

型号认可证数据单
THE VALIDATION DATA SHEET

编号/No.: VTC0054E

版次/Revision: 2

型号/Type:

GE90-76B, GE90-90B, GE90-113B,

GE90-77B, GE90-115B,

GE90-85B, GE90-110B1

批准人/Approved by:



日期/Date: 2016 年 8 月 9 日

本数据单是型号认可证（编号 VTC0054E）的组成部分，它规定了符合中国民用航空局的适航要求所颁发此型号认可证的产品状态和限制。

This data sheet, which is a part of Validation Type Certificate (No: VTC0054E), prescribes conditions and limitations under which the product for which the Type Certificate was issued meets the airworthiness requirements of the Chinese Civil Aviation Regulation.

型号认可证持有人/Validation of Type Certificate Holder:

General Electric Company

GE Aviation

1 Neumann Way

Cincinnati, OH, US 45215-6310

有效页清单/List of effective pages :

页数/ Pages	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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第1部分 概述

SECTION 1 GENERAL

1. CAAC认可数据单和型号合格证数据单

CAAC Validation Data Sheet and Type Certificate Data Sheet

	中国民用航空局认可数据单号、版次和颁发日期 CAAC Validation Data Sheet Number, Revision and issuance date	型号合格证数据单号、版次和颁发日期 Type Certificate Data Sheet Number, Revision and issuance date
当前 Current	No.VTC0054E, 版次 2, 2016 年 8 月 9 日颁发 No.VTC0054E; Revision 2; Date of Issue:	No. E00049EN, 版本: 19, 2016 年 6 月 23 日颁发 No. E00049EN, Revision 19, Date of Issue: 2016-6-23
历史 History	No.VTC0054E, 版次 1, 2008 年 12 月 30 日颁发 No.VTC0054E; Revision 1; Date of Issue: 2008-12-30	No. E00049EN, 版本: 13, 2007 年 3 月 8 日颁发 No. E00049EN, Revision 13, Date of Issue: 2007-3-8
	No.VTC65, 版次 0, 1997 年 1 月 6 日颁发 No.VTC65; Revision 0; Date of Issue: 1997-1-6	No. E00049EN, 版本: 4 No. E00049EN, Revision 4
	No.VTC0054E, 版次 0, 1995 年 12 月 26 日颁发 No.VTC0054E; Revision 0; Date of Issue: 1995-12-26	No. E00049EN, 版本: 1 No. E00049EN, Revision 1,

2. 类别/Category: 航空发动机/Aeroengine
3. 认可当局/Validation Authority: 中国民用航空局/CAAC
审定当局/Certifying Authority: 美国联邦航空局/FAA
4. 型号合格证持有人/Type Certificate Holder: General Electric Company
GE Aviation
1 Neumann Way
Cincinnati, OH, US 45215-6310
5. ETOPS:
6. CAAC专用要求/Special Requirements: 满足中国3号燃油 (GB6537-2006) 的要求。/Compliance with
requirement of P.R.China JET Fuel No.3 (GB6537-2006).

第2部分

SECTION 2

I. 型号/MODELS	GE90-76B	GE90-77B	GE90-85B	GE90-90B
类型/TYPE 额定值 (见注 5) RATINGS (See NOTE 5) 最大连续, 海平面, Maximum continuous, at sea level, 静态推力, 磅/ static thrust, lb 起飞 (5 分钟, 见注 16), 海平面, Takeoff (5 min. see NOTE 16), at sea level, 静态推力, 磅/ static thrust, lb 平台额定环境温度值/ Flat rating ambient temperture 起飞/Takeoff 最大连续/Maximum continuous	GE90 系列发动机是双转子、轴流、高涵道比涡轮风扇发动机。该发动机的 10 级高压压气机由 2 级高压涡轮驱动; 1 级风扇和 3 级低压压气机由 6 级低压涡轮驱动。 Dual rotor, axial flow, high bypass ratio turbofan. The 10-stage high pressure compressor is driven by a 2-stage high pressure turbine. The single stage fan and 3-stage low pressure compressor are driven by a 6-stage low pressure turbine.			
	75,430	75,430	81,230	90,580
	81,070	81,700	88,870	94,000
	91°F/32.8°C	--	86°F/30°C	--
	77°F/25°C	--	--	--

