System Description Section	15 September, 2021
IPC	D638A001	Illustrated Parts Catalog	15 September, 2021
IFIM	D633AM103	Interactive Fault Isolation Manual	15 October, 2021
MPD	D626A011	Maintenance Planning Data Document	15 September, 2021
TC	D633AM109	Task Card (for data not in AMM)	15 September, 2021

注释1：上述文件的客户化，如不同编号，不影响对文件的认可。客户化手册可能具有不同的修订版次，但修订日期是一致的。

注释2：下列 737-8 恢复运行文件经适航审定过程批准，中国航空运营人必须在使用和维护中遵守其批准的限制：

- AFM：飞机飞行手册（D631A002，按照 CAD2021-B737-19 修订及其后有效版

次)。

- 审定维修要求 (CMR) (D626A011-9-03, Revision 01, Nov 2020)。

注释 3: 除上述提到的运行和持续适航文件外, 为支持 737-8 型飞机的恢复运行, 波音还发布了一系列服务文件提供补充信息或指南 (服务文件清单参见附录 2), 也有益于中国航空运营人参考。



## 第 7 节 其他评审项目

### 7.1 前向观察员座椅

不涉及。

### 7.2 飞行机组睡眠区

不涉及。

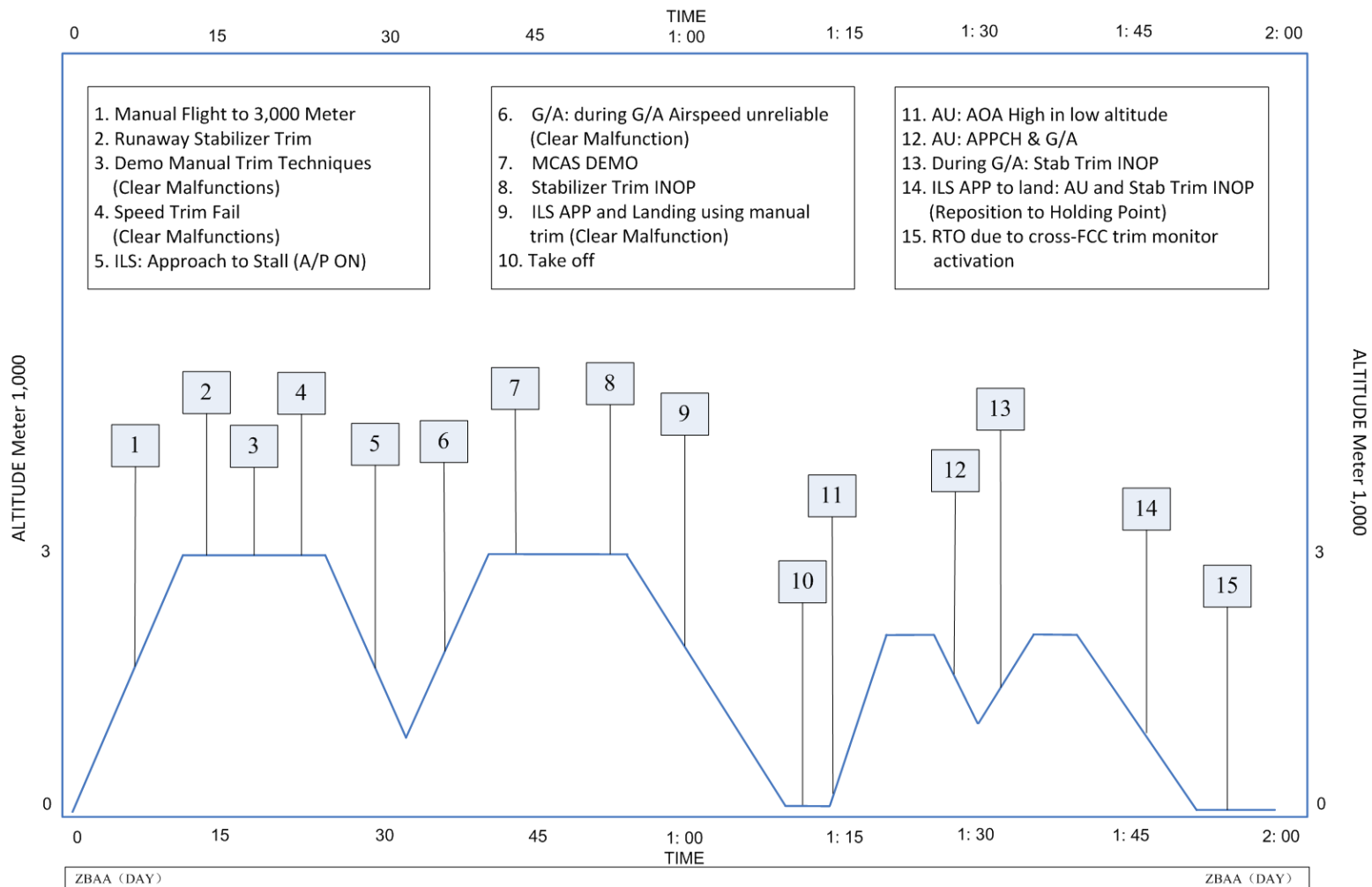
### 7.3 电子飞行包

不涉及。

### 7.4 应急撤离演示

不涉及。

### 附件 1: 恢复运行要求的飞行训练包线



## 附件 2：恢复运行相关的波音服务文件清单

Document	Subject
FOTB 737-19-03	Ferry flights for 737 MAX airplanes with FCC software Version P11.1 or earlier
FOTB 737-20-01	Operational readiness flight prior to 737 MAX RTS
FCT 737 NG/MAX (TM)	737 NG/MAX Flight Crew Training Manual
737-SL-31-072-A	MDS Service Letter
737-SL-22-073-A	FCC Service Letter
737-SL-22-074-A	FCC Non-MCAS Service Letter
MOM-MOM-20-0522-01B	Kathon Removal
