BAVirtual
CITYFLYER

E190 Operations Manual Part B
FCOM

Preface

Record of Amendments

Rev. No	Date Entered
1	09 October 2025

Revision Highlights

Revision 1 – October 2025

Initial release.

General

This manual forms part of the BAVirtual (BAV) Operations Manual (OM). The Operations Manual is divided into four sections:

Part A (OM-A): "What we do" – General information relating to BAVirtual operational policies.

Part B (OM-B): "How we do it" – How the operational policies outlined in Part A are executed on each particular aircraft type. This section includes general procedures applicable to all fleets alongside type-specific manuals.

Part C (OM-C): Route Information Manual – This comprises of aerodrome and area briefings and information alongside

Part D (OM-D): Training Manual – This section outlines how training is organised and conducted, and details training courses specific to each aircraft type.

This manual forms part of the Operations Manual Part B for the Embraer 190 (E190) fleet at BAVirtual. The policies within this manual are based on real BACF procedures applicable to the E190. These policies and procedures are used as a reference and standard for training and assessment during BAV flying training courses. Flight Data Monitoring events will also never be more restrictive than the policies outlined in this manual. However, outside of the training environment whilst all pilots are encouraged to follow these procedures to the best of their ability as a matter of good practice and for maximum realism,

Any questions about the procedures contained within this manual can be directed to:
CityFlyer Chief Pilot
BAVirtual

Organisation

The FCOM is organised in the following manner:

Preface: Contains general information regarding the manual's purpose, structure, and content. It also contains a list of abbreviations, a record of revisions, and a record of any FCOM bulletins.

Limitations: Provides the operational limitations applicable to E190 operations at BAVirtual.

Normal Procedures: Provides the procedures to be performed during routine operations including supplementary procedures that may routinely be encountered during normal operations.

Abnormal and Emergency Procedures: Provides the procedures to be performed in case of an abnormal or emergency situation in order to protect passengers and/or crew from serious harm and to maintain the airworthiness of the airplane. This section also includes some supplementary procedures that are not conducted typically conducted during routine operations.

Statement of Applicability

The FCOM forms part of the OM-B for the E190. The complete E190 OM-B comprises:

- BAVirtual OM-B General Procedures,
- E190 FCOM (this document) which forms the primary reference document for E190 operations,
- E190 Normal Checklist,
- E190 Performance Manual,
- E190 Quick Reference Handbook.

Additional operational information is presented in the following aide memoires:

- E190 Operational Aide Memoire,
- E190 Winter Operations Aide Memoire.

Warnings, Cautions and Notes

The following levels of written advisories are used throughout the FCOM and are not to be confused with EICAS messages, which are separately identified in the text:

WARNING: **OPERATING PROCEDURES, TECHNIQUES AND OTHER RELATED INFORMATION, WHICH MAY RESULT IN PERSONAL INJURY OR LOSS OF LIFE, IF NOT FOLLOWED.**

CAUTION: OPERATING PROCEDURES, TECHNIQUES AND OTHER RELATED INFORMATION, WHICH MAY RESULT IN DAMAGE OR DESTRUCTION OF EQUIPMENT, IF NOT FOLLOWED.

Note: Operating procedures, techniques and other related information, which are considered essential to emphasize the safety of flight.

FCOM Bulletins

EPIC Load 25 and 27 Standards **09 October 2025**

The BACF E190 fleet are equipped with Primus EPIC Load 25 standard.

The current E190 representations for MSFS (FSS) and XP12 (X-Crafts) depict Primus EPIC Load 27 standard.

A number of operational differences exist between Load 25 and Load 27.
Notable differences with Load 27 include:

- The PFD extended ASI format– at the time of writing both MSFS and XP12 add-ons can be modified to replicate the reduced ASI with grey scales format used in Load 25.
- MCDU page presentation and functionality differs most notably on PERF pages.
- Additional FMS functionality including secondary flightplan functionality.
- Autopilot LNAV and VNAV behaviour is changed and LNAV and VNAV now arm with TOGA selection and engage at 200 ft AAL (LNAV) and at the VNAV CAPTURE AFE specified in the FMS.

Procedures within this FCOM are based upon operating aircraft to Load 25 standard but have been modified to reflect the MCDU format and systems operation reflected in Load 27. This creates a best approximation of BACF operations within a Load 27 simulation.

Should any procedures not work as expected, guidance can be sought from the CityFlyer Chief Pilot.

CF34 Engine Variants **09 October 2025**

The BACF E190 fleet are equipped with CF34-10E5A1 engines.

The current E190 representations for MSFS (FSS) and XP12 (X-Crafts) depict CF34-10E5 engines.

The -10E5A1 engines feature higher thrust ratings at TO-1 and TO-2 as well as an additional TO-3 rating. The -10E5 engines feature only standard thrust TO-1 and TO-2 ratings. ATTCS is not available at TO-1 rating for -10E5A1 engines because the TO-1 rating for this engine is maximum rated thrust equivalent to TO-RSV for the -10E5 engine.

Procedures within this FCOM are based upon operating aircraft with -10E5A1 engines. Despite the reduced thrust at TO-1 and TO-2 modelled in the -10E5 engine simulation, crews shall still follow the SOP for Take-Off Performance Calculation. This includes selecting ATTCS OFF at the TO-1 thrust rating. This creates a best approximation of BACF operations and experience has demonstrated that adequate take-off performance is retained up to the fleet MTOW of 45,990 kg.

If necessary, further guidance can be sought from the CityFlyer Chief Pilot.

Abbreviations

A/I	Anti-Ice
AA	Acceleration Altitude
AAL	Above Aerodrome Level
AC	Alternating Current
ACARS	Aircraft Communications Addressing and Reporting System
ACCU	Accumulator
ACT	Altitude Compensated Tile
ADF	Automatic Direction Finding
ADS	Air Data System
AEO	All Engines Operating
AFE	Above Field Elevation
AFM	Airplane Flight Manual
AGL	Above Ground Level
AIS	Aeronautical Information Services
ALT	Altitude
ALT SEL	Altitude Selector
APP	Approach
APPR	Approach
APU	Auxiliary Power Unit
ASDA	Accelerate Stop Distance Available
AT	Auto-Throttle
ATC	Air Traffic Control
ATTCS	Automatic Take-off Thrust Control System
BARO	Barometric
BAV	BAVirtual
BC	Back Course
BRG	Bearing
BRK	Brake
BTMS	Brake Temperature Monitoring System
CAA	Civil Aviation Authority
CAP	Capture
CAT	Category
CB	Circuit Breaker
CDI	Course Deviation Indicator
CG	Centre of Gravity
CLB	Climb
COND	Conditioning
CTRL	Control
DA	Decision Altitude
DC	Direct Current
DEV	Deviation
DH	Decision Height
DME	Distance Measuring Equipment
DVDR	Digital Voice Data Recorder
EADI	Electronic Attitude Director Indicator
EASA	European Aviation Safety Authority
ECS	Environmental Control System
EFB	Electronic Flight Bag
EGPWS	Enhanced Ground Proximity Warning System
EGT	Exhaust Gas Temperature
EHSI	Electronic Horizontal Situation Indicator
EICAS	Engine Indication and Crew Alerting System
ELEC	Electric
ELT	Emergency Locator Transmitter
EMER	Emergency
ENG	Engine
ePerf	Electronic Performance Application
ETP	Equal Time Point
FAA	Federal Aviation Authority
FADEC	Full Authority Digital Engine Control
FAF	Final Approach Fix
FCOM	Flight Crew Operating Manual
FD	Flight Director
FL	Flight Level
FLCH	Flight Level Change
FLT	Flight
FMA	Flight Mode Annunciator
FMS	Flight Management System
FO	First Officer
FOD	Foreign Object Debris
FPA	Flight Path Angle

FSTN	Fasten
ft	feet
FWD	Forward
GA	Go-Around
GBAS	Ground Based Augmentation System
GEN	Generator
GLS	GBAS Landing System
GNSS	Global Navigation Satellite System
GP	Glide Path
GPS	Global Positioning System
GPU	Ground Power Unit
GPWS	Ground Proximity Warning System
GS	Glide Slop
HDG	Heading
HI	High
hPA	Hectopascals
HYD	Hydraulic
IAF	Initial Approach Fix
IAS	Indicated Air Speed
ICAO	International Civil Aviation Organization
IDG	Integrated Drive Generator
IESS	Integrated Electronic Standby System
IFR	Instrument Flight Rules
IGN	Ignition
ILS	Instrument Landing System
INIT	Initialise
IRS	Inertial Reference System
ISA	International Standard Atmosphere
ITT	Inter-Turbine Temperature
kg	Kilograms
KIAS	Knots Indicated Air Speed
kts	Knots
LCY	London City Airport
LDA	Landing Distance Available
LDG	Landing
LFE	Landing Field Elevation
LG	Landing Gear
LH	Left-hand
LNAV	Lateral Navigation
LO	Low
LOC	Localiser
LRC	Long Range Cruise
LT	Light
LVP	Low Visibility Procedures
LVTO	Low Visibility Take-Off
LW	Landing Weight
MAC	Mean Aerodynamic Chord
MAU	Modular Avionics Unit
MAX	Maximum
MCDU	Multifunction Control Display Unit
MDA	Minimum Descent Altitude
MED	Medium
MEL	Minimum Equipment List
MFD	Multi-Function Display
MIN	Minimum
min	Minutes
MLS	Microwave Landing System
MLW	Maximum Landing Weight
MRW	Maximum Ramp Weight
MSA	Minimum Safe Altitude
MTOW	Maximum Take-Off Weight
MZFW	Maximum Zero Fuel Weight
N1	Fan rotation speed
N2	High pressure shaft rotation speed
NADP	Noise Abatement Departure Procedure
NAV	Navigation
NBPT	No Break Power Transfer
NDB	Non-Directional Beacon
NM	Nautical Mile
NOTAM	Notice To Air Missions
OAT	Outside Air Temperature
OEI	One Engine Inoperative
OFP	Operational Flight Plan
OM	Operations Manual
OVHD	Overhead
P1	Pilot in charge of the sector
P2	Pilot operating as co-pilot for the sector
PA	Public Announcement
PAPI	Precision Approach Path Indicator