中国民用航空局
CIVIL AVIATION ADMINISTRATION OF CHINA

I. 型号/MODELS	GE90-76B	GE90-77B	GE90-85B	GE90-90B
部件/ COMPONENTS (GE P/Ns)				
液压机械控制组件 Hydromechanical Control Unit	1693M75 1851M65	-- --	-- --	-- --
全数字式发动机控制 Full Authority Digital Engine Control (FADEC)				
软件和硬件 Hardware (H/W) & Software (S/W)	1838M16	-	-	-
硬件 (注 21) / H/W (See Note 21)	1859M87 1838M16	-- --	-- --	-- --
软件 (注 21) / S/W(See Note 21)	1853M99	--	--	--
注: 1. '---' 表示相同; 2. '-' 表示不适用。				
发动机构型盒 (注10) Configuration Type Box (See Note 10)	320-837-701-0 320-839-501-0 320-892-101-0 320-892-201-0 320-846-701-0 320-892-601-0 320-915-201-0 320-921-501-0	- -- - -- -- -- -- --	- -- - -- -- -- -- --	- -- - -- -- -- -- --
FADEC额定值销 FADEC Rating Plug	320-833-701-0	320-833-901-0	320-833-801-0 320-834-201-0	320-834-001-0
主燃油泵 Main Fuel Pump	1689M10	--	--	-- --
点火系统/ IGNITION SYSTEM				
两个点火激励器GE P/N Two ignition units GE P/N	9238M66	--	--	--
两个点火塞GE P/N Two ignitor plugs GE P/N	1754M84	--	--	--

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1. 型号/MODELS	GE90-76B	GE90-77B	GE90-85B	GE90-90B
主要尺寸 (英寸) PRINCIPAL DIMENSIONS (in) 长度 (风扇进气锥到尾喷中心体) Length (Fan spinner to nozzle centerbody) 宽度 (最大外壳) / Width (maximum envelope) 高度 (最大外壳) / Height (maximum envelope)	286.9	--	--	--
重量 (干重) WEIGHT (dry) 包括发动机本体, 基本发动机附件和在发动机制造商规范中列出的选装设备 Includes basic engine, basic engine accessories, and optional equipment as listed in the manufacturer's engine specifications.	17,400	--	--	--
重心位置 (英寸), 仅发动机 CENTER OF GRAVITY LOCATIONS (in); Engine only				
站位 (轴向) Station (axial)	227.5 ± 1.5	--	--	--
水平线 Waterline	99.9 ± 0.5	--	--	--
纵剖线 Buttline	100.4 ± 0.5	--	--	--

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III. 型号/MODELS	GE90-110B1	GE90-113B	GE90-115B	
额定值 (见注 5) RATINGS (See NOTE 5) 最大连续, 海平面, Maximum continuous, at sea level, 静态推力, 磅/ static thrust, lb	110,000	110,000	110,000	
起飞 (5 分钟, 见注 16), 海平面, Takeoff (5 min. see NOTE 16), at sea level, 静态推力, 磅/ static thrust, lb	110,760	113,530	115,540	
平台额定环境温度值/ Flat rating ambient temperature 起飞/Takeoff 最大连续/Maximum continuous	92°F/33°C 77°F/25°C	86°F/30°C 77°F/25°C	86°F/30°C 77°F/25°C	
部件/ COMPONENTS (GE P/Ns) 液压机械控制组件 Hydromechanical Control Unit	1962M80	--	--	
全数字式发动机控制 Full Authority Digital Engine Control (FADEC)				
硬件 (注 21) H/W (See Note 21)	1962M67	--	--	
软件 (注 21) S/W (See Note 21)	2041M27	--	--	

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III. 型号/MODELS	GE90-110B1	GE90-113B	GE90-115B	
发动机型盒 Configuration Type Box	390-850-001-0 390-851-001-0 390-850-002-0 390-851-002-0	-- -- -- --	-- -- -- --	
FADEC额定值销 FADEC Rating Plug				
G01	390-801-011-0	390-802-001-0	390-800-001-0	
G02	390-803-001-0	390-804-001-0	390-805-001-0	
G03	390-803-011-0	--	390-805-011-0	
G04	390-803-021-0	--	390-805-021-0	
主燃油泵 Main Fuel Pump	2042M69	--	--	
点火系统/ IGNITION SYSTEM				
两个点火激励器GE P/N Two ignition exciters GE P/N	9238M66	--	--	
两个点火塞GE P/N Two ignitor plugs GE P/N	1754M84	--	--	
主要尺寸 (英寸) PRINCIPAL DIMENSIONS (in)				
长度 (风扇进气锥到尾喷中心体) Length (Fan spinner to nozzle centerbody)	286.67	--	--	
宽度 (最大外壳) / Width (maximum envelope)	148.38	--	--	
高度 (最大外壳) / Height (maximum envelope)	154.56	--	--	

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III. 型号/MODELS	GE90-110B1	GE90-113B	GE90-115B	
重量 (干重) WEIGHT (dry) 包括发动机本体, 基本发动机附件和在 发动机制造商规范中列出的选装设备 Includes basic engine, basic engine accessories, and optional equipment as listed in the manufacturer's engine specifications.	19316 lb	--	--	
重心位置 (英寸), 仅发动机 CENTER OF GRAVITY LOCATIONS (in); Engine only				
站位 (轴向) Station (axial)	219.2 ± 1.5	--	--	
水平线 Waterline	100.14 ± 0.5	--	--	
纵剖线 Buttline	100.28 ± 1.5	--	--	

IV. 型号/MODELS	所有/All
燃油/FUEL	见注释 7 已批准的燃油。 / See Note 7 for approved fuels.
滑油/OIL	2 类滑油中符合 GE 规范 D50TF1 或最新修订版本的滑油被授权使用。 被批准的滑油牌号见 GE90 服务通告 SB79-0001。 Type 2 oils conforming to GE90 Specification D50TF1 or the latest revisions are authorized. For approved brand of oils refer to GE90 Service Bulletin 79-001..