MOM-MOM-20-0178-01B	Recommendation – Fuel Tank Inspection
MOM-MOM-20-0891-01B	Certification Maintenance Requirements (CMR) – Implementation into the Maintenance Program
MOM-MOM-19-0246	737 MAX Maintenance Programs During Active Storage and/or Prolonged Parking Past 60 Days
Task Collection (Excel spreadsheet)	Related scheduled maintenance requirements

注释：上述服务文件，包括 Task Collection，可以联系波音获取。

## 附件 3：联系人

### A: CAAC AEG 737-8 恢复运行特别评审组

薛世俊	飞行标准司副司长
王 瑾	飞行标准司航空器评审处
朱恒宇	航空安全技术中心航空器评审中心 FSB 飞行员

### B: 波音联系人

Yohannes AMARE	Program Manager, System Safety & Regulatory Affairs, BCA
Victoria WILK	Director of Safety & Regulatory Affairs, China
郝一鸣	Deputy Director, Global Safety & Regulatory Affairs, China



---

**Civil Aviation Administration of China (CAAC)**

**Aircraft Evaluation Group (AEG)**

# **Special Aircraft Evaluation Report**

**For**

**737-8 Return to Service**

**Date: December 3, 2021**

**Manufacturer: The Boeing Company**

---

## Approval Page

**Prepared by:**

**WANG Jin**

Aircraft Evaluation Division

Flight Standards Department of Civil Aviation Administration of China

**ZHU Heng Yu**

FSB Pilot, Aircraft Evaluation Center

Civil Aviation Safety & Technology Center of Civil Aviation Administration of China