PAX	Passengers
PBIT	Power-up Built-In Test
PERF	Performance
PF	Pilot Flying
PFD	Primary Flight Display
PM	Pilot Managing
PNL	Panel
PREV	Preview function
PROG	Progress
PROT	Protection
QFE	Barometric pressure setting to indicate height above airfield
QNH	Barometric pressure setting to indicate altitude above mean sea level
QRH	Quick Reference Handbook
RA	Radio Altimeter
RAIM	Receiver Autonomous Integrity Monitoring
RAT	Ram Air Turbine
RECIRC	Recirculation
REF	Reference
REV	Reverse
RH	Right-hand
RNAV	Area Navigation
RNP	Required Navigation Performance
ROD	Rate of Descent
RTE	Route
RTO	Rejected Take-Off
RVSM	Reduced Vertical Separation Minima
SAT	Static Air Temperature
SDF	Simplified Directional Monitoring
SID	Standard Instrument Departure
SOP	Standard Operating Procedure
SPDA	Secondary Power Distribution Assembly
SSA	Sector Safe Altitude
STAB	Stabilised
STAR	Standard Terminal Arrival Route
STBY	Standby
STD	Scheduled Time of Departure
SYS	System
TA	Traffic Advisory
TAS	True Air Speed
TAT	Total Air Temperature
TCAS	Traffic Alert and Collision Avoidance System
TEMP	Temperature
TERR	Terrain
TLA	Thrust Lever Angle
TO	Take-Off
TOGA	Take-Off / Go-Around
TOW	Take-Off Weight
TRA	Thrust Reduction Altitude
TRANS	Transition
TRU	Transformer Rectifier Unit
V/L	VOR / LOC
V_1	Take-Off Decision Speed
V_2	Take-Off Safety Speed
V_A	Manoeuvre Speed
V_{AC}	Approach Climb Speed
V_{AP}	Approach Reference Speed
VAR	Variable
V_{FE}	Maximum speed for extending flaps and flight with flaps extended
VFR	Visual Flight Rules
V_{FS}	Final Take-Off Climb Speed
VGP	VNAV Glide Path
VHF	Very High Frequency
V_{LE}	Maximum speed for flight with landing gear extended
V_{LO}	Maximum speed for landing gear operation
VLV	Valve
VNAV	Vertical Navigation
VOR	VHR Omni-directional Range
V_R	Take-Off Rotation Speed
V_{RF}	Landing Reference Speed
VS	Vertical Speed
VSI	Vertical Speed Indicator
WOW	Weight-on-wheels
WT	Weight
WX	Weather
XFEED	Cross-feed
XPDR	Transponder
ZFW	Zero Fuel Weight

Contents

1 Limitations

1.1 Introduction

The aircraft must be operated in accordance with the limitations presented in this Section. These limitations are extracted from the Aeroplane Flight Manual (AFM) and all applicable Supplements and/or Appendices.

1.2 General Limitations

1.2.1 Kinds of Operation

The E190 is certified in the Transport Category and may be flown day and night in the following conditions, when the appropriate equipment and instruments required by airworthiness and operating regulations are approved, installed and in an operable condition:

- Visual (VFR)
- Instrument (IFR)
- Icing conditions
- Category I, II and III
- Autoland
- RNP
- Steep Approach

1.2.2 Performance Category

The E190 is categorised by BAV CityFlyer as Category C for procedure calculations.

1.3 Weight

To comply with the performance and operating limitations of the regulations, the maximum allowable take-off and landing operational weights may be equal to, but not greater than the certified limits in the table below.

Model	MAX Ramp Weight (MRW)	MAX Take-Off Weight (MTOW)	MAX Landing Weight (MLW)	MAX Zero Fuel Weight (MZFW)
E190	46,150 kg	45,990 kg	43,000 kg	40,800 kg

The take-off weight limit (weight at brake release or at start of take-off run) is the lowest between MTOW and the following weights:

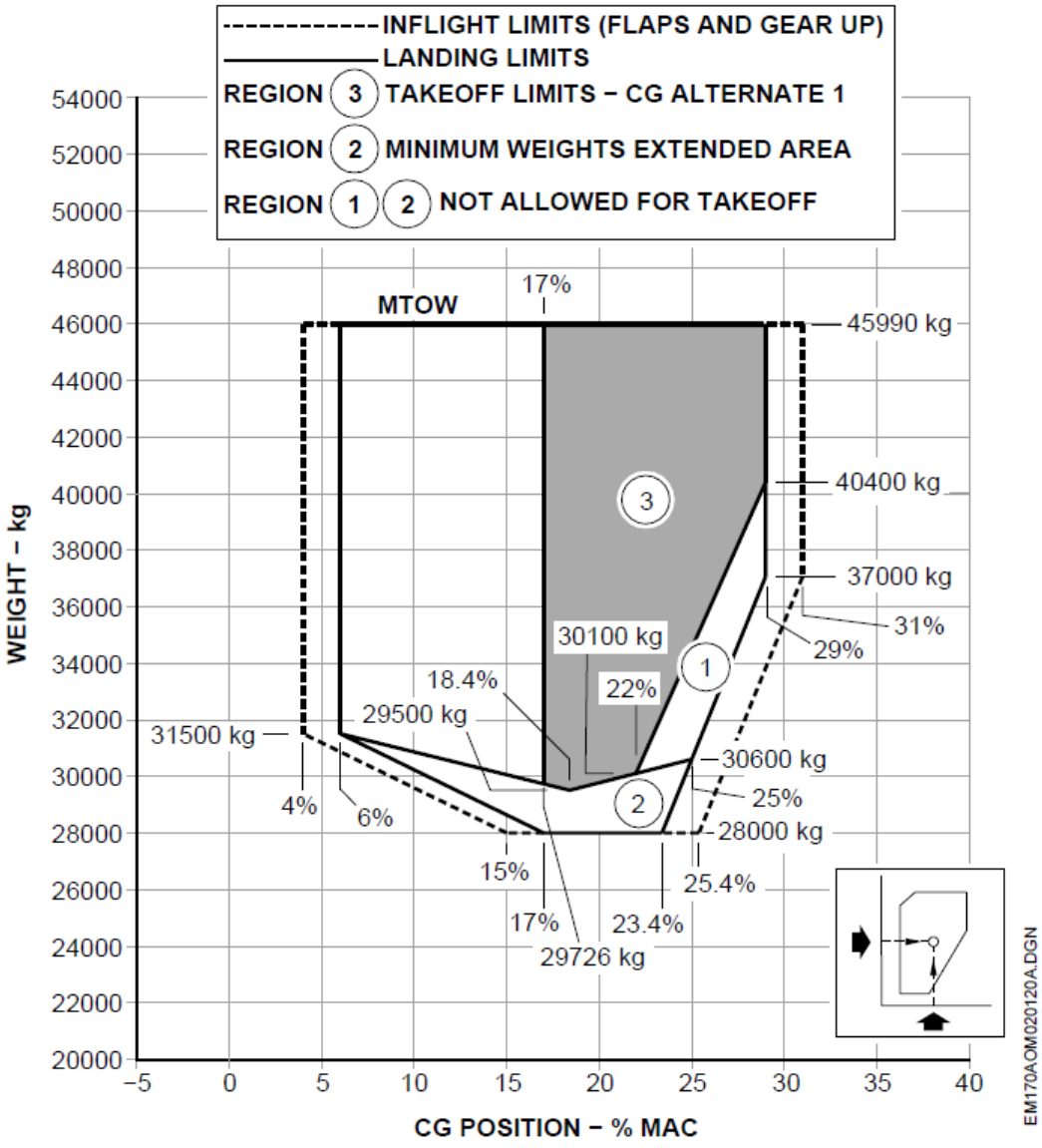
- Maximum take-off weight as calculated using approved software, and as limited by field length, climb and brake energy.
- Maximum take-off weight, as limited by enroute and landing operating requirements.

The landing weight is the lowest between MLW and the following weights:

- Maximum approach and landing weight as limited by runway length, altitude and temperature and calculated using approved software.

1.4 Loading

1.4.1 Centre of Gravity Envelope

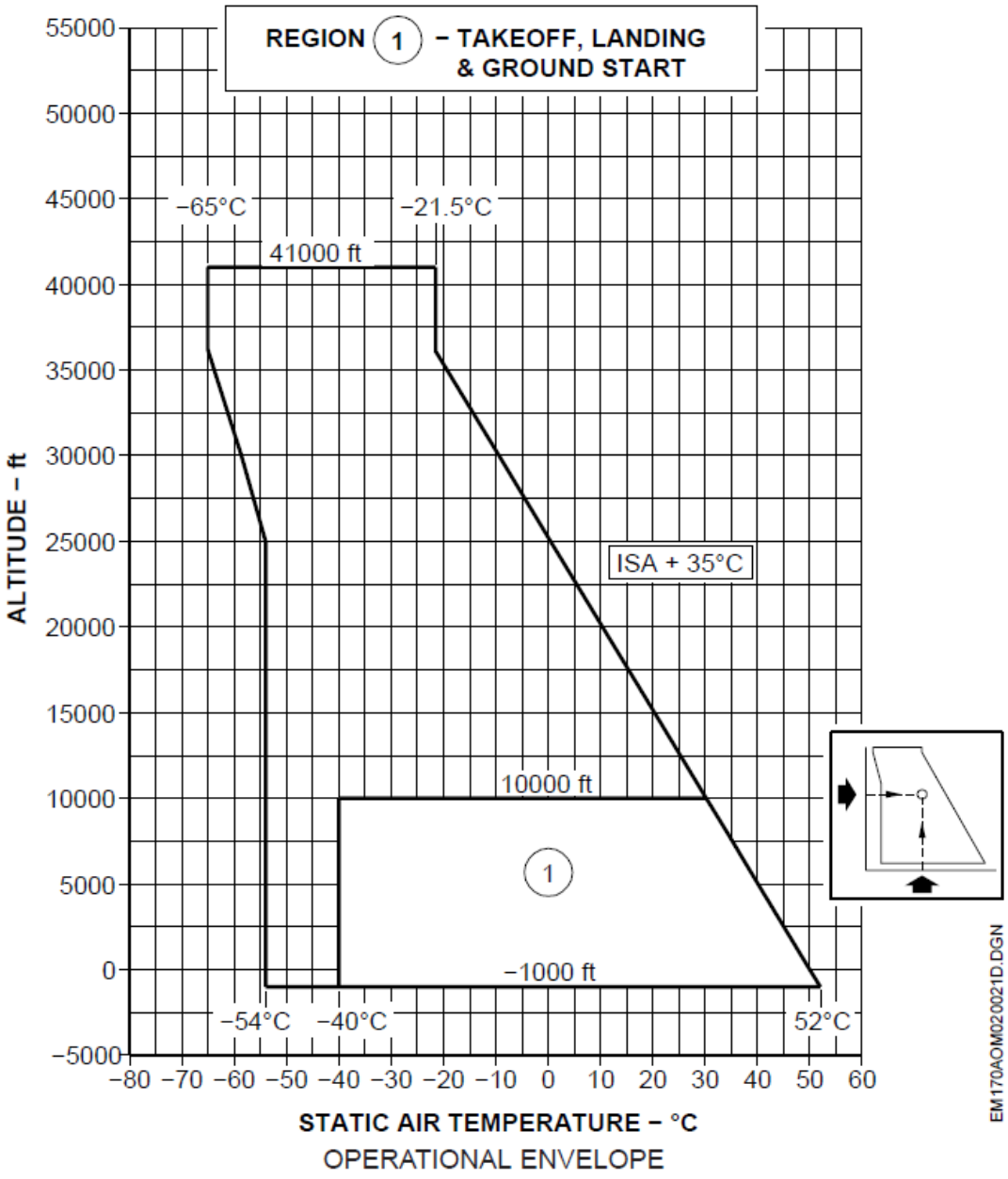


CG ENVELOPE - EMBRAER 190 SR (ALTERNATE 1 - CENTER OF GRAVITY - 17%)

Note: If the use of Autoland is required at low weights, the Zero Fuel Weight must not sit inside the Minimum Weights Extended Area (Region 2).