审定基础/

CERTIFICATION BASIS

(GE90-76B/-77B/-85B/-90B)

- 1965 年 2 月 1 日生效的 14 CFR 第 33 部, 第 33-1 到 33-15 修正案; 2009 年 6 月 29 日生效的 14 CFR 第 34 部, 第 4 修正案; 专用条件 SC-33-ANE-08-NE; 2008 年 11 月 24 日生效的第 33-27 修正案 33.71(c)(4)条款。 / Title 14, Code of

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Federal Regulations (14 CFR) part 33, effective February 1, 1965, amendments 33-1 through 33-15, inclusive; 14 CFR part 34, amendment 4, effective June 29, 2009; and Special Condition Number SC-33-ANE-08-NE; and para. 33.71(c)(4), amendment 33-27, effective November 24, 2008.

(GE90-110B1/-113B/-115B)

- 1965 年 2 月 1 日生效的 14 CFR 第 33 部, 第 33-1 到 33-20 修正案; 2012 年 12 月 31 日生效的 14 CFR 第 34 部, 第 5 修正案; 专用条件 SC-33-ANE-08-NE; 2003 年 1 月 15 日发布的针对§33.73(b)的第 7953 号豁免令; 2008 年 11 月 24 日生效的第 33-27 修正案 33.71(c)(4)条款。/ 14 CFR part 33, effective February 1, 1965, including Amendments 33-1 through 33-20; 14 CFR part 34, amendment 5, effective December 31, 2012; Special Condition SC-33-ANE-08-NE, and Exemption to §33.73(b), No. 7953 dated January 15, 2003; and para. 33.71(c)(4), amendment 33-27, effective November 24, 2008.
- GE90-110B1, GE90-113B, and GE90-115B 的有关燃油排泄和排放的审定基础请见注 25。/See NOTE 25 for detailed summary of the certification basis for fuel venting and exhaust emissions for GE90-110B1, GE90-113B, and GE90-115B models.

型号合格证 E00049EN/ TYPE CERTIFICATE E00049EN

型号 MODEL	申请日期 DATE	颁发 / 修订 ISSUED/AMENDED
GE90-76B	DEC 16, 1991	FEB 2, 1995
GE90-85B	DEC 16, 1991	FEB 2, 1995
GE90-90B	AUG 10, 1994	JUL 2, 1996
GE90-77B	NOV 20, 1995	JUL 2, 1996
GE90-94B	MAR 5, 1999	JUN 9, 2000
GE90-113B	JUN 27, 2000	JUL 30, 2003
GE90-115B	JUN 27, 2000	JUL 30, 2003
GE90-110B1	JAN 9, 2002	JUL 30, 2003
GE90-75B	DEC 16, 1991	FEB 2, 1995
		(取消/Deleted JUL 24, 1995)
GE90-92B	AUG 10, 1994	JUL 2, 1996
		(取消/Deleted June 26, 2000)

CAAC 认可审定基础/ CAAC
VALIDATION BASIS

接受 FAA 的审定基础作为认可审定基础。
Accept FAA certification basis as validation basis.

生产基础/
PRODUCTION BASIS

GE90-76B/-77B/-85B/-90B/-110B1/-113B/-115B 生产合格证 No. 108。
GE90-76B/-77B/-85B/-90B/-110B1/-113B/-115B Production Certificate No. 108

注释/ NOTE

注 1/NOTE 1 最大许用发动机转子转速 /MAXIMUM PERMISSIBLE ENGINE ROTOR SPEEDS

GE90-76B

低压转子/Low pressure rotor (N1):	2,465 RPM (109.0%)*
高压转子/High pressure rotor (N2) :	10,705 RPM (114.7%)**

GE90-77B/-85B/-90B

低压转子/Low pressure rotor (N1):	2,465 RPM (109.0%)*
高压转子/High pressure rotor (N2) :	10,918 RPM (117%)**

GE90-110B1/-113B/-115B

低压转子/Low pressure rotor (N1):	2,602 RPM (110.5%***)
高压转子/High pressure rotor (N2) :	11,292 RPM (121%)**

* 100% N1 is 2,261.5 RPM

** 100% N2 is 9,332.0 RPM

*** 100% N1 is 2,355.0 RPM

注 2/NOTE 2 最大许用温度/MAXIMUM PERMISSIBLE TEMPERATURES

GE90-76B (见注 10)

指示的涡轮排气温度 (T49)

Indicated turbine exhaust gas temperature (T49)

起飞 5 分钟 (见注 16) /	1,787°F (975°C)
Takeoff 5 minutes (see NOTE 16)	
最大连续	1,697°F (925°C)
Maximum Continuous	
地面起动 (手动或自动) /	1,382°F (750°C)
Ground starts (manual or auto)	
空中起动 (手动或自动) /	1,517°F (825°C)
Inflight starts (manual or auto)	
* 60 秒最大瞬时 /	1,796°F (980°C)
* 60 seconds maximum transient	