**Reviewed by:**



**XUE Shi Jun**

Deputy Director General

Flight Standards Department of Civil Aviation Administration of China

**Approved by:**



**HAN Guang Zu**

Director General

Flight Standards Department of Civil Aviation Administration of China

## Table of Contents

<b>APPROVAL PAGE</b> .....	<b>1</b>
<b>TABLE OF CONTENTS</b> .....	<b>2</b>
<b>FOREWORD</b> .....	<b>4</b>
<b>SECTION 1: BOEING ACTIONS FOR RETURN TO SERVICE</b> .....	<b>5</b>
1.1 DESIGN CHANGES .....	5
1.2 FLIGHT PROCEDURES IMPROVEMENT.....	5
1.3 FLIGHT CREW TRAINING IMPROVEMENT .....	6
1.4 OTHER AREAS AFFECTED .....	6
<b>SECTION 2: PILOT TYPE RATING AND QUALIFICATION SPECIFICATION</b> .....	<b>7</b>
2.1 STATEMENT AND EXPLANATION .....	7
2.2 PILOT TYPE RATING AND LICENCE ENDORSEMENT .....	7
2.3 ODR AND MDR.....	7
2.4 SPECIFICATION FOR TRAINING .....	8
2.5 SPECIFICATION FOR CHECKING .....	9
2.6 SPECIFICATION FOR CURRENCY .....	10
2.7 SPECIFICATION FOR FLIGHT SIMULATION TRAINING DEVICES .....	10
<b>SECTION 3: MAINTENANCE PERSONNEL QUALIFICATION SPECIFICATION</b> .....	<b>11</b>
3.1 STATEMENT AND EXPLANATION .....	11
3.2 MAINTENANCE LICENSE ENDORSEMENT .....	11
3.3 SPECIFICATION FOR TRAINING .....	11
<b>SECTION 4: MASTER MINIMUM EQUIPMENT LIST</b> .....	<b>12</b>
4.1 STATEMENT AND EXPLANATION .....	12
4.2 CAAC SUPPLEMENTAL.....	12
<b>SECTION 5: SCHEDULED MAINTENANCE REQUIREMENTS</b> .....	<b>13</b>
5.1 STATEMENT AND EXPLANATION .....	13
5.2 CAAC SUPPLEMENTAL.....	13
<b>SECTION 6: OPERATIONAL AND CONTINUED AIRWORTHINESS INSTRUCTIONS</b> .....	<b>14</b>
6.1 STATEMENT AND EXPLANATION: .....	14
6.2 LIST OF OPERATIONAL AND CONTINUED AIRWORTHINESS INSTRUCTIONS FOR 737-8 AIRPLANE.....	14
<b>SECTION 7: OTHER EVALUATION ITEMS</b> .....	<b>16</b>
7.1 FORWARD OBSERVER SEAT .....	16
7.2 FLIGHT CREW SLEEPING QUARTERS .....	16
7.3 ELECTRONIC FLIGHT BAG.....	16

**Special Aircraft Evaluation Report for 737-8 RTS**

---

7.4 EMERGENCY EVACUATION DEMONSTRATION FOR 737-8 AIRPLANES..... 16

**APPENDIX 1: REQUIRED FLIGHT TRAINING PROFILE FOR RTS ..... 17**

**APPENDIX 2: BOEING SERVICE DOCUMENTS LIST FOR RTS..... 18**

**APPENDIX 3: POINT OF CONTACT ..... 19**

A: CAAC AEG SPECIAL EVALUATION TEAM FOR 737-8 RTS ..... 19

B: BOEING POINT OF CONTACT..... 19



## **Foreword**

The 737-8 model airplanes were grounded after the two fatal accidents related to the airplane's Maneuvering Characteristics Augmentation System (MCAS). For ensure the airplane's safe return to service (RTS), The Boeing Company (Hereinafter referred to as Boeing) has taken comprehensive actions in the design, operation, proposed training and maintenance changes.

The CAAC AEG conducted the special operation evaluation for the 737-8 model airplanes from April 2019 to September 2021 for the Boeing RTS actions in addition to the airworthiness certification for design changes which conducted by CAAC Aircraft Airworthiness Department.

This report are the conclusions for above special operation evaluation. It should be noted that:

(1) This report is only for support the 737-8 model airplanes RTS which already introduced by Chinese operators, not applicable for future introduction as there may be continued product or service improvement for the airplane's.

(2) This report is developed based on the design changes which required by CAAC Airworthiness Directive (AD) CAD2021-B737-19, intended to provide necessary information for Chinese operators when make preparation for RTS, but should not be considered as operation approval.

(3) After Chinese operators has showing their successful RTS based on this report, the general requirements which also applicable for future introduced 737-8 model airplanes will then transfer to the normal Aircraft Evaluation Report (AER) for 737 series airplanes.

This report will be cancelled automatically after all the grounded 737-8 model airplanes of Chinese operators has been finished their RTS.