1.5 Operational Limitations

1.5.1 Operational Envelope



OPERATIONAL ENVELOPE

Note: In the event of a landing below −40°C, the airplane may not take-off without further maintenance inspection.

1.5.2 Maximum Altitude For Flap Extended

Maximum Altitude For Flap Extended..... 20,000 ft

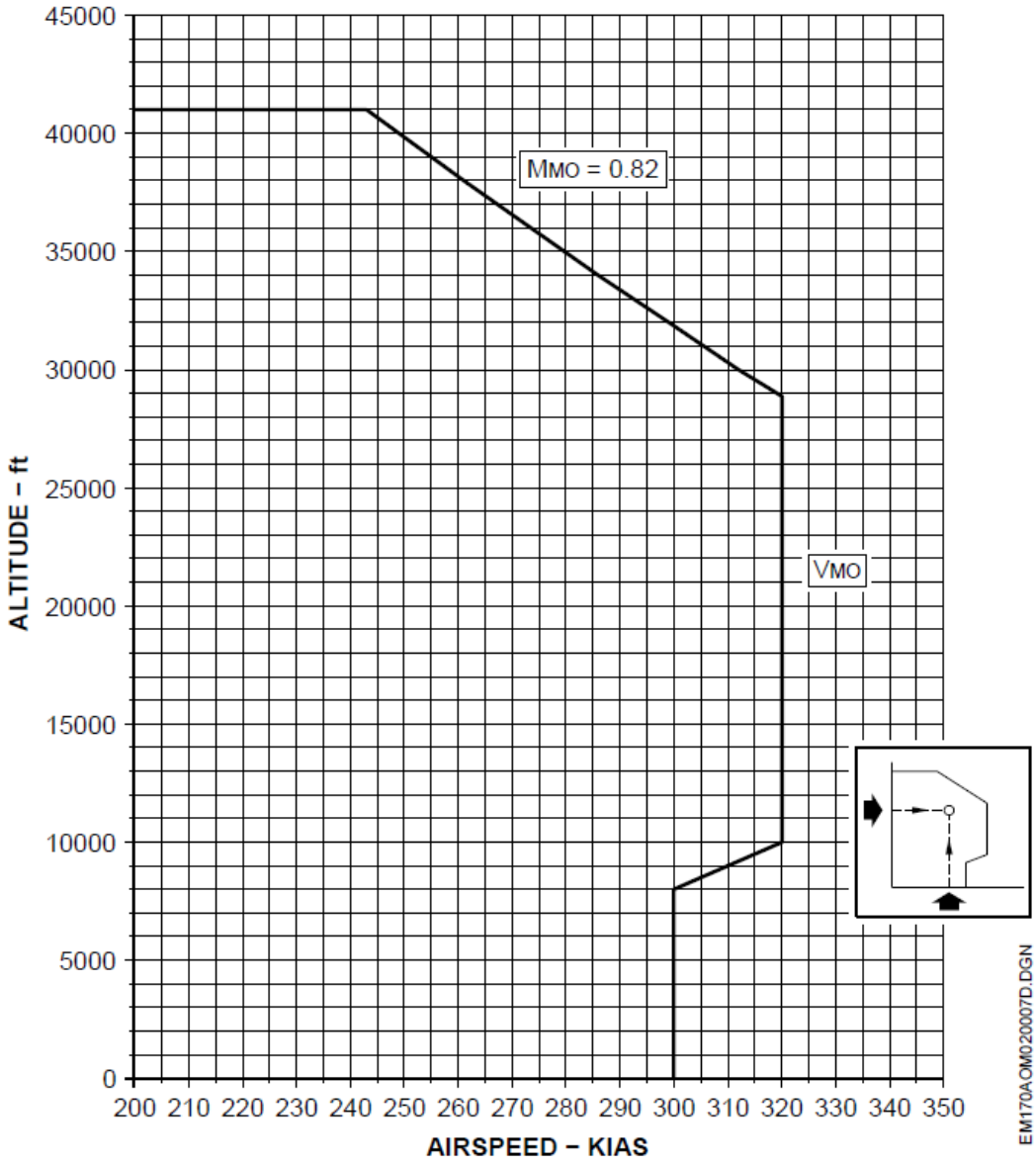
1.5.3 Landing Gear Operation/Extended Speed (V_{LO} and V_{LE})

	E190
V_{LO} for retraction	235 KIAS
V_{LO} for extension	265 KIAS
V_{LE}	265 KIAS

Note:

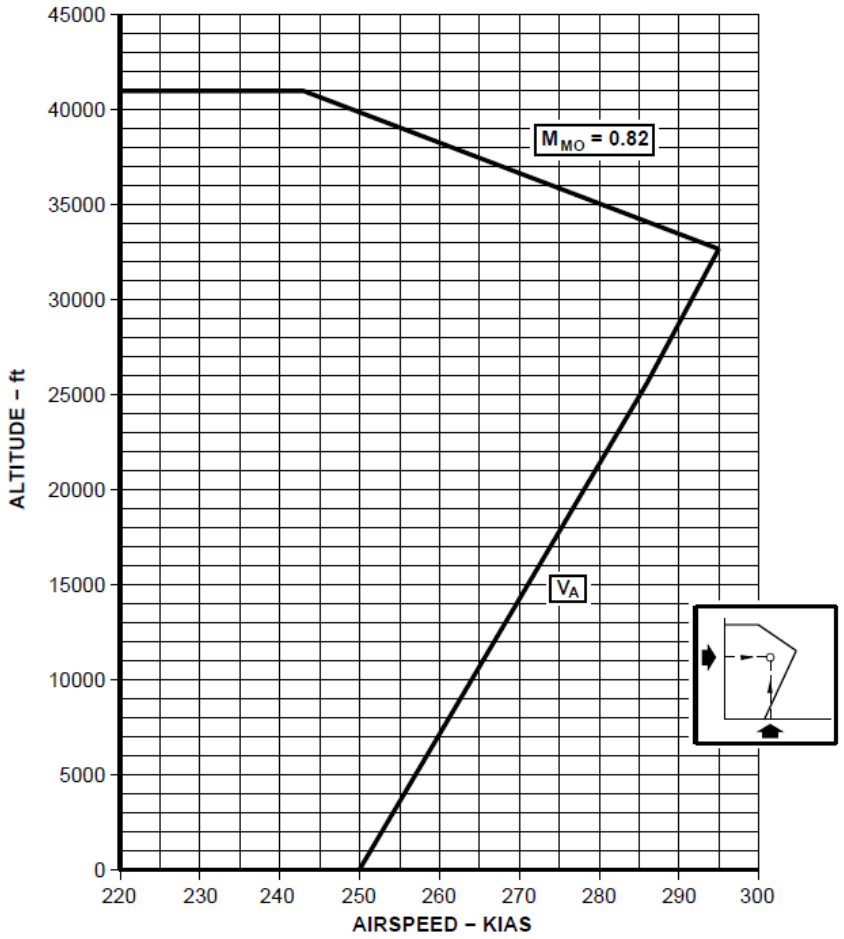
- V_{LO} is the maximum speed at which the landing gear can be safely extended and retracted.
- V_{LE} is the maximum speed at which the airplane can be safely flown with the landing gear extended and locked.

1.5.4 Maximum Operating Speed



Note: V_{MO}/M_{MO} may not be deliberately exceeded in any regime of flight (climb, cruise, or descent).

1.5.5 Manoeuvring Speed (V_A)



Note: Manoeuvres that involve angle of attack near the stall or full application of rudder, elevator, and aileron controls should be confined to speeds below V_A. In addition, the manoeuvring flight load factor limits, presented in this Section, should not be exceeded.

WARNING: RAPID AND LARGE ALTERNATING CONTROL INPUTS, ESPECIALLY IN COMBINATION WITH LARGE CHANGES IN PITCH, ROLL, OR YAW (E.G. LARGE SIDE SLIP ANGLES) MAY RESULT IN STRUCTURAL FAILURES AT ANY SPEED, EVEN BELOW V_A.

1.5.6 Maximum Flap Extended Speed (V_{FE})

Flaps 1	230 KIAS
Flaps 2	215 KIAS
Flaps 3	200 KIAS
Flaps 4	180 KIAS
Flaps 5	180 KIAS
Flaps Full	165 KIAS

1.5.7 Maximum Tyre Ground Speed

Maximum Tyre Ground Speed..... 195 kts

1.5.8 Minimum Crew

Minimum Flight Crew: Pilot and Co-Pilot

1.5.9 Manoeuvring Flight Load Factors

These corresponding accelerations limit the bank angle during turns and limit the pull-up manoeuvres.

Load Factor Limit	Flaps Up	Flaps Down
Positive	2.5 g	2.0 g
Negative	−1.0 g	0 g

1.5.10 Runway

Runway Slope..... −2% TO +2%

Runway Surface Type..... PAVED

1.5.11 Towing

Towbarless towing is prohibited, unless the Towbarless towing operations are performed in compliance with the appropriate operational requirements using Towbarless towing vehicles that are designed and operated to preclude damage to the airplane nose wheel steering system, or which provide a reliable and unmistakable warning when damage to the steering system may have occurred.

BAV Ground Services will approve the use of Towbarless towing vehicles to ensure only manufacturer-approved vehicles are provided to the operation. For Towbarless towing operations the maximum flap setting is 2.

Brake application during towing is prohibited unless for emergency.