滑油温度限制/Oil temperature limits

连续/Continuous	255°F (124°C)
瞬时/Transient	275°F (135°C)

GE90-77B/-85B/-90B

指示的涡轮排气温度 (T49)

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Indicated turbine exhaust gas temperature (T49)	
起飞 5 分钟 (见注 16) /	1,885°F (1,030°C)
Takeoff 5 minutes (see NOTE 16)	
最大连续	1,859°F (1,015°C)
Maximum Continuous	
地面起动 (手动或自动) /	1,382°F (750°C)
Ground starts (manual or auto)	
空中起动 (手动或自动) /	1,517°F (825°C)
Inflight starts (manual or auto)	
* 60 秒最大瞬时 /	-
* 60 seconds maximum transient	
滑油温度限制/Oil temperature limits	
连续/Continuous	255°F (124°C)
瞬时/Transient	275°F (135°C)

GE90-110B1/-113B/-115B

指示的涡轮排气温度 (T49)

Indicated turbine exhaust gas temperature (T49)	
起飞 5 分钟 (见注 16) /	1,994°F (1,090°C)
Takeoff 5 minutes (see NOTE 16)	
最大连续	1,922°F (1,050°C)
Maximum Continuous	
地面起动 (手动或自动) /	1,382°F (750°C)
Ground starts (manual or auto)	
空中起动 (手动或自动) /	1,517°F (825°C)
Inflight starts (manual or auto)	
* 30 秒最大瞬时 /	2,003°F (1,095°C)
* 30 seconds maximum transient	
滑油温度限制/Oil temperature limits	
连续/Continuous	270°F (132°C)
瞬时/Transient	290°F (143°C)

注 3/NOTE 3

燃油和滑油压力限制/FUEL AND OIL PRESSURE LIMITS

最大允许燃油压力是 70 psig。最小允许燃油压力在正常操作条件下 (飞机燃油系统可完全操作) 是 5.0 psia。飞行高度在 38,000 英尺以下, 如果平均燃油压力高于 4.5 psia, 在 15 秒内允许燃油压力低至 3.5 psia。

Maximum allowable fuel pressure is 70 psig. Minimum allowable fuel pressure under normal operating conditions (fully operational aircraft fuel system) is 5.0 psia. At altitudes of 38,000 feet and below, transitory excursions of 15 seconds or less to a minimum fuel pressure of 3.5 psia are allowable provided

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the average fuel pressure remains above 4.5 psia.

滑油压力限制/OIL PRESSURE LIMITS

低压/LOW PRESSURE

限制是 10.0 psid (69 kPa 压差) (见注 14) /The limit is 10.0 psid (69 kPa diff.). (See NOTE 14)

注 4/NOTE 4

附件驱动特性/

ACCESSORY DRIVE PROVISIONS

GE90-76B/-77B/-85B/-90B

驱动座 DRIVE PAD	转向(面朝齿轮箱 安装座) Rotation Facing Gearbox Pad	齿轮/核心转子比 Gear Ratio to Core Speed	连续转动马力（千瓦） Horsepower Continuous Pad Rating HP (kW)	剪切扭矩 英寸-磅（牛·米） Shear Torque IN-LB (N·m)	最大悬臂力矩 英寸-磅（牛·米） Maximum Overhung Moment IN-LB (N·m)
整体发电机/ IDG (120 kVA)	CCW (*)	0.7947	243 (181.3)	10,000 – 10,500 (1,130 – 1,187)	2,000 (226.0)
液压泵/ Hydraulic Pump	CCW	0.3783	85 (63.5)	4,250 – 4,850 (480 - 548)	230 (26.0)
恒速装置发电机/ VSCF/PMG Generator (20/30 kVA)	CCW	2.4126	58 (43.3)	3,500; 4,500** (395, 508)**	400 (45.2)
发电机过载限制/ IDG Overload Limits	1000小时中，超过304马力(226.8 kVA)最多5分钟。/ 304 HP (226.8 kVA) for 5 minutes per 1,000 hours of operation 1000小时中，超过406马力(302.9 kVA)最多5秒钟。/406 HP (302.9 kVA) for 5 seconds per 1,000 hours of operation 超过500马力(373.0 kVA) 时会出现电气故障。/500 HP (373.0 kVA) electrical fault				
VSCF 过载限制/ VSCF/PMG Overload limits	1000小时中，超过87马力(64.9 kVA)最多5分钟。/87 HP (64.9 kVA) for 5 minutes per 1,000 hours of operation 1000小时中，超过116马力(86.5 kVA)最多5秒钟。/116 HP (86.5 kVA) for 5 seconds per 1,000 hours of operation 超过128马力(95.5 kVA)会出现电气故障。/128 HP (95.5 kVA) electrical fault				
	100%核心机转速是 9,332 RPM./ 100% core speed is 9,332 RPM (*) 逆时针/ Counter Clockwise (**) 剪切扭矩裕度与运营商的要求有关，具体裕度请咨询 GE 航空。/Shear torque capability is a function of operator requirements. Consult GE Aviation for installed capability.				