***Note:** Some common documents are used by the 737MAX fleet but are titled differently, e.g. MMEL identified with 737MAX and subtitled by B-737-8/-8200/-9; MRBR subtitled by 737-7/-8/-8200/-9/-10. Currently, only the 737-8 has been validated by CAAC Aircraft Airworthiness department, the phrase "737MAX" is used in this report for some reference documents, but only the applicable contents for the 737-8 are valid at this time.*

## Section 1: Boeing Actions for Return to Service

### 1.1 Design Changes

To ensure the operation safety and meet airworthiness standards, the following design change has been taken by Boeing for the 737-8 model airplanes:

- Flight Control Computer (FCC) Software upgrade to version 12.1.2 through SB 737-22A1342 RB;
- MAX Display System (MDS) Software upgrade to Block Point 1.5.1 through SB 737-31-1860 R01.
- Stall Warning System - Button (Colored Cap) Installation on Stick Shaker Circuit Breakers through SB 737-27-1320.

In addition, there are also following SBs required to be implemented before RTS:

- SB 737-54A1056 R01 for EME Strut Fairing
- SB 737-11A1337 for Kathon Prohibition
- SB 737-27-1318 R02 for Wire Separation (including related AMOC 01, AMOC 02 and AMOC 03)
- SB 737-00-1028 for AOA Sensor Test.

After above SBs implemented, operational readiness flight are required following the guidance provided by SB 737-00-1028 and FOTB 737-20-01.

### 1.2 Flight Procedures Improvement

To provide proper operation instruction, Boeing has improved the following flight crew procedures:

- The NNCs updated as a result of the design changes associated with FCC12.1.2, which only applicable for the 737-8 model airplanes:
  - SPEED TRIM FAIL
  - STAB OUT OF TRIM
- Another 5 NNCs updated to enhancement the operation in non-normal conditions, which applicable for both 737NG series and 737-8 model airplanes (in part, to the 737CL & JR fleets):
  - Runaway Stabilizer
  - Stabilizer Trim Inoperative
  - ALT DISAGREE
  - AOA DISAGREE
  - Airspeed Unreliable

### **1.3 Flight Crew Training Improvement**

To ensure sufficient training received for pilots, Boeing has improved the 737 NG and MAX type rating training syllabus to reflect above design changes and NNC improvement, and reconsidering the training differences between 737 NG to MAX.

### **1.4 Other Areas Affected**

To reflect above design changes, Boeing has revised the MMEL, maintenance training manual, scheduled maintenance requirements and other Instructions for Continued Airworthiness be affected.

## Section 2: Pilot Type Rating and Qualification Specification

### 2.1 Statement and Explanation

This section is the formal notification that the CAAC AEG has conducted Pilot Qualification Specification (PQS) evaluation for Boeing 737-8 model airplanes RTS actions with reference to the FAA published Flight Standardization Board Report (FSBR) Revision 18, which included the FAA determination of flight crews training, checking and currency for 737-8 model airplanes RTS.

*Note: Even with reference to the FAA FSBR, the CAAC AEG has been conducted an independent evaluation with the technical support of Boeing, and there are some differences with FAA determination.*

The provisions in this section should be used, as the basis, by Chinese operators to revise their pilot qualification and training program for 737-8 model airplanes RTS.

**Find FAA FSB Report here:**

<http://fsims.faa.gov/PICResults.aspx?mode=Publication&doctype=FSB%20Reports>

### 2.2 Pilot Type Rating and Licence Endorsement

Not impacted.

### 2.3 ODR and MDR

The Operator Differences Requirements (ODR) for 737-800 to 737-8 (and vice versa) model airplanes have been revised by Boeing, and the Master Differences Requirements (MDR) tables for 737-600, -700, -800, -900, -900ER and 737-8 model airplanes were revised as follows:

*Note: The ODR Tables are available by request to Boeing.*

**MDR Table**

		FROM AIRPLANE					
		737-600	737-700	737-800	737-900	737-900ER	737-8
<b>TO AIRPLANE</b>	737-600	-- 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	B/B
	737-700	A/A 1*2*3*4*	-- 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	B/B
	737-800	A/A 1*2*3*4*	A/A 1*2*3*4*	-- 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	B/B
	737-900	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	-- 1*2*3*4*	A/A 1*2*3*4*	B/B
	737-900ER	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	A/A 1*2*3*4*	-- 1*2*3*4*	B/B
	737-8	C/C 5*	C/C 5*	C/C 5*	C/C 5*	C/C 5*	-- 5*

**Note:**

1\*: Differences from EFIS to PFD/ND is C/B.

2\*: Differences from PFD/ND to EFIS is D/C.

3\*: EDFCS (Enhanced Digital Flight Control System) Fail Operational Autoland requires additional training, checking, and currency as C/C.

