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## **I. General**

### **1. Type/Models:**

TFE731-20, TFE731-20AR, TFE731-20BR, TFE731-20R, TFE731-40, TFE731-40R, TFE731-40AR, TFE 731-40BR, TFE731-50R, TFE731-60

### **2. Type Certificate Holder:**

Honeywell International Inc.  
111 South 34<sup>th</sup> Street  
Phoenix  
AZ 85034  
USA

### **3. Manufacturer:** Honeywell International Inc.

### **4. EASA/JAA Validation Application Date:**

|                                 |             |               |                  |              |
|---------------------------------|-------------|---------------|------------------|--------------|
| TFE731-20, -20R, -40, -40R, -60 | TFE731-20AR | TFE731-20BR   | TFE731-40AR      | TFE731-40BR  |
| 10 March 1994                   | 26 May 1999 | 19 March 2004 | 01 November 2005 | 20 June 2012 |

  

|                  |
|------------------|
| TFE731-50R       |
| 20 December 2004 |

### **5. Validation Reference Date:** 19 January 1993

### **6. JAA Validation Recommendation Date:**

|                 |                 |                 |             |
|-----------------|-----------------|-----------------|-------------|
| TFE731-20, -20R | TFE731-20AR     | TFE731-40, -40R | TFE731-60   |
| 18 March 1998   | 18 October 1999 | 20 June 1996    | 31 May 1996 |

### **7. EASA Certification Date:**

|                 |                  |                 |              |                   |
|-----------------|------------------|-----------------|--------------|-------------------|
| TFE731-20, -20R | TFE731-20AR      | TFE731-40, -40R | TFE731-60    | TFE731-20BR       |
| 17 August 1998  | 17 November 1999 | 13 January 1997 | 10 July 1998 | 01 September 2004 |

  

|              |                  |              |
|--------------|------------------|--------------|
| TFE731-40AR  | TFE731-50R       | TFE731-40BR  |
| 01 June 2007 | 07 December 2007 | 31 July 2013 |

EASA Type Certification for the TFE731-20, TFE731-20AR, TFE731-20R, TFE731-40, TFE731-40R and TFE731-60 engine models is granted, in accordance with article 2 paragraph 3 (a)(i) of EU Commission Regulation EC 1702/2003, based on the CAA United Kingdom validation letter issued following the JAA Validation Recommendation.

## **II. Certification Basis**

### **1. FAA Certification Basis details:**

See FAA TCDS E1NM.

### **2. EASA Certification Basis:**

#### **2.1 Airworthiness Standards:**

JAR-E change 8 dated 4 May 1990 plus Orange Paper E/91/1 published 27 May 1991 and JAR-E850 as amended by Orange Paper E/93/1 effective 17 May 1993.

In addition, for TFE731-40AR, TFE731-40BR and TFE731-50R, CS-E Original Issue, dated 24 October 2003, paragraph CS-E 790.

In addition, for TFE731-50R, CS-E Original Issue, dated 24 October 2003, paragraphs CS-E 100(c), CS-E 650, CS-E 800, applicable to the fan rotor assembly only, and CS-E 890, applicable to the whole engine.

In addition, for TFE731-40BR, CS-E Original Issue, dated 24 October 2003, paragraph CS-E890 .

## 2.2 Special Conditions:

### 2.2.1 TFE731-20, -20R, -20 AR, -20BR, -40, -40R, -60

PC338-1: Ingestion of Rain and Hail

### 2.2.2 TFE731-40AR, -40BR, -50R

None.

## 2.3 Deviations:

None.

## 2.4 Equivalent Safety Findings:

### 2.4.1 TFE731-20, -20R, -20 AR, -20BR, -40, -40R, -40AR, -60

JAR-E890(b)(1): Thrust Reverser Endurance Tests

### 2.4.2 TFE731 -40BR, -50R

None.