GE90-110B/-113B/-115B

驱动座 DRIVE PAD	转向(面朝齿轮箱 安装座) Rotation Facing Gearbox Pad	齿轮/核心转子比 Gear Ratio to Core Speed	连续转动马力(千瓦) Horsepower Continuous Pad Rating HP (kW)	剪切扭矩 英寸-磅(牛·米) Shear Torque IN-LB (N·m)	最大悬臂力矩 英寸-磅(牛·米) Maximum Overhung Moment IN-LB (N·m)
整体发电机/ IDG (120 kVA)	CCW (*)	0.7947	243 (181.3)	10,000 – 10,500	2,000 (226.0)

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液压泵/ Hydraulic Pump	CCW	0.3783	85 (63.5)	(1,130 – 1,187) 4,250 – 4,850 (480 - 548)	230 (26.0)
恒速装置发电机/ VSCF/PMG Generator (20/30 kVA)	CCW	2.4126	58 (43.3)	1,250 max (141.2 max)	400 (45.2)
发电机过载限制/ IDG Overload Limits	1000小时中, 超过304马力(226.8 kVA)最多5分钟, / 304 HP (226.8 kVA) for 5 minutes per 1,000 hours of operation 1000小时中, 超过406马力(302.9 kVA)最多5秒钟, /406 HP (302.9 kVA) for 5 seconds per 1,000 hours of operation 超过500马力(373.0 kVA) 时会出现电气故障。 /500 HP (373.0 kVA) electrical fault				
VSCF 过载限制/ VSCF/PMG Overload limits	1000小时中, 超过87马力(64.9 kVA)最多5分钟。 /87 HP (64.9 kVA) for 5 minutes per 1,000 hours of operation 1000小时中, 超过116马力(86.5 kVA)最多5秒钟。 /116 HP (86.5 kVA) for 5 seconds per 1,000 hours of operation 超过128马力(95.5 kVA)会出现电气故障。 /128 HP (95.5 kVA) electrical fault				
	100%核心机转速是 9,332 RPM/ 100% core speed is 9,332 RPM (*) 逆时针/ Counter Clockwise				

注 5/NOTE 5 发动机额定值是基于下列条件下的校准台架性能: /Engine ratings are based on calibrated test stand performance under the following conditions:

1. 海平面静止状态, 标准压力(14.696 psia), 59 °F /Sea level static, standard pressure (14.696 psia), 59 °F
2. 无客户端引气和功率提取 /No customer bleed or customer horsepower extraction
3. 理想进气, 100%冲压恢复 /Ideal inlet, 100% ram recovery
4. 产品型飞机飞行整流罩 /Production aircraft flight cowling
5. 产品型传感设备 /Production instrumentation
6. 燃油低热值 18,400 BTU # / Fuel lower heating value of 18,400 BTU #

注 6/NOTE 6 最大许用引气提取 /MAXIMUM PERMISSABLE BLEED AIR EXTRACTION

GE90-76B/-77B/-85B/-90B

	第4级 Stage 4	第7级 Stage 7	第10级 Stage 10	最大允许值 Maximum Allowable
<u>Below 23% N1K</u>	7.8	1.8	13.6	15.4
<u>23 to 31% N1K</u>	7.6	1.6	12.8	14.4
<u>31 to 57.4% N1K</u>	7.4	1.3	12.6	13.9
<u>57.4 to 80% N1K</u>	7.2	1.3	12.6	13.9
<u>80 to 96.8% N1K</u>	7.0	1.3	6.5	8.3
<u>Above 96.8% N1K</u>	6.5	1.3	6.5	7.8

GE90-110B1/-113B/-115B

	第4级 Stage 4	第7级 Stage 7	第9级 Stage 9	最大允许值 Maximum Allowable
<u>Below 27% N1K</u>	7.6	1.5	11.2	12.7
<u>At 51% N1K</u>	7.6	1.5	11.5	13.0
<u>At 80% N1K</u>	7.6	1.5	12.0	13.5
<u>At 88% N1K</u>	7.6	1.5	11.0	12.5
<u>At 93% N1K today</u>	7.6	1.5	8.0	9.1
<u>Above 93% N1K</u>	7.6	1.5	7.3	9.1

注 7/NOTE 7

燃油/FUEL

批准的燃油必须满足GE规范D50TF2的要求。某些燃油如按照PRC规范RP3生产的燃油可以满足规范D50TF2的要求。使用混合燃料或燃油添加剂也要满足GE规范D50TF2的要求。

Approved fuels must conform to GE Specification D50TF2. Certain fuels such as those produced to PRC Specification RP3 meet the requirements of D50TF2 by means of the Specification. The engine will operate with a mixture of fuels or additives conforming to GE Specification D50TF2.