4\*: As for there are some critical NNC improvement involved for 737NG airplanes due to the RTS actions for 737-8 model airplanes, even pilots for 737NG not flying 737-8, update training for the NNC improvement also required by next recurrent training.

5\*: The differences are based on RTS actions for 737-8 model airplanes, all 737-8 pilots must receive the difference training before RTS even already qualified for flying 737-8 model airplanes.

### 2.4 Specification for Training

737 MAX Return to Service (RTS) Training Program and 737 NG to 737 MAX Differences Training Program have been developed for RTS by Boeing, those documents have to be considered as a baseline by operators in improving their pilot training program for RTS.

**Note 1:** The training program mentioned above including requirements for RTS both type rating training and differences training for 737 NG series and 737MAX airplanes.

**Note 2:** For ground training of 737-8 model airplanes RTS, a Computer Based Training (CBT) course has been developed by Boeing that may directly be used by operators.

**Note 3:** For flight training of 737-8 model airplanes RTS, it should be conducted in a 737 MAX Full Flight Simulator (FFS) and:

- Full profile required as in Appendix 1 should be covered if update training for the NNCs improvement applicable for 737NG not yet accomplished;
- Only show MCAS activation required if update training for the NNCs improvement applicable for 737 NG already accomplished.

**Note 4:** About training program or CBT courses are available by request to Boeing.

For 737-8 model airplanes RTS training, the following training areas of special emphasis should be addressed in operators training program:

#### **Ground Training:**

- Speed Trim System: The MCAS function and related system, design differences associated with FCC software version 12.1.2.
- Manual stabilizer trim operation: Manual stabilizer trimming techniques and effects of airspeed and aerodynamic loads on manual stabilizer trim operation
- Determining a Reliable Airspeed: Recognition of flight deck effects of an unreliable airspeed condition, memory pitch and thrust settings and determination of reliable airspeed indication

#### **Full Profile Flight Training:**

## Special Aircraft Evaluation Report for 737-8 RTS

---

- Demonstration of MCAS activation for each pilot, including:
  - o MCAS activation during an impending stall (or full stall) and recovery demonstration during manual flight in a clean configuration.
  - o Demonstrate MCAS activation stabilizer trim responses:
    - Stabilizer trim in the nose down direction when above threshold AOA for MCAS activation during stall.
    - Stabilizer trim in the nose up direction when below threshold AOA for MCAS activation during recovery.
- A runaway stabilizer condition that requires the pilots to use manual stabilizer trim:
  - o Recognition and timely pilot actions required by the Runaway Stabilizer NNC.
  - o Demonstrate control column functionality and its effect on a runaway stabilizer condition.
  - o Emphasize the need to trim out forces on the column prior to selecting STAB TRIM cutout.
- Use of manual stabilizer trim during approach, go-around, and level off:
  - o Procedures for the proper use of main electric and manual stabilizer trim during normal and non-normal conditions.
  - o The different manual trim techniques.
  - o The effects of the air loads on the stabilizer and the resulting trim forces in both the nose-up and nose-down directions.

*Note: Boeing 737 FOTB 737-20-04 recommend to be referenced for manual trim techniques.*

- A Cross-FCC Trim Monitor activation demonstration: Condition should terminate in a landing or in a rejected take-off to demonstrate the updated STAB OUT OF TRIM light functionality.
- Erroneous high AOA that leads to an unreliable airspeed condition:
  - o Demonstrates flight deck effects (i.e. aural, visual, and tactile) associated with the failure.
  - o Fault occurring during the takeoff procedure.
  - o Go-around or missed approach flown with erroneous high AOA condition: FD behavior biasing out of view upon selecting takeoff/go-around (TO/GA)

*Note: When training on the NNC for Airspeed Unreliable, in addition to demonstrate the complex procedure and memory items, there are also following points need to be pay special attention to crew operations:*

*- Avoid overspeed landing flap load relief during approach lead to unstable approach condition (Boeing 737 FOTB 737-13-2 Rev 1 may be referenced as guidelines).*

*- Ensure obstacle performance in low altitude just after take-off when implement memory items (Boeing 737NG/MAX FCTM Chapter 8, 8.29 may be referenced as guidelines).*

### 2.5 Specification for Checking

For 737-8 model airplanes RTS training, the appropriate training areas of special emphasis should be checking to each pilot acting as PF.