## 2.5. Environmental Standards:

### 2.5.1 TFE731-20, -20R, -20 AR, -40, -40R, -60

Emissions and Fuel Venting per ICAO Annex 16, Volume II, Amendment 2, Nov 1993.

### 2.5.2 TFE731-20BR, -40AR, -50R

Emissions and Fuel Venting per ICAO Annex 16, Volume II, Amendment 4, Nov 1999.

### 2.5.3 TFE731-40BR

Emissions and Fuel Venting per ICAO Annex 16, Volume II, Amendment 7, Nov 2013.

## **III. Technical Characteristics**

### **1. Type Design Definition:**

The Type Design Definition is in accordance with the following Honeywell Engine Parts Lists:

|             |           |
|-------------|-----------|
| TFE731-20   | 3060080-1 |
| TFE731-20AR | 3060082-2 |
| TFE731-20BR | 3060084-1 |
| TFE731-20R  | 3060020-6 |
| TFE731-40   | 3060050-1 |
| TFE731-40R  | 3060040-4 |
| TFE731-40AR | 3062020-1 |
| TFE731-40BR | 3062075-1 |

|            |           |
|------------|-----------|
| TFE731-50R | 3060090-1 |
| TFE731-60  | 3060000-4 |

and later approved Engine Parts Lists published in the applicable Light Maintenance Manual.

### 3. Description:

Turbofan, one stage geared fan, four stage axial flow pressure compressor, one stage centrifugal high pressure compressor, annular combustor, one stage high pressure turbine and three stage low pressure turbine. Fuel control is by means of a Digital Electronic Engine Control (DEEC) with back up hydromechanical control. The starter, thrust reverser and engine mounts are not part of the engine definition.

### 3. Equipment:

Engine equipment is specified by the Engine Equipment List part number as referenced in the Light Maintenance Manual.

### 4. Dimensions:

|                | TFE731-20,-20AR,-20BR,-20R,-40,-40R,-40AR,-40BR | TFE731-50R            | TFE731-60             |
|----------------|---|-----------------------|-----------------------|
| Overall Length | 1.547m (60.91 inches)                           | 1.975m (77.77 inches) | 2.083m (81.99 inches) |
| Overall Width  | 0.847m (33.35 inches)                           | 0.893m (35.16 inches) | 0.932m (36.68 inches) |
| Overall Height | 1.00m (39.36 inches)                            | 1.027m (40.44 inches) | 1.076m (42.37 inches) |

### 5. Dry Weight:

| TFE731-20,-20AR,-20BR,-20R,-40BR | TFE731-40,-40R,-40AR | TFE731-50R        | TFE731-60         |
|----------------------------------|----------------------|-------------------|-------------------|
| 405.97kg (895lb)                 | 401.43kg (885lb)     | 443.61 kg (978lb) | 450.42 kg (993lb) |

See Note 4

### 6. Ratings:

|             | Maximum Continuous at Sea Level <sup>(1)</sup> | Take off (5 minutes) at Sea Level <sup>(1)(2)</sup> |
|-------------|--|---|
| TFE731-20   | 15.57kN (3500lb)                               | 15.57kN (3500lb)                                    |
| TFE731-20AR | 15.57kN (3500lb)                               | 16.24kN (3650lb)                                    |
| TFE731-20BR | 15.57kN (3500lb)                               | 16.24kN (3650lb)                                    |
| TFE731-20R  | 15.57kN (3500lb)                               | 16.24kN (3650lb)                                    |
| TFE731-40   | 18.90kN (4250lb)                               | 18.90kN (4250lb)                                    |
| TFE731-40R  | 18.90kN (4250lb)                               | 19.84kN (4462lb)                                    |
| TFE731-40AR | 18.90kN (4250lb)                               | 19.66kN (4420lb)                                    |
| TFE731-40BR | 15.57kN (3500lb)                               | 17.31kN (3850lb)                                    |
| TFE731-50R  | 22.24kN (5000lb)                               | 22.24kN(5000lb)                                     |
| TFE731-60   | 20.13kN (4525lb)                               | 22.24kN (5000lb)                                    |

(1) See Note 1, Section VI.