注 8/NOTE 8

对重要转动件的寿命限制 / Life limits established for critical rotating components for:

对GE90-76B/-77B/-85B/-90B的寿命限制见GE90发动机手册GEK 100700第5章

GE90-76B/-77B/-85B/-90B are published in Chapter 5 of the GE90 Engine Manual, GEK 100700

对GE90-110B1/-113B/-115B的寿命限制见GE90发动机手册GEK 109993第5章

GE90-110B1/-113B/-115B are published in Chapter 5 of the GE90-100 Engine Manual, GEK 109993

注 9/NOTE 9

所有运行的功率设置，功率检查和发动机推力输出控制都是基于风扇转速（N1）。为此，转速传感器包括在发动机组件中。

Power setting, power checks, and control of engine thrust output in all operations are based on Fan Speed (N1). Speed sensors are included in the engine assembly for this purpose.

注 10/NOTE 10

对于构型控制盒件号为320-839-501-0 的GE90-76B发动机，必须按照GE90服务通告72-169对HP/LP涡轮硬件进行改装。FADEC引入了30°C的调整，相应显示的EGT红线值是975°C (起飞)，

980°C (起飞, 最多60秒), 965°C (最大连续)。

GE90-76B engines with configuration type box number 320-839-501-0 must incorporate the HP/LP turbine hardware and associated changes per General Electric GE90 Service Bulletin 72-169. The FADEC incorporates a 30°C shunt. The corresponding indicated EGT limits are 975°C (take-off), 980°C (take-off with 60 second max. transient), and 965°C (max. continuous).

注 11/NOTE 11 在地面结冰条件下运行, 必须执行以下操作规程: /For ground operation in icing conditions the following procedures must be observed:

GE90-76B/-77B/-85B/-90B

在地面结冰条件操作期间 (包括飞机滑出和滑入), 飞行员必须执行以下操作之一: / During ground operations (including taxi-in and taxi-out) in icing conditions, the pilot must perform one of the following shed procedures:

(a) 迅速将发动机加速到N1大于50%, 且间隔不超过15分钟, 或, / Run up the engines momentarily to a minimum of 50% N1 at intervals not to exceed 15 minutes, or
(b) 在外界环境温度在-6 °C (23 °F) 以上时, 且机场海拔高度不超过3,048米(10,000 英尺), 按照不超过60分钟的间隔执行以下操作: / For operation at ambient conditions of -6 °C (23 °F) and above, and at airport altitudes up to 3,048 meters (10,000 ft), perform the following at intervals not to exceed 60 minutes:

- 1) 将N1转速提高到55%以上 / Increase throttle to a minimum of 55% N1
- 2) 在此转速下停留至少20秒. / Dwell at the specified N1 for 20 seconds minimum
- 3) 减速到慢车转速或者执行起飞程序. / Decelerate to idle or proceed with normal takeoff procedure.

见GE90操作指导手册GEK 100703。 / See GE90 Operating Instructions Manual GEK 100703.

GE90-110B1/-113B/-115B

在地面结冰条件操作期间 (包括飞机滑出和滑入), 发动机必须加速到N1大于50%, 且间隔不超过60分钟。见GE90-100操作指导手册GEK 109994。 / During ground operations (including taxi-in and taxi-out) in icing conditions, the engine must be run up momentarily to a minimum of 50% N1 at intervals not to exceed 60 minutes. See GE90-100 Operating Instructions Manual GEK109994.

注: 结冰条件下发动机加速时间的可能变化, 见GE90-100 安装手册GEK 109995。 /Note: For possible variations in engine acceleration times in icing conditions see the GE90-100 Installation Manual GEK 109995.

注 12/NOTE 12 所有构型盒件号为320-892-101-0 或320-892-201-0的GE90发动机, 都必须按照GE90服务通告 77-008安装PT25防冰罩延伸, 同时必须按照GE90服务通告 73-040安装FADEC软件 P/N 1853M99P06 (版本 9.1.9.7 or 更新)。 / All GE90 engines with configuration type box part numbers 320-892-101-0 or 320-892-201-0 must incorporate the PT25 extended wedge ice shield per GE90 Service Bulletin 77-008 and must incorporate FADEC software P/N 1853M99P06 (version 9.1.9.7 or later) per GE90 Service Bulletin 73-040.

所有构型盒件号为320-837-701-0, 320-839-501-0, 320-892-101-0, 320-892-201-0, 320-846-701-0,

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320-892-601-0 和 320-915-201-0的GE90发动机, 在空中结冰条件下, 最小允许N2转速为6,066 RPM。 / All GE90 engines with configuration type box part numbers 320-837-701-0, 320-839-501-0, 320-892-101-0, 320-892-201-0, 320-846-701-0, 320-892-601-0 and 320-915-201-0, have a minimum permissible N2 of 6,066 RPM for in-flight operation during icing conditions.

所有构型盒件号为320-921-501-0的GE90发动机, 在空中结冰条件下, 最小允许N2转速为6,310RPM。 / All GE90 engines with configuration type box part numbers 320-921-501-0 have a minimum permissible N2 of 6,310RPM for in-flight operation during icing conditions

所有构型盒件号为390-850-001-0 和 390-851-001-0的GE90发动机, 在空中结冰条件下, 最小允许N1 转速为730 RPM。 / All GE90 engines with configuration type box part numbers 390-850-001-0 and 390-851-001-0 have a minimum permissible N1 of 730 RPM for in-flight operation during icing conditions.