1.5.12 Maximum Contaminant Depth

The maximum allowable water equivalent depth of contaminant for take-off operation is:

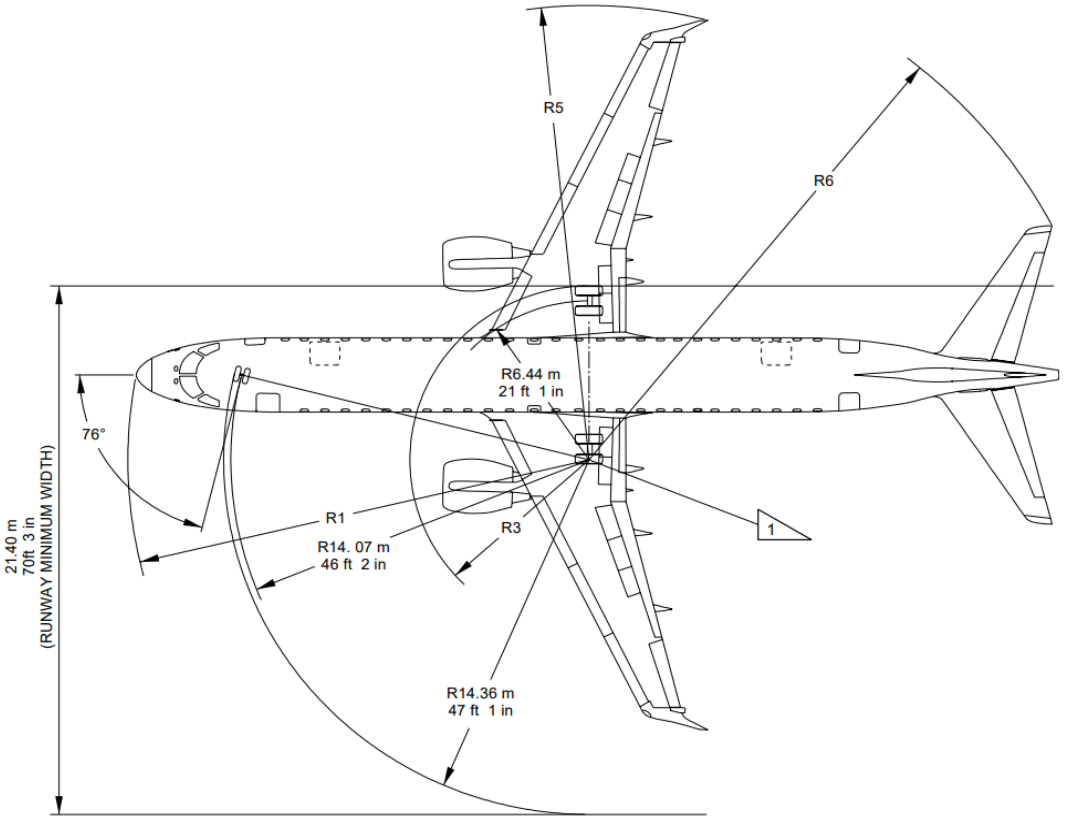
E190..... 24.5 mm

When using the precipitation depth feature with surface contaminants, the following Precipitation Specific Gravities (SG) should be used. The actual limit for the type of contaminant is also listed.

	SG	E190
Standing Water	1.00	24.5 mm
Slush	0.85	28 mm
Wet Snow	0.5	49 mm
Dry Snow	0.2	122.5 mm

Example: 10 mm of slush. Slush specific gravity is 0.85 giving a water-equivalent-depth of 10 × 0.85 = 8.5 mm.

1.5.13 Turning Radius



Steering Angle	Nose	Nose Gear	Outboard Gear	Right Winglet	Right Tail Tip
76°	18.12 m	14.07 m	7.04 m	18.39 m	20.51 m

1.5.14 Wind Limitations

Maximum Crosswind Operation ..... 38 kts

Maximum Door Opening/Closing ..... 40 kts

Maximum Cargo Door Open ..... 60 kts

Maximum Passenger and Service Doors Open ..... 65 kts

	Normal Ops		Steep Approach	Autoland	CAT II Man Land
	Dry Rwy	Wet Rwy			
Headwind	N/A	N/A	N/A	25 kts	37 kts
Crosswind	38 kts	31 kts	25 kts	15 kts	16 kts
Tailwind	15 kts	15 kts	5 kts	10 kts	10 kts

	Compacted Snow	Standing Water, Slush, Wet & Dry Snow	Ice
Headwind	N/A	N/A	N/A
Crosswind	20 kts	18 kts	12 kts
Tailwind	0 kts	0 kts	0 kts

1.6 Warning Systems

1.6.1 Enhanced Ground Proximity Warning

The following limitations are applicable to the Enhanced Ground Proximity Warning System (EGPWS):

- Navigation is not to be predicated on the use of the Terrain Awareness Display.
- The use of predictive EGPWS functions should be manually inhibited when landing to an airport that is not in the airport database to avoid unwanted alerts.
- Pilots are authorised to deviate from their current Air Traffic Control (ATC) clearance to the extent necessary to comply with an EGPWS warning.
- The Terrain Display is intended to be used as a situational tool only and may not provide the accuracy and/or fidelity on which to solely base terrain avoidance manoeuvring.
- The use of predictive EGPWS functions should be manually inhibited during QFE operations if GPS data is unavailable or inoperative.

1.6.2 Traffic Alert and Collision Avoidance

The following limitations are applicable to the Traffic Alert and Collision Avoidance System (TCAS):

- Deviation from the ATC assigned altitude is authorised only to the extent necessary to comply with a TCAS Resolution Advisory (RA).
- Manoeuvres must not be based solely on information presented in the traffic display.

1.6.3 Tail Strike Avoidance

The following limitations are applicable to operations with the tail strike avoidance system inoperative:

During Landing:
Maximum Pitch ..... 10° PITCH UP

1.7 Fuel

1.7.1 Fuel Capacity

	E190
Maximum usable quantity per tank	8076.3 L (6550 kg)
Unusable quantity per tank	56.7 L (46 kg)

Note: Maximum fuel capacity is 16266 L (13192 kg).

Maximum permitted imbalance between tanks ..... 360 kg

Note: The weights above have been determined for an adopted fuel density of 0.811 kg/L. Different fuel densities may be used provided the volumetric limits are not exceeded.

1.7.2 Fuel Specification and Temperature

Standard	Fuel Type	Low Temperature Limit
ANP 1/2003	QAV-1	−44°C
ASTM D1655	JET A	−37°C
ASTM D1655	JET A1	−44°C
MIL-T-83133A	JP-8	−44°C
STAGNAG 3747 ED5	F-34	−44°C
STAGNAG 3747 ED5	F-35	−37°C

1.7.3 Crossfeed Operation

Crossfeed Selector Knob must be set OFF during take-off and landing.

1.8 Auxiliary Power Unit

The APU on the E190 is the Sundstrand APS 2300.

1.8.1 Operational Limits

Parameter	**MIN**	**MAX**
Start:		
Temperature	−54°C	**Note 3**
Altitude	-	30,000 ft
Operation:		
Temperature	**Note 3**	**Note 3**
Altitude:	-	33,000 ft
Electrical Gen	-	33,000 ft
Bleed	-	15,000 ft
To Assist Engine Start	-	21,000 ft
Rotor Speed	-	108%
EGT: **Notes 1 and 2**		
Start	-	1032°C
Continuous	-	717°C

Note:

1. In flight, there is no automatic shutdown if EGT exceeds the limits.
2. There is no time limitation for operating the APU on ground or in flight in the amber range between 662°C and 717°C.
3. APU temperature limits match the Airplane Operational Envelope temperature limits.

1.8.2 APU Starter Limits

Cooling periods after each starting attempt:

First and Second Attempts ..... 60 s OFF

Third Attempt ..... 5 min OFF

1.9 Powerplant

1.9.1 Engines

The E190 is equipped with two General Electric CF34-10E5A1 engines.

1.9.1.1 Operational Limits

Parameter	MIN	MAX
N1	-	100%
N2	59.3%	100%
ITT:		
Start	-	740°C
Inflight Start	-	875°C
Normal and Maximum TO and GA	-	983°C **Notes 1, 2 and 3**
Maximum Continuous	-	960°C
Oil Pressure	25 psi **Note 4**	-
Oil Temperature (Continuous)	-	155°C

Note:

1. Time limited to 5 minutes.
2. The take-off time limit is extended to 10 minutes with one engine inoperative.
3. ITT transients above the nominal ITT limits are allowed to Normal and Maximum Take-Off, up to 5.5°C for 2 s, 4.4°C for 5 s, 3.6°C for 15 s and 2.4°C for 30 s.
4. During starts with oil temperature below –22°C the minimum oil pressure is 5 psi, time limited to 2 minutes.

1.9.2 Starter Limits

1.9.2.1 Dry Motoring Duty Cycle Limits

Motoring Number	Maximum Time	Cool-Down Time
1	90 seconds	5 minutes
2 through 5	30 seconds	5 minutes

Note: After five sequential motorings, cycle may be repeated following a 15-minute cool-down period.

1.9.2.2 Starting Duty Cycle Limits

Motoring Number	Maximum Time	Cool-Down Time
1 and 2	90 seconds (on ground) 120 seconds (in-flight)	10 seconds
3 through 5	90 seconds (on ground) 120 seconds (in-flight)	5 minutes

Note:

1. For ground starts, the maximum cumulative starter run time per start attempt is 90 seconds (motoring plus start time).

2. For in-flight starts, the maximum cumulative starter run time per start attempt is 120 seconds (motoring plus start time).

1.9.3 Engine Thrust

Powerback is prohibited.

Operation at reduced take-off thrust based on the assumed temperature higher than the actual ambient temperature is permissible if the airplane meets all applicable performance requirements at the planned take-off weight and reduced thrust setting. The total thrust reduction must not exceed 25% of the full take-off thrust.

Use of reduced take-off thrust procedures is not allowed on runways contaminated with standing water, slush, snow, or ice, and are not allowed on wet runways unless suitable performance accountability is made for the increased stopping distance on the wet surface. Application of reduced take-off thrust is always at the pilot's discretion.

When conducting a take-off using reduced take-off thrust, normal take-off thrust may be selected at any time during the take-off operation.

1.10 Pressurisation

	E190
Maximum Differential Pressure	
Up to 37,000 ft	7.8 psi
Above 37,000 ft	8.4 psi
Maximum Differential Overpressure	8.77 psi
Maximum Differential Negative Pressure	−0.5 psi
Maximum Differential Pressure for Take-Off and Landing	0.2 psi

1.11 Ice and Rain Protection

1.11.1 Operation In Icing Conditions

There is no temperature limitation for anti-icing system automatic operation.

On Ground – Before Take-Off:

- The TO DATASET MENU on the MCDU must be set to ENG when OAT is greater than 5°C and to equal, or less than, 10°C with visible moisture.
- The TO DATASET MENU on the MCDU must be set to ALL when OAT is at or below 5°C with visible moisture.

On Ground – After Landing:

- The Ice Protection Mode Selector Knob must be set to ON when OAT is less than 10°C with visible moisture.

In-Flight:

- The engine and wing anti-ice systems operate automatically, in case of ice encounter when the ice protection mode selector is in the AUTO position. If either one or both ice detectors are failed, the crew must set the mode selector to ON when icing conditions exist or are anticipated below 10°C TAT with visible moisture.

Note:

1. Icing conditions may exist whenever the Static Air Temperature (SAT) on the ground or for take-off, or Total Air Temperature (TAT) inflight, is 10°C or below and visible moisture in any form is present (such as clouds, fog with visibility of one mile or less, rain, snow, sleet, and ice crystals).

2. Icing conditions may also exist when the SAT on the ground and for take-off is 10°C or below when operating on ramps, taxiways, or runways where surface snow, ice, standing water, or slush may be ingested by the engines, or freeze on engines, nacelles, or engine sensor probes.