(2) See Note 9, Section VI.

### 7. Control System:

Fuel controls and power management are controlled by a Digital Electronic Engine Control (DEEC) with a backup hydromechanical control. The hardware and software configuration of this system and the associated engine fuel pump and hydromechanical unit are controlled by the approved engine equipment list for each specific engine model and aircraft application.

### 8. Fluids (Fuel/Oil/Additives)

See applicable Installation Manual.

**9. Aircraft Accessory Drives:**

| Accessory Drive   | Drive Type (one each)   | Internal Spline Config. | RPM and Rotation Facing Drive End                        | Accessory Max. Torque Nm (lb-in)<br>Note (e) |                |                  | Weight kg (lb) maximum<br>Note (b) | Overhung Moment Nm(lb-in) |
|---|---|-------------------------|--|--|----------------|------------------|------------------------------------|---------------------------|
|   |   |                         |  | Tc   | To             | Ts               |                                    |                           |
| Starter or Starter Generator D2*<br>Note (c)                                  | AND20002<br>Type XII-D modified as follows: RPM, torques, accessory weight, and moment as shown | AND20002                | 12,602<br>Note (a)<br>CW<br><br>12,728<br>Note (f)<br>CW | 22.60<br>(200)                               | 33.90<br>(300) | 180.78<br>(1600) | 20.41<br>(45)                      | 45.19<br>(400)            |
| Aircraft Accessory D3*  | AND20002<br>Type XII-D modified as follows: RPM, torques, accessory weight, and moment as shown | AND20002                | 12,602<br>Note (a)<br>CW<br><br>12,728<br>Note (f)<br>CW | 22.60<br>(200)                               | 33.90<br>(300) | 112.98<br>(1000) | 18.14<br>(40)                      | 45.19<br>(400)            |
| Aircraft Accessory D1*<br>(For engines without motive fuel pump)              | AND20001<br>Type XI-B modified as follows: RPM, torques, accessory weight, and moment as shown  | AND20001                | 6,300<br>Note (a)<br>CW<br><br>6,364<br>Note (f)<br>CW   | 27.12<br>(240)                               | 40.67<br>(360) | 186.42<br>(1650) | 6.80<br>(15)                       | 11.30<br>(100)            |
| Aircraft Accessory D1*<br>(For engines with motive flow fuel pump)<br>Note(d) | AND20001<br>Type XI-B modified as follows: RPM, torques, accessory weight, and moment as shown  | AND20001                | 6,300<br>Note (a)<br>CW<br><br>6,364<br>Note (f)<br>CW   | 11.30<br>(100)                               | 18.64<br>(165) | 112.98<br>(1000) | 3.18<br>(7)                        | 2.03<br>(18)              |

CW = clockwise (looking aft)  
Tc = continuous torque

To = torque overload (5 minutes per 4 hour period)  
Ts = static torque

\* Accessory pads are identified by these symbols on the applicable installation drawings.

Notes:

- (a) All models except TFE731- 40BR and -50R: drive speeds are based on a maximum steady state HP rotor speed of 31485 rpm.
- (b) Total weight of the accessories is not to exceed 43.06 kg (95 lb) for engines without motive fuel pump or 39.46 kg (87 lb) for engines with motive fuel pump.
- (c) The estimated torsional spring constant for the starter generator drive is 790.89 Nm/radian (7000 lb-in/radian).
- (d) Drive is located on engine auxilliary motive flow fuel pump.
- (e) Total combined accessory power extraction limits are specified in the applicable engine installation manual.
- (f) TFE731-40BR and -50R only: drive speeds are based on a maximum steady state HP rotor speed of 31800 rpm.