注 13/NOTE 13

在针对§33.68 条款的符合性验证中, 感应系统的结冰验证是对应安装在 B777-200LR/300ER 飞机和 B777 货机上的 GE90-110B1/-113B/-115B 发动机。对于这些发动机装在其他飞机型号上, 其对 §33.68 的符合性验证需要单独评估和验证。

Demonstration of compliance to §33.68, Induction System Icing is installation specific to the B777-200LR/300ER and B777 Freighter airplanes for the GE90-110B1/-113B/-115B model engines. Installation of these model engines on different airplane models or types will require a separate evaluation and finding of compliance to §33.68

注 14/NOTE 14

仅在负过载的情况下, 允许滑油压力低于10 psid (69.0 kPa 压差), 不超过15秒。 / During "negative-G" operation only, it is permissible to operate below minimum oil pressure of 10 psid (69.0 kPa diff) for a maximum of 15 seconds.

见GE90操作手册GEK 100703/ See GE90 Operating Instructions Manual, GEK 100703, for GE90-76B/-77B/-85B/-90B.

见GE90-100操作手册GEK 109994/ See GE90-100 Operating Instructions Manual, GEK 109994, for GE90-110B1/-113B/-115B.

注 15/NOTE 15

这些发动机具有以下总体特性。 / THESE MODELS INCORPORATE THE FOLLOWING GENERAL CHARACTERISTICS

<u>发动机型号/</u>	<u>特性/</u>
ENGINE MODEL	CHARACTERISTICS
GE90-76B	基本型 / Basic Model
GE90-77B	除了改进HPT/LPT气流通道和提高额定推力外, 与GE90-76B一样。推力额定值相应改变。 / Same as GE90-76B except improved HPT/LPT flowpath and higher thrust ratings. Corresponding Rating Plug changes
GE90-85B	除提高额定推力外, 与GE90-76B一样。推力额定值相应改变。 / Same as GE90-76B except higher thrust ratings. Corresponding Rating Plug changes.

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GE90-90B	除提高额定推力外，与GE90-77B一样。推力额定值相应改变。/ Same as GE90-77B except higher thrust ratings. Corresponding Rating Plug changes.
GE90-110B1	与基本型相比，FAN, LPC, HPC, HPT and LPT的硬件都有改变，提高了起飞推力，转速和温度限制，推力额定值相应改变。见注22。/ Differs primarily from basic model in FAN, LPC, HPC, HPT and LPT hardware, higher takeoff thrust rating with increased speed, and temperature limitations. Corresponding rating plug changes. See NOTE 22.
GE90-113B	除提高额定推力外与GE90-110B1一样。推力额定值相应改变。/ Same as GE90-110B1 except higher thrust ratings. Corresponding Rating Plug changes.
GE90-115B	除提高额定推力外与GE90-113B一样。推力额定值相应改变。/ Same as GE90-113B except higher thrust ratings. Corresponding Rating Plug changes.

注 16/NOTE 16 在应急情况下，正常起飞的 5 分钟时间限制可以延长到 10 分钟。
The normal 5 minute takeoff time limit may be extended to 10 minutes for engine out contingency.

注 17/NOTE 17 限时放行标准 /TIME LIMITED DISPATCH CRITERIA

对发动机控制系统的放行和维护标准：对于GE90-76B/-77B/-85B/-90B，见GE文件GEK 103084和GE90发动机手册GEK 100700中的适航限制部分，其中定义了不同构型的最大使用间隔。/ Criteria pertaining to the dispatch and maintenance requirements for the engine control systems are specified in: For the GE90-76B/-77B/-85B/-90B see General Electric Document GEK 103084 and the Airworthiness Limitations Section of the GE90 Engine Manual GEK 100700, which defines the various configurations and maximum operating intervals.

对于GE90-110B1/-113B/-115B，要求定义在GE90-100 发动机手册GEK 109993中的适航限制部分。/For the GE90-110B1/-113B/-115B the requirements are defined in the Airworthiness Limitations section of the GE90-100 Engine Manual GEK 109993

注 18/NOTE 18 对于复合材料风扇叶片在内环气流通道以下的根部位置的损伤进行的修理，其修理的批准对于GE90-76B/-77B/-85B/-90B按照GE90发动机手册GEK 100700中的适航限制部分，对于GE90-110B1/-113B/-115B按照GE90-100 Engine Manual GEK 109993中的适航限制部分。
For approval of repairs of fan blade composite material in the root section of the fan blade up to the inner annulus flow path line see the Airworthiness Limitations Section of GE90 Engine Manual GEK 100700 for the GE90-76B/-77B/-85B/-90B and GE90-100 Engine Manual GEK 109993 for the GE90-110B1/-113B/-115B.

注 19/NOTE 19 删除。/Note deleted

注 20/NOTE 20 预留。/Reserved..