Caution: On ground, do not rely on visual icing evidence or ice detector actuation to turn on the anti-icing system. Use the temperature and visual moisture criteria as specified above. Delaying the use of the anti-icing system until ice buildup is visible from the cockpit may result in ice ingestion and possible engine damage or flame-out.

1.11.2 Windshield Wiper Operation

Maximum Airspeed for Windshield Wiper Operation ..... 253 KIAS

1.12 Autopilot

Minimum Engagement Height ..... 400 ft

Minimum Use Height:

Cruise and Descent ..... 1,000 ft

Approach ..... 50 ft

Note: Autopilot use below 50 ft is permitted during Autoland when AUTOLAND 1 is engaged. Autoland provides touchdown and 5 seconds of roll-out guidance.

1.13 Navigation Approvals

BAV CityFlyer hold the following Navigation Approvals for the E190:

- RNP-10
- RNAV-5 (B-RNAV)
- RNAV-1 (P-RNAV)
- RNP APCH (with barometric vertical navigation)

1.13.1 RNP APCH Approvals

BAV CityFlyer E190 aircraft are approved to conduct RNP APCH approaches conducted to LNAV or LNAV/VNAV minima, this includes RNAV/RNP Visual approaches.

RNP AR (authorisation required) approaches (chart minima RNP 0.3 or below) and LP/LPV approaches are **not** authorised.

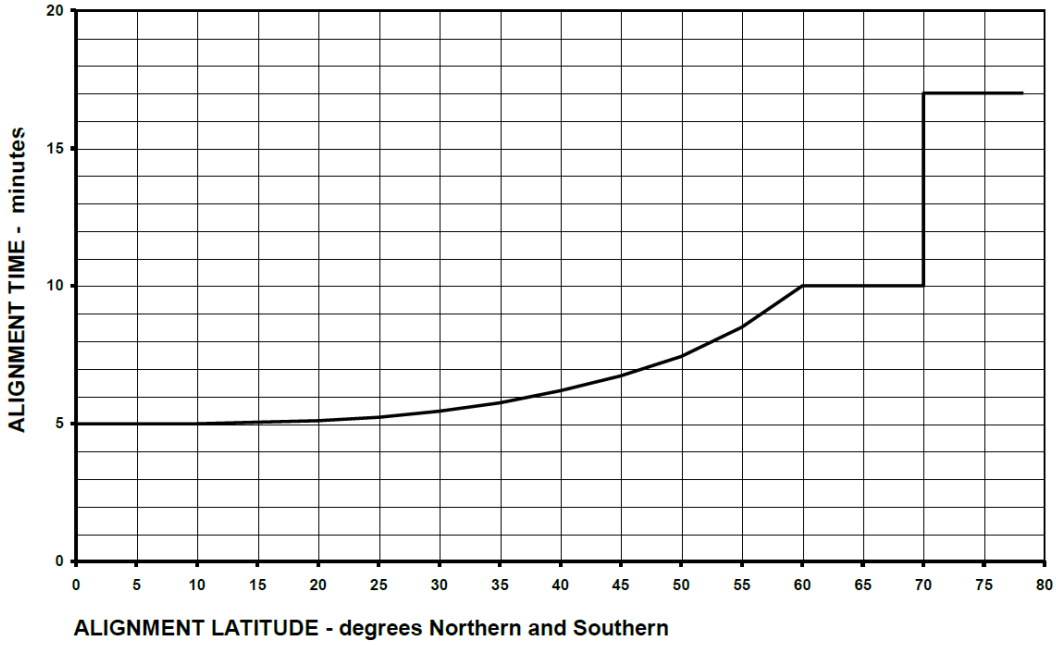
1.14 Navigation/Communication Equipment

- TAS, TAT and SAT information are only valid above 60 KIAS.
- While transmitting in VHF1 the standby magnetic compass indication is not valid.
- Barometric altimeter minimums must be used for all CAT I approaches except when otherwise authorised.
- Back course approaches using the IESS are prohibited.
- The ACARS is limited to the transmission and receipt of messages that will not create an unsafe condition if the message is improperly received, unless they are verified per approved operational procedures.

1.14.1 Inertial Reference System

Maximum Latitude For Stationary Alignment..... 78.25° Northern and Southern

- IRS stationary alignment will complete only after a valid airplane present position (latitude and longitude) is received from the FMS.
- Time to stationary alignment completion:



1.14.2 Primus EPIC Flight Management System

- Use of speed mode in FMS is prohibited for the one engine inoperative condition.
- The use of the VNAV guidance when the FD mode is other than VNAV is prohibited unless pilots set the ALT SEL to each waypoint altitude constraint required by the FMS entered procedure.
- Use of GPS is limited to areas where GPS is approved. De-selection of GPS should be performed in other non-approved areas.
- Prior to flight using the FMS for IFR navigation, a minimum of one VOR, DME, and IRS must be verified to be installed and operational. Also, any appropriate ground facilities (VOR, DME) that are utilised by the procedures to be flown must be verified as operational using an approved method (NOTAM).

- If GPS RAIM is annunciated as not available during terminal, en-route, or remote/oceanic operation, the pilot must monitor FMS guidance data and crosscheck against raw data from an alternate source (VOR, DME, or IRS).
- Due to priority use of GPS by the FMS, IFR navigation using the FMS is limited to use with procedures that are referenced to the WGS-84 or NAD-83 datum, unless other appropriate authorised procedures are used.
- IFR navigation using the FMS is prohibited unless the pilot verifies the currency of the selected navigation database cycle on the NAV IDENT page.
- IFR navigation using the FMS is limited to geographic regions contained within the navigation database that is installed in the airplane.
- FMS performance management calculations have not been certified by the CAA. FMS performance management information is advisory information only and may not be used as a basis for fuel load planning or airplane range predictions.
- Selection of FMS Position Update is prohibited during RNP operations, including RNP-10 operations.
- Use of the Step Climb function is prohibited.
- Selection of course interception to a conditional waypoint is prohibited.

1.14.3 Primus EPIC Approach Limitations

- ILS, LOC, LOC-BC, LDA, SDF, GLS, MLS, Visual, and Radar approaches, using the FMS as the navigation source for guidance, are prohibited.

Note: RNAV/RNP Visual approaches are authorised, however, FMS guidance within the visual segment is advisory only and visual references must be used as the primary navigation reference.

- FMS instrument approaches must be accomplished in accordance with approved instrument approach procedures that are retrievable from the FMS navigation database (as displayed on the APPROACH page on the MCDU). The pilot must review the complete procedure, comparing the waypoints, speeds, and altitudes displayed on the FMS with those on the published procedure charts. If any doubt exists about the integrity of the coded procedure, the procedure should not be used.
- Prior to commencing and during the final approach, the APPR annunciator must be visible on the PFD. If the APPR annunciator is not visible, and the appropriate runway visibility indications are not observed, the pilot must declare a missed approach.
- When using FMS guidance to conduct an instrument approach procedure that does not include GPS in the title of the published procedure, the flight crew must verify that the procedure specified navaids(s) and associated avionics are operational (VOR, DME, or ADF). If GPS RAIM is annunciated as not available during the approach, the pilot must monitor FMS guidance data and crosscheck against raw data from the alternate source(s).
- When a GPS Only Approach is planned (GPS only in title or GPS required by operational rules), prior to dispatch, the crew is required to verify that the predictive RAIM at the destination ETA is within the approach criteria. This information (RAIM AVAILABLE) is displayed on the PREDICTIVE RAIM page on the MCDU.
- When an alternate airport is required by the applicable operating rules, the alternate airport must be served by an approach based on a navigation aid other than GPS.
- If an alternate airport is not required by the applicable operating rules, the destination airport must be served by an approach based on a navigation aid other than GPS.

- When the reported station temperature exceeds the limits published in the approach chart, the use of VNAV barometric procedures are prohibited unless the pilot uses the VNAV temperature compensation function.
- Use of VNAV guidance below the published approach minimums is prohibited.
- VNAV path guidance is supplementary guidance information. The flight crew must rely on the altimeter as the primary altitude reference during the final approach segment, including step down fixes.

1.15 CAT II (Non-Autoland) Operations

1.15.1 Autopilot

Minimum Use Height ..... 50 ft RA

Note: Coupled go-around height loss may be 50 ft.

1.15.2 Approach and Landing Flaps

CAT II approach and landing must be performed with slats/flaps 5.

1.15.3 Wind Limitations

For maximum wind components refer to **1.5.14**.

1.15.4 Minimum Equipment Required

The performance of Category II approaches has been demonstrated to meet the airworthiness requirements of FAA AC 120-29A – Appendix 3 and CS AWO Subpart 2 requirement, when the following equipment are installed and operative:

- 2 Inertial Reference Systems
- 2 Flight Director Systems
- 2 Primary Flight Displays (PFD)
- 1 Windshield Wiper
- 2 VOR/ILS NAV Systems
- 1 VHF/COMM System
- 1 Radio Altimeter
- 1 Ground Proximity Warning System (GPWS)
- 2 Air Data Systems (ADS)
- 1 Autopilot System Channel must be operative
- Rudder in Normal Mode
- SPOILER FAULT message not presented

Flight Director Manual CAT II approaches are prohibited.

1.16 RVSM

The E190 is approved for RVSM operations.

1.16.1 Minimum Equipment Required

During RVSM operation it is necessary that the following equipment and instruments be in proper operating condition:

- RVSM Compliant Air Data Systems
- 1 Autopilot with Altitude Hold Mode operative
- 1 Altitude Alerter
- 1 Transponder

Notes:

1. The ADS 1, ADS 2 and ADS 3 are compliant with RVSM operation.

2. The ADS 3 is not considered RVSM compliant in case of loss of sideslip compensation (EICAS message 'ADS 3 SLIPCOMP FAIL' displayed).

3. The IESS must not be used for RVSM operation.

4. Should any of the required equipment fail prior to the airplane entering RVSM airspace, the pilot must request a new clearance to avoid entering this airspace.

1.17 Autoland

The following operations are prohibited:

- MLS
- ILS beam not coincident with the central axis of the runway
- Autoland for an ILS CAT I, unless explicitly authorised by the appropriate regulatory authority.

1.17.1 Glideslope Angles

The maximum and minimum glideslope angles are 3.25° and 2.5° respectively.

1.17.2 Weight

Autoland operation in the Centre of Gravity Envelope minimum weights extended area is prohibited.

1.17.3 Maximum Airport Elevation

The maximum airport elevation for Autoland operation is 7,340 ft.

1.17.4 Minimum Decision Height

The Autoland system was demonstrated to meet the necessary requirements under the following conditions:

Minimum DH ..... 50 ft

Note: The actual decision height or decision altitude to be used will depend on flight crew and airport facilities certification.

1.17.5 Approach and Landing Flaps

Autoland operations must be performed with Flaps 5.

1.17.6 Wind Limitations

For maximum wind components refer to **1.5.14**.

1.17.7 Minimum Equipment Required

The Autoland system fitted to the E190 meets the airworthiness requirements for a fail-passive (CAT IIIA) automatic landing system.