## 2.6 Specification for Currency

Not influenced.

## 2.7 Specification for Flight Simulation Training Devices

For 737-8 model airplanes RTS training and checking, use of the 737 MAX Full Flight Simulator (FFS) is required.

*Note: The 737 MAX FFS requirement is due to no MCAS function in the FFS for 737 NG.*

## Section 3: Maintenance Personnel Qualification Specification

### 3.1 Statement and Explanation

This section is the formal notification that the CAAC AEG has conducted Maintenance Training Evaluation (MTE) for Boeing 737-8 model airplanes RTS actions with the support of Boeing.

The provisions in this section should be used, as the basis, by Chinese operators to revise their maintenance personnel qualification and training program for 737-8 model airplanes RTS.

### 3.2 Maintenance License Endorsement

Not impacted.

### 3.3 Specification for Training

The 737 MAX Master Minimum Maintenance Type Training Syllabus proposed by Boeing has been revised to Rev. E, it has to be considered as a baseline by operators in improving their maintenance training program.

*Note 1: The above training syllabus are compliance with the AC-66-FS-009 specifications. The Maintenance Type Training Syllabus for 737-8 also includes differences training from 737NG to 737 MAX.*

*Note 2: For 737-8 model airplanes RTS, self-organized training by Chinese operators or maintenance organizations approved under CCAR-145 may be adopted with reference to the appropriate training material recommended by Boeing.*

*Note 3: The Maintenance Type training syllabus and training material are available from Boeing by request.*



## Section 4: Master Minimum Equipment List

### 4.1 Statement and Explanation

This section is the formal notification that the CAAC AEG has conducted the Master Minimum Equipment List (MMEL) evaluation for Boeing 737-8 model airplanes RTS actions based on the FAA published Boeing 737 MAX Master Minimum Equipment List (MMEL) Revision 3, which specifies the FAA determination of items that may be inoperative for 737-8 model airplanes after RTS.

For 737-8 model airplanes RTS, the deleted or modified items in above FAA approved Boeing 737 MAX MMEL revision must be incorporated into operator's approved Minimum Equipment List (MEL).

#### Find FAA MMEL here:

<http://fsims.faa.gov/PICResults.aspx?mode=Publication&doctype=MMEL>

737 series airplanes MMEL is also published by Boeing on MyBoeingFleet website.

### 4.2 CAAC Supplemental

Not applicable.

## Section 5: Scheduled Maintenance Requirements

### 5.1 Statement and Explanation

This section is the formal notification that the CAAC AEG has conducted Scheduled Maintenance Requirements (SMR) evaluation for Boeing 737-8 model airplanes RTS actions based on the FAA published Boeing 737 MAX Maintenance Review Board Report (MRBR) Revision dated Feb-2021, which specifies the FAA determination of minimum maintenance requirements for 737-8 model airplanes after RTS.

***Note 1:** For 737-8 model airplanes RTS, in addition to a new task generated by MSG-3 logic process in above FAA approved Boeing 737 MAX MRBR revision, there also some new CMRs for FCC software P12.1.2 upgrade.*

***Note 2:** As the 737-8 model airplanes may face to un-usual situations of long term storage before RTS, Boeing has developed an Aircraft Storage Maintenance Program (ASMP D626A015), which providing list of tasks recommended for both preservation and de-preservation, and was accepted by FAA MRB as Appendix M of above MRBR.*

For 737-8 model airplanes RTS, the new MRBR task in the FAA approved 737-8 MRBR revision and new CMRs must be incorporated into operator's approved Maintenance Program, and Boeing ASMP may be referenced when develop their task package of de-preservation.

***Note:** In addition to above, tasks in revised Airworthiness Limitations Section (ALS) of the applicable CFM LEAP-1B Engine by CAD2020-MULT-19 (Refer to FAA AD 2020-06-01) should also be incorporated into operator's approved Maintenance Program before 737-8 model airplanes RTS, even not included in Boeing actions for RTS.*

#### **FAA MRBR distribution:**

Available on MyBoeingFleet website.

### 5.2 CAAC Supplemental

Not applicable.

## Section 6: Operational and Continued Airworthiness Instructions

### 6.1 Statement and Explanation:

This section is the formal notification that the CAAC AEG has conducted evaluation of the operational and continued airworthiness instructions for Boeing 737-8 model airplanes RTS actions based on the FAA related evaluation and determinations.