注 21/NOTE 21 最初 FADEC 件号是硬件和软件共同的件号。现在硬件和软件都有单独的件号。发动机安装的 FADEC 可以通过组合号或者硬件和软件号来识别。

The FADEC unit P/N originally defined both hardware and software. The hardware and software are now defined by separate P/Ns. The engine should be equipped with a FADEC defined either by the combined P/N or by the hardware and the software P/Ns.

注 22/NOTE 22 GE90-110B1/-113B/-115B发动机，在2002年8月26日在华盛顿获得了对§21.19(a)的豁免，该豁免许可GE航空在满足如下条件和限制时，可以通过修订型号证书E00049EN来增加发动机的型号而不用重新申请新的型号证书：

An exemption to §21.19(a) was granted and issued in Washington, DC, on August 26, 2002, for the GE90-110B1/-113B/-115B engine models. This exemption allowed GEAE to amend Type Certificate No. E00049EN to add these models rather than apply for a new type certificate for those engines, subject to the following conditions and limitations:

1. 如同新的型号证书，GE航空必须遵循§21.17。/GEAE must comply with §21.17 as if it was a new type certificate.
2. GE航空必须遵循§33.76，进行大量的鸟击测试。/GEAE must conduct a large flocking bird test as part of compliance with §33.76, Bird Ingestion.
3. GE航空必须遵循§33.90 (初始维护检查)，进行发动机测试表明符合性。/GEAE must include an engine test to demonstrate compliance to §33.90, Initial Maintenance Inspection.
4. 安装GE90-110B1/-113B/-115B 发动机的飞机必须满足所有适用的针对新型号发动机认证的适航标准，包括适用飞机的特殊条件。/An applicant installing the GE90-110B1/-113B/-115B engine models into an aircraft must comply with all of the applicable airworthiness standards for a new type certificated engine, including applicable aircraft special conditions.

注 23/NOTE 23 在§33.73(b)的验证中，功率或推力响应针对的是安装GE90-110B1/-113B/-115B发动机的B777-200LR/300ER飞机和B777 货机。若将这些发动机安装在其他飞机型号上，将要求按照§33.73(b)进行单独的评估和验证。

Demonstration of compliance to §33.73(b) Power or Thrust Response is installation specific to the B777-200LR/300ER and B777 Freighter airplanes for the GE90-110B1/-113B/-115B model engines. Installation of these model engines on different airplane models or types will require a separate evaluation and finding of compliance to § 33.73(b).

注 24/NOTE 24 GE90-76B/-77B/-85B/-90B和GE90-110B1/-113B/-115B发动机的滑油油箱盖满足了§33.71(c)(4)的要求。

The engine oil tank filler cap of GE90-76B/-77B/-85B/-90B and GE90-110B1/-113B/-115B engine

model meet the requirement of §33.71(c)(4).

注 25/NOTE 25

GE90-110B1, GE90-113B和GE90-115B发动机能满足以下排放的标准要求, 这些标准来自2012年12月31日生效的14 CFR第34部, 第5修正案, 和2012年7月18日生效的40 CFR第87部:

The following emissions standards promulgated in 14 CFR Part 34, Amendment 5, effective December 31, 2012, and 40 CFR Part 87, effective July 18, 2012, have been complied with for: GE90-110B1, GE90-113B, and GE90-115B.

燃油排泄标准: /Fuel Venting Emission Standards: 14 CFR 34.10(a) and 34.11; in addition, 40 CFR 87.10(a) and 87.11.

发烟指数 (SN) 排放标准: /Smoke Number (SN) Emission Standards: 14 CFR 34.21(e)(2); in addition, 40 CFR 87.23(c)(1).

一氧化碳 (CO) 排放标准: /Carbon Monoxide (CO) Emission Standards: 14 CFR 34.21(d)(1)(ii); in addition, 40 CFR 87.23(c)(1).

碳氢化合物 (HC) 排放标准: /Hydrocarbons (HC) Emission Standards: 14 CFR 34.21(d)(1)(i); in addition, 40 CFR 87.23(c)(1).

氮氧化物 (NO_x) 排放标准: /Oxides of Nitrogen (NO_x) Emission Standards: 14 CFR 34.23(a)(2); in addition, 40 CFR 87.23(c)(2).

除了美国联邦航空局(FAA)确定基于本型号合格证数据单确定的审定要求的符合性之外, 发动机制造商声明已证明符合国际民航组织(ICAO)附件16第二卷第三版第三部分第二章, 2.2.2节发烟指数、2.3.2节一氧化碳和碳氢化合物、2.3.2.d.3 氮氧化物(也称为CAEP/6)的排放标准, 并且符合第二部分第二章燃油排泄要求。

In addition to the FAA's finding of compliance based on the certification requirements defined in this TCDS, the engine manufacturer has declared that the ICAO emissions standards identified in Annex 16, Volume II, Third Edition, Part III, Chapter 2, Section 2.2.2 for SN, Section 2.3.2 for CO and HC, Section 2.3.2 .d.3 for NO_x (also known as CAEP/6), and Part II Chapter 2 for fuel venting have also been demonstrated.

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