The following equipment must be installed and operative:

- Inertial Reference Systems
- Flight Director Systems
- Primary Flight Displays (PFD)
- Windshield Wipers
- Independent VOR/ILS NAV Systems (VOR/ILS Data Link Level A)
- 1 VHF/COMM System
- 2 Radio Altimeters
- 2 Air Data Systems (ADS)
- 1 Autopilot Channel.

1.18 Steep Approach

The Steep Approach to landing may be performed with an approach flight path angle up to 5.5°.

This operation cannot be initiated with one engine inoperative.

This operation is not permitted if the Steep Approach mode is not armed.

Only CAT I approaches are permitted with the Steep Approach mode engaged.

1.18.1 Landing Reference Speed (V_{RF})

The Steep Approach to landing must be done at Landing Reference Speed (V_{RF}) applicable to Steep Approach.

1.18.2 Autopilot

Minimum Use Height ..... 167 ft.

1.18.3 Approach and Landing Flaps

The Steep Approach to landing must be performed with slats/flaps FULL.

1.18.4 Wind Limitations

For maximum wind components refer to **1.5.14**.

2 Normal Procedures

2.1 Introduction

All mandated operating criteria written in the manufacturer operating manuals are included in this FCOM. The procedures listed below are type-specific and supersede any type-generic procedures documented in the BAV OM-A, OM-B and/or manufacturer supplementary information.

2.1.1 Normal Procedures and Checklists Philosophy

2.1.1.1 Introduction to Normal Procedures and Checklists

In the following sections the Normal Procedures to be followed by the flight crew during the conduct of a flight are defined along with the checklists to be completed at the various stages of flight. The Normal Checklist broadly divides actions into two types:

Challenge and Response
Challenge and response items are indicated by a solid line (PARK BRAKE ___ SET) with the challenge read aloud by the FO (on the ground)/PM (in the air) and the response announced by the Captain (on the ground)/PF (in the air) – checklist items should already be actioned/set from the relevant set-up before challenge and response checklists are run.

Note:

- Items marked SET shall include the setting when they relate to altimeter barometric reference, slats/flaps position, and pitch trim.
  Example: Slats / Flaps ___ "SET 2 & CKD"
- Items marked AS REQ'D shall have the required setting checked and announced.
  Example: APU ___ "ON"
- Items marked X-CKD shall be announced by both crew.
  Example: QNH ___ P1: "1012 SET", P2: "1012 SET"

Within the Normal Procedures, challenge and response checklists are described using an 'Expanded Checklist' format. Where sub-items are listed in bullet points, this indicates the detailed steps that the flight crew will have completed **before** actioning the Checklist and is not intended to identify steps completed during the Checklist.

Example: The Before Start Checklist includes the item MCDU (Initial) _____ SET & CKD. Within the Normal Procedures the 'Expanded Checklist' details the following items:

- *Set Flight ID and correct transponder for PF.*
- *Select NAV IDENT page and check its contents.*
- *Select POSITION INIT page and load the present position.*
- *The F/O sets the route in the FMS according to the flight plan and both pilots check course, distance, time and altitude on each waypoint.*
- *The F/O sets the Perf Init pages.*
- *Insert the intended SID or the departing runway on the FMS and both pilots must check the accuracy of the procedure retrieved by FMS database.*

These MCDU inputs must have been completed before actioning the Checklist. When completing the Checklist, there should a brief review of the relevant MCDU pages to confirm that the data entry is complete.

Read and Do
Read and do items are indicated by a dotted line (Cabin Crew … ADVISE) with actions completed by the FO as the Checklist is run.

Read and do items may be completed silently.

2.1.1.2 Division of Crew Responsibilities

Normally and always when accepting an aircraft they have not previously flown that duty day, the Captain will perform the External Inspection whilst the First Officer completes the Cockpit Safety Inspection, Power Up, and Cockpit Preparation 'to the line' as required. With the exception of the first acceptance external inspection, the crew may elect to swap these duties for role reversal up to the Before Start Checklist 'below the start approved line'.

There is only one tiller on the E-Jet, so all ground handling must be conducted with the Captain as PF. Consequently, the Captain will manage the operation until the aircraft is lined up on the runway and then handover control if the First Officer is PF for that sector. To avoid confusion on the flight deck, the Captain will always start engines and the First Officer will call out the checklist challenges for the Before Start 'below the start approved line', After Start and Taxi Checklists and complete the Before Take-Off actions.

After landing the Captain must take over as PF before ground manoeuvring. The First Officer can control the aircraft using rudder fine steering on the runway and for the initial turn onto a high-speed exit. To avoid confusion, the Captain will always shutdown the engines and the First Officer complete the After Landing actions and call out the checklist challenges at Shutdown.

Throughout operations the PM will operate the radio unless agreed otherwise. This does not preclude the PF from responding to radio calls if the PM is otherwise engaged.

2.1.2 Dark and Quiet Cockpit Concept

The design philosophy of the airplane states that during normal flight and system operation, the pushbuttons and annunciators on the overhead, main, glareshield and control pedestal panels must be dark (that is, displaying no lights).

Absence of visual or aural warnings indicates normal operation of the airplane systems.

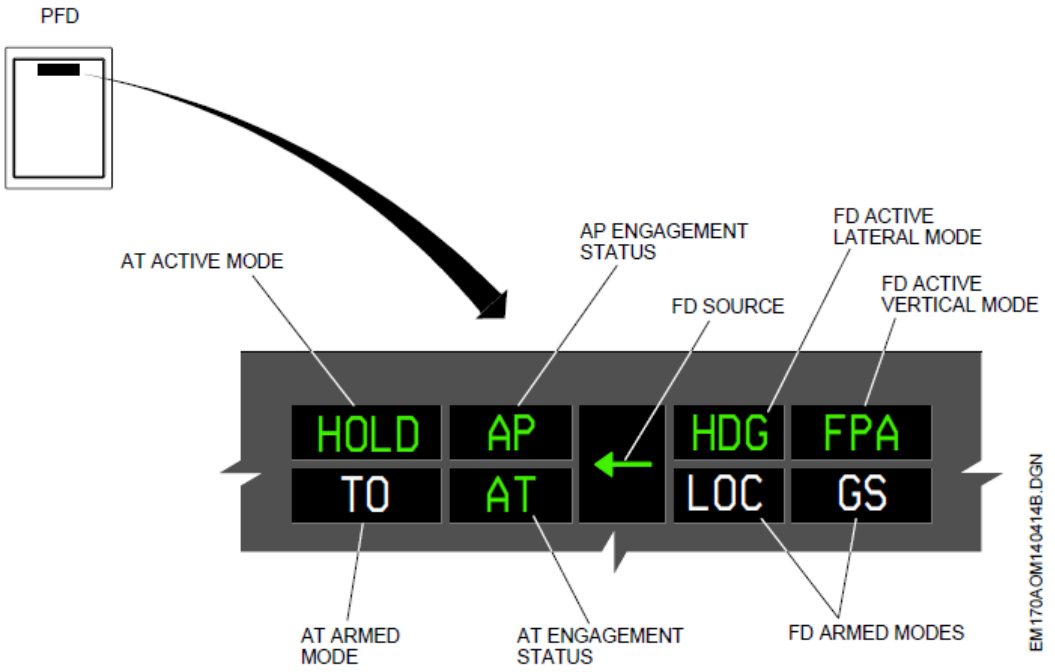
2.1.3 Buttons Concept

The normal operating position of the push in/out buttons is identified with no light bar illuminated, regardless of switch position.

2.1.4 Automatic Flight

Pilots must plan to be synchronised with the airplanes' automation. Being 'ahead' of the airplane is essential for smooth operation of the automated systems, since auto-flight systems may receive faulty inputs from the flight crew or may contain database errors. When the airplane does not perform as expected, the autopilot must be disconnected and manual flight promptly established.

The FMA must be monitored at all times by both pilots. The Guidance Panel does **not** have selection lights. All selections must be confirmed by both pilots from the FMA with the PF announcing all active and armed modes from 400 feet AAL after take-off until the handover of control for landing on final approach.



The PF shall callout the mode and colour for FMA annunciated lateral and vertical modes except for LOC and GS modes which shall be called per the example. The AT mode does not require callout unless an AT failure results in an incorrect mode for the current vertical mode.

Examples:
"HEADING GREEN" *or* ***"LNAV MAGENTA"***
"FLIGHT LEVEL CHANGE GREEN" *or* ***"FPA GREEN"*** *or* ***"PATH MAGENTA"***
"ALT CAPTURE GREEN" *then* ***"ALT HOLD GREEN"***
"APPROACH ARMED" *then* ***"LOC / GS CAPTURED"***

During briefs both pilots must ensure the MCDU and the displays are set correctly.

2.1.5 Use of the Flight Director

The Flight Director should be used and updated at all times. The PF can request the PM to perform the tasks required to keep the Flight Director updated with the manoeuvres performed. If the Flight Director is not synchronised with the actual airplane's manoeuvre it must be updated or turned off.

The FD can be removed by pressing the FD Button on the Guidance Panel.

2.1.6 Guidance Panel

The use of FMS Speed mode is prohibited below FL100/10,000 ft.

VNAV may be used in the climb and descent. Pilots must be aware of the requirement for speed and configuration changes not programmed into the FMS. The source of the vertical FMA mode must be confirmed using the FMA colour:
"**PATH/FLCH MAGENTA**" or "**FPA/FLCH GREEN**".

Magenta indicates FMS commanded modes.
Green indicates modes manually commanded via the Guidance Panel.

2.1.7 Use of the MCDU

MCDU usage must be coordinated in all flight phases (VHF frequency tuning and navigation, performance, progress monitoring and changes). Whenever entering a new route, it is the crews' responsibility to check all the waypoints for correct coordinates and associated navigation aids. It is recommended that one pilot enter the flight plan and the other pilot check the data entered.

During periods of manual flight, MCDU changes should be made by the PM and executed only after confirmation by the PF.

Note: Pilots should be aware of the tendency to be 'heads in' when making selections on the MCDU. One pilot must be 'heads out' at all times when below FL100/10,000 ft.

2.1.8 Use of the Autopilot

Pilots should use the Autopilot as much as possible, allowing effective monitoring of the flight.

It is recommended that the AP is engaged at minimum engagement height and disengaged at traffic pattern altitude for a visual approach or at MDA/DA/DH during an instrument approach (if not performing an Autoland or a go-around).

The amount of automation to be used during each phase of flight should be determined by the PF. Pilots must always be alert and monitor the AP. High levels of automation use can cause crews to be out of the loop, with excessive confidence in the automatic flight systems.

2.1.9 Use of the Autothrottle

The Autothrottle should be used for the entire flight, engaged just prior to take-off and disengaged after touchdown or at the PF's discretion during the approach.