## 10. Maximum Permissible Air Bleed Extraction:

For all engine models, the bleed extraction limits are specified in the applicable engine installation manual.

## IV. Operational Limits

### 1. Temperature Limits:

#### 1.1 Maximum Interstage Turbine Temperature (ITT) Limits °C (°F):

|             | Maximum Continuous | Take off (5 minutes) | Starting (Ground/Air) |
|-------------|--------------------|----------------------|-----------------------|
| TFE731-20   | 941 (1726)         | 963 (1766)           | 941 (1726)            |
| TFE731-20AR | 941 (1726)         | 963 (1766)           | 941 (1726)            |
| TFE731-20BR | 991 (1816)         | 1022 (1871)          | 994 (1822)            |
| TFE731-20R  | 941 (1726)         | 963 (1766)           | 941 (1726)            |
| TFE731-40   | 991 (1816)         | 1022 (1871)          | 994 (1822)            |
| TFE731-40R  | 991 (1816)         | 1022 (1871)          | 994 (1822)            |
| TFE731-40AR | 991 (1816)         | 1022 (1871)          | 994 (1822)            |
| TFE731-40BR | 991 (1816)         | 1022 (1871)          | 994 (1822)            |
| TFE731-50R  | 991 (1816)         | 1022 (1871)          | 994 (1822)            |
| TFE731-60   | 991 (1816)         | 1022 (1871)          | 994 (1822)            |

External engine components maximum temperatures are as specified in the applicable engine installation manual.

#### 1.2 Maximum Oil Inlet Temperature Range °C (°F):

|                              | Sea Level to<br>9144m (30000 ft) | Above<br>9144m (30000 ft) |
|------------------------------|----------------------------------|---------------------------|
| Fan Gearbox Inlet<br>maximum | 127 (260)                        | 140 (284)                 |
| Accessory Gearbox<br>maximum | 149 (300)                        | 157 (315)                 |

#### 1.3 Fuel Inlet Temperature °C (°F):

Maximum 57 (135) with a vapour volume to liquid volume ratio (V/L) equal to 0.45.  
Minimum -54 (-65) with fuel at a viscosity of 12 centistokes or less during starting.

For use of anti-icing additives and limitations for installation with and without fuel heaters and which may or may not extract motive flow for aircraft injector systems refer to the applicable engine installation manual.

### 2. Maximum Permissible Rotor Speeds:

|  | Low Pressure Rotor (N1)<br>rpm (%) | High Pressure Rotor (N2) rpm (%)          |                        |
|--|------------------------------------|---|------------------------|
|  |                                    | All models except<br>TFE731-40BR and -50R | TFE731-40BR<br>and-50R |
| Take off                                   | 21000 (100)                        | 31485 (100)                               | 31800 (101)            |
| Maximum Continuous                         | 21000 (100)                        | 31485 (100)                               | 31485 (100)            |
| Transient (10 seconds<br>maximum duration) | 21105 (100.5)                      | 31957 (101.5)                             | 32277 (102.5)          |

### 3. Pressure Limits:

#### 3.1 Fuel Pump Inlet pressure:

Minimum absolute pressure: 34.47 kPa (5 psi) above the true vapour pressure of the fuel used.

Maximum gauge pressure: 344.74 kPa (50 psi).

3.2 Oil Pressure Limits:

Normal operating gauge pressure: 448.16 - 551.58 kPa (65-80 psi)

Minimum gauge pressure at idle: 344.74 kPa (50 psi)

**4. Installation Assumptions:**

The installation assumptions are quoted in the applicable Engine Installation Manual.

**5. Dispatch Limitations:**

TFE731-20,-20AR,-20BR,-20R,-40,-40R, -40AR, -40BR, -50R and -60 engines are not herein approved for Time Limited Dispatch with the electronic control system inoperative (manual mode).

For installed engines, consult the applicable Engine Installation Manual and aircraft MMEL.