The Operational & Continued Airworthiness Instructions (OCAI) document listed in the following paragraphs was found acceptable by the CAAC AEG for 737-8 model airplanes RTS.

This acceptance may not assure the accuracy and applicability of the content in each document. It is the aircraft owner or operator responsibility to report any defect or discrepancy in the documents to the aircraft manufacturer or the CAAC AEG through our website: <http://aeg.caac.gov.cn/>.

### Operational & Continued Airworthiness Instructions distribution:

Operational & Continued Airworthiness Instructions documents are available on MyBoeingFleet website. The engine manufacturer distributes engine manuals directly to operators.

### 6.2 List of Operational and Continued Airworthiness Instructions for 737-8 airplane

The following operational and continued airworthiness instructions revised by Boeing and should be as the necessary guidance for properly operating and maintaining of 737-8 model airplanes for RTS:

Manual	Reference No.	Description	Revision
FCOM/QRH	D6-27370-MAX	Flight Crew Operations Manual (FCOM)/Quick Reference Handbook (QRH)	01 December, 2021
DDG	D639A001-01	Dispatch Deviations Guide	30 April, 2021
AMM	D633AM101	Airplane Maintenance Manual	15 September, 2021
SDS	D633AM102	System Description Section	15 September, 2021
IPC	D638A001	Illustrated Parts Catalog	15 September, 2021
IFIM	D633AM103	Interactive Fault Isolation Manual	15 October, 2021
MPD	D626A011	Maintenance Planning Data Document	15 September, 2021
TC	D633AM109	Task Card (for data not in AMM)	15 September, 2021

*Note 1: Document customization such as different reference number does not affect CAAC's acceptance to above documents. A customized manual may have different revision number from a non-customized manual but both will have the same revision date.*

*Note 2: The following documents approved by type certification process for 737-8 model airplanes RTS must be followed by Chinese operators for operation and maintenance within approved limitations:*

- *AFM: Airplane Flight Manual (D631A002, Revised in accordance with CAD2021-B737-19 and effective revision thereafter)*
- *Certification Maintenance Requirements (CMR) (D626A011-9-03, Revision 01 Nov 2020)*

## Special Aircraft Evaluation Report for 737-8 RTS

---

*Note 3: In addition to above mentioned operational and continued airworthiness instructions, Boeing has published a series of service documents to provide supplemental information or guidelines for support 737-8 model airplanes RTS (reference Appendix 2 for service documents list), it is also valuable to be referenced by Chinese operators.*

## Section 7: Other Evaluation Items

### 7.1 Forward Observer Seat

Not influenced.

### 7.2 Flight Crew Sleeping Quarters

Not applicable.