Pilots must always be alert and monitor the AT operation checking the movement of the thrust levers occur in the correct direction. In particular, during the approach and landing, always anticipate having to over-ride the AT, both for speed control and sink-rate in the later stages. In windy or turbulent conditions, change your mindset from 'anticipating' to 'expecting' to have to over-ride.

2.1.10 Manual Flying

To reduce the risk of 'automation complacency' crews may elect to practise manual flight during normal line operations. This is approved provided the following restrictions are observed:

- Both pilots are happy to revert to manual flight
- A low ATC-workload environment
- Weather conditions are appropriate:
  - Minimum of 1000 ft cloud base and 5 km visibility
  - No forecast or reported windshear or turbulence
- The reversion to non-standard flying has been fully briefed
- A decision to deselect the Autothrottle has been considered separately and can only be considered for approaches – all take-offs must be with AT on unless unserviceable.

After the AP has been de-selected the PF should concentrate on control of the aircraft, working with the PM to organise the flight path and using the PM to make all Guidance Panel and configuration selections.

Both pilots must recognise the increased workload on the flight deck. The PM should anticipate and monitor flight path, descent profile and energy management, being ready to intervene with any necessary guidance in good time.

Note: The principle of monitored approach remains, so the PF manually flying the approach is doing so on behalf of the PM, who remains as the P1 and responsible for the sector and landing.

A decision to de-select the AT must be accepted by the pilot subsequently landing, as the change will affect their landing technique.

All standard calls and checks must be completed normally.

The restrictions described above apply equally to manual departures. Any decision to delay the engagement of the AP beyond the acceleration altitude must be briefed and the PF and PM roles confirmed as above. If this has not been briefed or agreed as a crew, then the PM will engage the AP as normal during the climb sequence.

WARNING: ANY FLIGHT WITHOUT THE AT ENGAGED WILL LOSE ALL SPEED PROTECTIONS NORMALLY AVAILABLE.

WARNING: CREWS SHOULD BE PARTICULARLY CAUTIOUS IF ELECTING TO FLY BOTH A MANUAL AND A VISUAL APPROACH AT THE SAME TIME AS SUCH AN EXTREME DEPARTURE FROM NORMAL PROCEDURES HAS CAUSED FLIGHT SAFETY ISSUES IN THE PAST.

2.1.11 EICAS and Aural Warnings

Precise and accurate identification of all warnings is paramount in ascertaining the nature of any malfunction. In normal circumstances, any EICAS warnings should be verbally identified by PM. For example, "**AMBER CAUTION - AC BUS 1 OFF**". The PF should acknowledge and confirm the warning before asking for it to be cancelled. They should then call for any specific drill required to deal with the situation. In the case of multiple warnings where there is uncertainty as to what the primary caution is, crew should prioritise as follows:

- AC failure
- DC failures
- MAU failures
- SPDA.

2.1.12 Altimeter Policy

2.1.12.1 Altimeter Subscale Settings

Changes to altimeter settings must be confirmed and visually cross-checked by both pilots on all altimeters. Changes to altimeter settings should be initiated by PF and communicated to PM. Should the PF not initiate the relevant altimeter setting change as soon as is practicably possible, the PM will prompt with the call "**ALTIMETERS**".

2.1.12.2 Take-Off

Prior to take-off the airfield QNH should be set on all the altimeters.

2.1.12.3 Climb Above MSA/Transition Altitude

When first cleared to climb to a flight level the PF will initiate the setting of the Standard Pressure Setting on both main altimeters. The standby altimeter should remain set to the local QNH until passing the higher of either transition altitude or MSA.

Where the initial climb is to a Flight Level, both primary altimeters should be set to Standard Pressure Setting at Acceleration Altitude.

2.1.12.4 Top of Descent

The destination QNH should be set on the standby altimeter prior to the top of descent during the descent briefing.

2.1.12.5 Approach

When the aircraft is cleared to descend to an altitude the QNH should be set on all altimeters.

Baro Minimums (DA/MDA) shall be set to the appropriate minima as determined from the approach plates.

2.1.12.6 Radio Altimeter

Radio Altimeter DH will only be set for CAT II/III approaches or, when authorised, approved CAT I approaches to a radio DH.

During any phase of flight when the radio altimeter becomes active, the PF shall announce "**POSITION CHECK**" – both pilots shall make a verification of the RA reading with regard to terrain and also of the aircraft's energy and configuration with regard to the approach. The PM shall make a positive statement which justifies continuing the approach after comparing significant factors in relation to terrain.

2.1.12.7 Altimeter Standard Callouts

Phase of Flight	Event	Challenge – PF	Response – PM
Climb and Descent	In the climb, above AA, and cleared to a FL **Note 1**	"**SET STANDARD**"	"**STANDARD SET AND CROSS-CHECKED**"
	Clearance above or below MSA	"**CLEARANCE ABOVE/BELOW MSA**"	"**MSA [ ] FEET" NOTE 2**"
	Passing FL100/10,000 ft and FL200/FL300 in climb or descent **Notes 3, 4 and 5**	"**ALTIMETER CHECK**"	"**[ ] CLIMBING/ DESCENDING TO [ ]. STANDARD/QNH SET. PRESSURISATION CHECKED."**
Climb and Descent	1,000 ft below/above cleared level **Note 6**	**PM:** "**1,000 TO GO**"	**PF:** "**CHECKED**"
	Pre-selected altitude capture **Note 7**	"**ALT CAPTURE**"	"**CHECKED**"
	Pre-selected altitude hold **Note 7**	"**ALT HOLD**"	"**CHECKED**"

	In the descent, when cleared from a FL to an altitude **Note 1**	"**SET QNH**"	"**[ ] SET AND CROSS-CHECKED**"
Descent	Radio Altimeter alive	"**POSITION CHECK**"	**Note 8**
Approach	4 NM or equivalent position for glidepath verification check	"**PASSING [ ] FT**"	"**CHECKED**"
	Visual reference achieved		"**VISUAL**" **Note 9**
	1,000 ft RA auto-callout **Note 10**		"**STABLE**" *or* "**SPEED**" *or* "**UNSTABLE, GO-AROUND**"
	When stable at/below 1,000 ft RA and prior to 500 ft RA		"**STABLE, AUTO/MANLAND [ ] BARO/RADIO, (*AUTOLAND GREEN*)**" **Note 11**
	500 ft RA auto-callout, if not stable **Note 10**		"**UNSTABLE, GO-AROUND**"
	100 ft above DA/H	"**100 ABOVE**"	"**CHECKED**"
	DA/H	"**DECIDE**"	"**CONTINUE**" *or* "**GO-AROUND**" **Note 12**

Callouts are displayed in **bold**.

Note:

1. The altimeter-sub scale can only be changed when the aircraft is climbing or descending. If level, changing the datum will cause a pitch change as the aircraft recaptures the selected altitude.

2. The PM shall reply with a response to justify the continuation of flight beneath MSA.

3. Passing FL100/10,000 ft there are additional set-up actions.

4. A check between the altimeters for RVSM compliance must be made at the 10,000 ft checks. The maximum tolerance RVSM compliance is 200 ft difference between altimeters 1 and 2. The aircraft monitoring will provide a comparison caution if the difference is 200 ft or more.

5. The maximum tolerance above FL200 for aircraft serviceability is 180 ft difference between altimeter 1 and 2. When an altitude difference between PFD 1 and PFD 2 exceeds 180 ft, select ADS 3 on the PFD that does not agree with the IESS. This then needs to be reported in the tech log at the end of that sector.

6. If it appears likely that the vertical speed will be greater than 1,500 ft/minute within 1,000 ft of the cleared level, the PM shall make an additional alert call of "**2,000 TO GO**" to allow time for the PF to intervene.

7. 'ASEL' and 'ALT' is displayed on the PFD (flashing or steady). If the PF misses the call the PM should make the call. There are two distinct phases of 'ALT Capture' and 'ALT Hold', both of which need to be called.

8. PM shall make a positive statement which justifies continuing the approach after comparing significant factors in relation to terrain.

9. Once the "**VISUAL**" call had been made there is no need to call "**MANLAND [ ] BARO**".

10. PF monitors for auto-callout and announces if inoperative.

11. This call may be combined with the 1,000 ft RA call if stable at this point. When conducting an Autoland, confirm AUTOLAND 1 is engaged in green on the FMA. A "**MANLAND [ ] BARO**" call is omitted if a "**VISUAL**" call is made prior.

12. If a transfer of control has not yet occurred, then an "**I HAVE CONTROL**" call shall be made following a "**CONTINUE**" call to effect the transfer of control.

2.1.12.8 Change of Altitude or Flight Level

When cleared to a new altitude or flight level the PF will set the new clearance in the ALT SEL on the Guidance Panel if the autopilot is engaged and the PM will confirm the correct selection.

If the PF is flying manually these actions are reversed.

2.1.13 Crew Awareness

2.1.13.1 Weather Radar

The weather radar should always be used for night operations and anytime it is necessary at the crews' judgment.

The following use of the weather radar provides effective results in weather conditions typically encountered during BAV CityFlyer operations:

- VAR Gain – set to '56': This reduces receiver sensitivity and minimises returns from insignificant weather. Returns that are displayed are likely significant enough to require avoiding action.
- ACT – select ON: This mode sets an appropriate antenna tilt angle for the range selected on the MFD, this ensures the area scanned by the radar is appropriate for the selected range.

On the ground, selecting 'WX' places the radar into forced standby mode. If use of the radar is required on the ground, for example when lined up on the runway to assess if a deviation is required from the SID, the select 'STAB OFF' four times in less than three seconds.

2.1.13.2 PFD/EICAS

Precision approaches should be flown with ILS indications on both sides. VOR and NDB approaches must use some form of raw data to cross check FMS information. RNAV approaches should always be done after making sure equipment performance is within limits and local regulations were considered.

EICAS messages should always be announced when displayed. When more than one message is displayed careful consideration should be applied in order to prioritise actions.

2.1.14 Aircraft Library

Following the flight deck security check, the P2 shall check the contents of the aircraft library:

Glareshield Checklist Holder:
Operational Aide Memoire

Captain and First Officer Centre Console Holders:
Normal Checklist

Aft Centre Console Holder:
QRH
Winter Operations Aide Memoire

During the aircraft library check, the P2 shall confirm that the gear pins are stowed.

2.1.15 On-Side and Cross-Side

The terms on-side and cross-side are sometimes used with this manual. They indicate functionality associated with a particular side of the aircraft. For example, the on-side VOR is VOR 1 for the Captain whilst ross-side means associated with the opposite side (VOR 2 for the FO).

2.1.16 Use of APU

External ground crew clearance is not normally required before starting the APU; however, its use is now regulated at an increasing number of airports, check local restrictions before starting. Further, if refuelling, starting the APU should be delayed until fuelling is complete. If it is essential to start the APU then permission of the refueller should be sought.

If the APU is not required while on stand to provide power or air conditioning, it should be shut down and restarted no sooner than 10 minutes before departure.

The APU should not be started during de-icing.

2.1.17 Use of Lights

Navigation
Navigation lights must be ON whenever the airplane is energised.