**V. Operating and Service Instructions**

|                          | TFE731-20,-20AR,<br>-20BR,-20R   | TFE731-40, -40R,<br>-40AR | TFE731-50R | TFE731-60 | TFE731-40BR |
|--------------------------|----------------------------------|---------------------------|------------|-----------|-------------|
| Installation Manual      | IM-8300                          | IM-8010                   | IM-8024    | IM-8009   | IM-8033     |
| Operating Instructions   | IM-8300                          | IM-8010                   | IM-8024    | IM-8009   | IM-8033     |
| Light Maintenance Manual | Report No. 72-03-06 (See Note 3) |                           |            |           |             |
| Heavy Maintenance Manual | Report No. 72-03-07              |                           |            |           |             |
| Service Bulletins        | Published as required            |                           |            |           |             |

**VI. Notes**

Note 1: Ratings

The thrust ratings are based on static test stand operation under the following conditions:

- (a) No loading of accessory drives
- (b) No compressor bleed airflow
- (c) Bellmouth inlet conforming to Honeywell International Inc drawing SKP 17308 for the TFE 731-20/20AR/20BR/20R and -40/40R/40AR/40BR, SKP 23600 for the TFE731-50R, and 5837113 for the TFE731-60.
- (d) Fan exhaust and turbine exhaust nozzles conforming to Honeywell International Inc drawing SKP 23199 for the TFE 731-40/40R/40AR, SKP 23202 for the TFE731-60, SKP 23196 for the TFE 731-20/20AR/20BR/20R/40BR and SKP 24973 for the TFE731-50R.
- (e) No anti-icing airflow
- (f) Interstage Turbine Gas Temperature (ITT) and rotor speed limits not exceeded.
- (g) Dry inlet air

Note 2: For additional authorised operation and installation detailed information, refer to FAA approved sections of the applicable engine Installation Manual.

Note 3: Certain engine parts are life-limited. These limits are published in the Light Maintenance Manual, Chapter 5, and referenced in the Honeywell International Inc Service Bulletin TFE 731-72-5101.

Note 4: The engine weight shown is that of the power section and all components coded "E" in the Engine Equipment List. The total engine weight, including the weight of items coded "A" in the Engine Equipment List is included on the engine installation drawing for each specific aircraft configuration.



- Note 5: Variations in engine configuration and installation components are identified by a suffix to the basic model number on the engine nameplate, ie TFE 731-60-XX, and an Engine Equipment List number. Certain features of these components are influenced by aircraft design considerations. In the Engine Equipment List, those items coded "E" are basic engine items as defined in JAR-E as Group 1 Equipment. Items coded "A" have been demonstrated as compatible with the basic engine during engine certification testing. However, operation, functioning, and performance of these in a specific aircraft installation must be demonstrated during aircraft certification. Subsequent design control associated with these factors is the responsibility of the aircraft manufacturer.
- Note 6: Power setting, power checks and control of engine thrust output in all operations is to be based on Honeywell International Inc engine charts referring to low pressure rotor speed (N1). Speed sensors are included in the engine assembly for this purpose.
- Note 7: The TFE 731-20/20AR/20BR/20R and-40BR engines are approved for use with the Nordam (formerly Dee Howard Company) thrust reverser designated TR 5045.
- The TFE 731-40R and -40AR engines are approved for use with the Nordam thrust reverser designated TR 5040AS.
- The TFE 731-40 engine is approved for use with the Dassault (formerly Alenia) thrust reverser designated F50B-583-D3.
- The TFE 731-60 engine is approved for use with the Dassault thrust reverser designated FGFB-583-D1.
- The TFE731-50R is approved for use with the Nordam thrust reverser designated TR5050.
- Note 8: The software contained in the DEEC has been designed and developed in accordance with RTCA/DO178B, criticality Level A.
- Note 9: The normal 5-minute take off time may be extended to 10 minutes for engine-out contingencies.
- Note 10: deleted