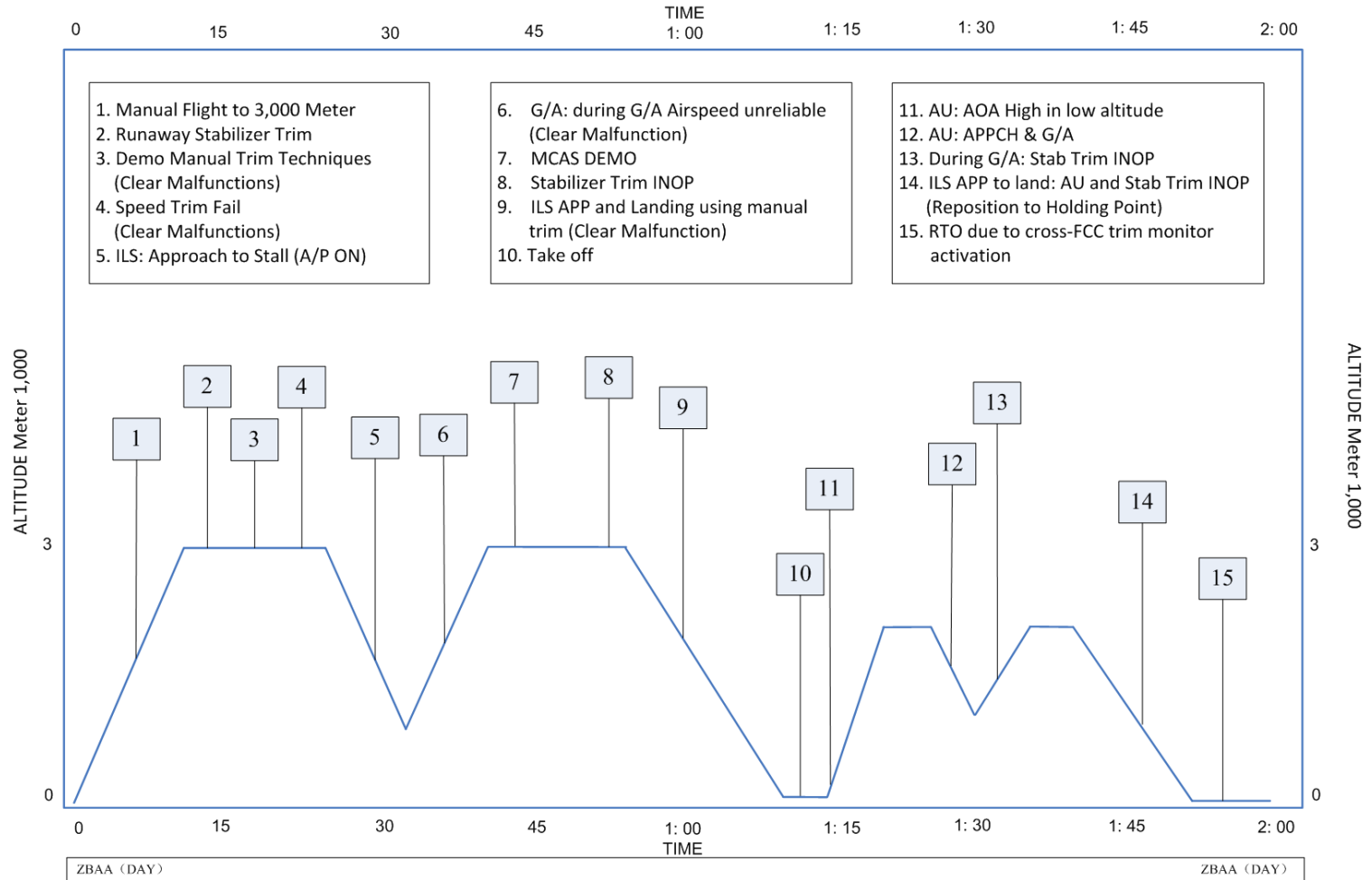
### 7.3 Electronic Flight Bag

Not influenced.

### 7.4 Emergency Evacuation Demonstration for 737-8 airplanes

Not influenced.

### Appendix 1: Required Flight Training Profile for RTS



**Appendix 2: Boeing Service Documents list for RTS**

<b>Document</b>	<b>Subject</b>
FOTB 737-19-03	Ferry flights for 737 MAX airplanes with FCC software Version P11.1 or earlier
FOTB 737-20-01	Operational readiness flight prior to 737 MAX RTS
FCT 737 NG/MAX (TM)	737 NG/MAX Flight Crew Training Manual
737-SL-31-072-A	MDS Service Letter
737-SL-22-073-A	FCC Service Letter
737-SL-22-074-A	FCC Non-MCAS Service Letter
MOM-MOM-20-0522-01B	Kathon Removal
MOM-MOM-20-0178-01B	Recommendation – Fuel Tank Inspection
MOM-MOM-20-0891-01B	Certification Maintenance Requirements (CMR) – Implementation into the Maintenance Program
MOM-MOM-19-0246	737 MAX Maintenance Programs During Active Storage and/or Prolonged Parking Past 60 Days
Task Collection (Excel spreadsheet)	Related scheduled maintenance requirements

*Notes: Above service document including Task Collection is available by request to Boeing.*

### Appendix 3: Point of Contact

#### A: CAAC AEG Special Evaluation Team for 737-8 RTS

XUE Shijun	Deputy Director of General, Flight Standards Department
WANG Jin	Aircraft Evaluation Division, Flight Standards Department
ZHU Hengyu	FSB Pilot, Aircraft Evaluation Center, Civil Aviation Safety & Technology Center of CAAC

#### B: Boeing Point of Contact

Yohannes AMARE	Program Manager, System Safety & Regulatory Affairs, BCA
Victoria WILK	Director of Safety & Regulatory Affairs, China
HAO Yiming	Deputy Director, Global Safety & Regulatory Affairs, China