Logo
Logo lights must be ON from sunset to sunrise and during low visibility procedures.

Red Beacon
Must be ON whenever one or more engines are running or during airplane movement.

Side Taxi
Side Taxi lights must be ON during airplane ground movement.

Nose Taxi
Nose Taxi light may be used to assist airplane ground movement as required and shall be ON for take-off and landing.

Strobe
Strobe lights must be ON from the moment the airplane enters the runway for take-off to

the point where the airplane leaves the runway after landing and additionally when crossing active runways during airplane ground movement.

Landing
Landing lights must be ON for take-off and landing, when below FL100/10,000 ft, and when operating in congested areas.

Inspection
Inspection lights must be used when visual inspection of the wing surfaces is required.

The standard use of the lights is outlined below:

Engine start	Beacon ON
Taxi	Side Taxi ON (plus Nose Taxi if required)
Cabin Secure	Sterile ON until FL100/10,000 ft minimum
Entering runway	Strobes and Side Landing ON
Cleared take-off	Nose Landing and Nose Taxi ON
FL100 climbing	Landing and Taxi OFF (plus Sterile as appropriate)
FL100 descending	Side Landing, Side Taxi and Sterile ON
Cleared to land	Nose Landing and Nose Taxi ON
Runway exit	Strobe and Landing OFF (plus Taxi Nose unless required)
Approach stand	All Taxi lights OFF

2.1.18 Brakes Usage

In order to reduce carbon brake wear, avoid applying the brakes too often during taxi. Wear is far more related to the number of applications than to the energy applied. Carbon brakes wear less when operated at high temperatures.

2.1.19 Thrust Reverser Usage

The thrust reversers are more effective at high speeds; the use of reverse below 60 knots increases the chances of foreign object ingestion by the engine.

Full thrust reverser should be used when landing over contaminated runways. During a landing the thrust reverser should be closed by 60 knots. If necessary, the thrust reversers can be used until the airplane comes to a complete stop.

During a rejected take-off the thrust reverser can be used until the airplane comes to a complete stop.

Any use of full reverse will require an engine cool down period of 6 minutes from the end of reverse thrust. Consequently, only MIN REV should be used unless performance requires a greater setting.

2.2 FMS Operation

2.2.1 Databases

The FMS database contains departure, arrival and stored flight plan information within its database. Once a flight plan has been selected, the SID/STAR should be entered after ATC clearance has been received.

Additional waypoints may be entered if:

1. ATC modifies the clearance
2. They are additional waypoints promulgated on SID/STARs, which assist in the accuracy of the briefed flight path.
3. They are additional waypoints used for situational awareness whilst using conventional navigation, (all waypoints and their coordinates must be agreed and confirmed by both pilots during data entry).

It is vitally important all RNAV-1 waypoints entered into either FMS are verified and crosschecked for accuracy by both crewmembers against the SID/STAR plate and the OFP. Normally the PM will enter the requested waypoint and confirm the coordinates with the PF before entering them into the active flight plan.

2.2.2 RNAV-1 (P-RNAV) Operation

2.2.2.1 Introduction

For RNAV-1 STARs and approach transitions, the PF must use the FMS as the primary navigation reference, with LNAV engaged until either ATC discontinue the planned routing with radar vectors or the aircraft is established at the final approach fix. At this point a transition shall be made to the appropriate navigation aid(s) for the approach as per **2.19.3 – Approach Guidance Table**.

For ILS approaches, ILS data should be displayed and used by both pilots as the primary aid. For non-precision approaches, RNAV should be used for tracking, but conventional backup **must** be displayed and monitored.

Note: Both pilots must monitor the LNAV navigation to verify its accuracy. In order to avoid track/noise abatement violations, SID/STAR profiling must be closely monitored and accurately flown. Both pilots must monitor aircraft track and ensure turns are made at the correct points/DME distances.

Providing the navigation database is in date, SIDs and STARs may be flown using LNAV as the primary navigation aid. RNAV-1 procedures operate with sole reference to the FMS, requiring no secondary back up, therefore it is imperative that the crew carefully cross check and verify FMS waypoints for accuracy and to confirm the integrity of the navigation database prior to use.

The PM should deselect autotune for FMS SIDs and tune appropriate navigational aids (such as DME hold and VORs) for cross reference. An appropriate NAV course bar should be selected on standby but with the PFD in FMS display for primary track checking, this is achieved through manual operation of the PREV function. This is referred to as ‘Contingency Procedure’ in the checklists below.

The following procedures should be reviewed alongside the RNAV airspace procedures listed in **OM Part A 4.3.7**.

The following procedures are prepared based on TGL-10.

RNAV-1 operations satisfies a required track keeping accuracy of ±1 NM for at least 95% of the flight time, and the automatic selection, verification and, where appropriate, de-selection of navaids.

- RNAV-1 operations determine airplane position on the horizontal plane using inputs from the following types of positioning sensors:
- Distance Measurement Equipment (DME) giving measurements from two or more ground station (DME/DME).
- VHF Omni-directional Range (VOR) with a co-located DME (VOR/DME), where it is identified as meeting the requirements of the procedures.
- Global Navigation Satellite System (GNSS) GPS or GALILEO.
- Inertial Reference System (IRS), with automatic updating from suitable radio based navigation equipment.

RNAV-1 may be used for departures, arrivals and approaches down to the final approach fix. The final approach segment to the runway threshold and the associated missed approach are not covered by RNAV-1 procedures (refer to **2.2.3 – RNP APCH Operation**).

Note: The FMS VNAV and the FMS SPEED are not required for RNAV-1.

RNAV-1 minimum equipment required:

- 1 FMS
- 1 FD
- 1 DME
- 1 VOR
- 1 GPS
- 1 MCDU

Note: State issued procedures that require dual RNAV-1 will be published in the OM Part C Aerodrome Briefings. Where dual RNAV1 is required, both FMS must be operative at dispatch. If an FMS in-flight failure occurs, the procedure must be discontinued.

Navigation sensor status can be checked on the FMS MAINTENANCE PAGE 2/3.

2.2.2.2 General Limitations

- If GPS RAIM is annunciated as not available during any phase of flight, the pilot must monitor FMS guidance data and crosscheck with raw data from an alternate source (i.e. VOR, DME, or IRS).
- Although the magnetic heading and track angle provided by the IRS are available up to 73° latitude north and 60° latitude south, the FMS uses the IRS as sensor in the range 72° 30.0' latitude north and 59° 30.0' latitude south. RNAV-1 operation is prohibited outside of the IRS FMS usable range.
- RNAV-1 requires the use of the Flight Director.
- Prior to flight using FMS for IFR navigation, check the NOTAMs for un-serviceability of any appropriate ground facilities that are utilised by the procedures.
- The creation of new waypoints by manual entry into the RNAV system by the flight crew is not permitted, as it would invalidate the affected RNAV-1 procedure. Route

modifications in the terminal area may take the form of radar headings or 'direct to' clearances and the flight crew must be capable of reacting in a timely fashion. This may include the insertion in the flight plan of waypoints loaded from the database.

- The FMS Disable selection on MCDU Radio Tune NAV page is prohibited.
- The pilot must ensure that the displayed guidance data from non-usable stations is not used for navigation purposes by the flight crew. The NOTAM function in the FMS does not always inhibit tuning of a NOTAM selected station by the FMS when in AUTO tune mode. Note that the FMS will not use NOTAM selected station data for FMS position determination.

2.2.2.3 Normal Procedures

2.2.2.3.1 Prior To Flight

Verify NOTAMs for the availability of the intended RNAV-1 procedure. Verify also if any navaid identified in the departure chart(s) as critical for the intended RNAV-1 procedure is unavailable.

FMS Identification ..... CHECK

FMS Position ..... INITIALISE

Flight Plan ..... LOAD and ACTIVATE

At system initialisation, the flight crew must confirm that the navigation database is current and verify that the aircraft position has been entered correctly. The loaded procedure must be checked by comparing the charts with the MFD MAP or PLAN display and the MCDU. This includes confirmation of the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. If required by a procedure, a check will need to be made to confirm that updating will use a specific navigation aid(s), or to confirm exclusion of a specific navigation aid. A procedure shall not be used if doubt exists as to the validity of the procedure in the navigation database.

PFD NAV Source on PF Side ..... SELECT FMS

Contingency Procedure ..... REVIEW

2.2.2.3.2 After Take-Off

LNAV ..... SELECT

The LNAV mode can command bank angles up to 30°, which is above the maximum allowable bank angle for OEI conditions below the level-off. Do not engage the LNAV mode until the airplane is above the level-off if the departure procedure may cause the airplane to bank over the 15° limit. This contingency must be included in the departure briefing.

2.2.2.3.3 Arrival

Verify NOTAMs for the availability of the intended RNAV-1 procedure. Verify also if any navaid identified in the departure chart(s) as critical for the intended RNAV-1 procedure is unavailable.

Flight Plan ..... LOAD

The loaded procedure must be checked by comparing the charts with the MFD MAP or PLAN display and the MCDU. This includes confirmation of the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. If required by a procedure, a check will need to be made to confirm that updating will use a specific navigation aid(s), or to confirm exclusion of a specific navigation aid. A procedure shall not be used if doubt exists as to the validity of the procedure in the navigation database.

PFD NAV Source on PF Side.....SELECT FMS

Contingency Procedure.....REVIEW

Note: During the procedure and where feasible, flight progress should be monitored for navigational reasonableness, by cross-checks, with conventional navigation aids using the primary displays in conjunction with the MCDU.

2.2.3 RNP APCH Operation

2.2.3.1 Introduction

RNP APCH operations correspond to RNP, RNAV(GNSS) or RNAV(GPS) approach operations. For these operations, the GPS is required to support the RNP value of 0.3 NM.

RNP AR operation is not authorised.

2.2.3.2 Navigation Data Validation

The navigation database must be confirmed as valid prior to departure and remain current for the duration of the flight.

Note: If the AIRAC cycle will change during the flight, the locations of the waypoints used to define routes and procedures must be verified with current navigational charts.

2.2.3.3 General Guidance

While operating on RNP APCH segments, pilots are encouraged to use the flight director and/or autopilot in lateral navigation mode and vertical navigation mode.

RNP approach procedures require flight crew monitoring of lateral and vertical track deviations on the PFD to ensure the airplane remains within the bounds defined by the procedure. Since the lateral scale and CDI are automatically changed by the RNP value set on FMS, pilots must ensure the RNP set is suitable for each of the various segments of the procedure.

All pilots are expected to maintain centerlines, as depicted by onboard lateral deviation indicators and/or flight guidance during all RNP operations, unless authorized to deviate by ATC or under emergency conditions. For normal operations, cross-track error/deviation should be limited to half the navigation accuracy associated with the procedure (i.e. 0.5 NM for RNP 1). Brief deviations from this standard (e.g. overshoots or undershoots) during and immediately after turns, up to a maximum of one times the navigation accuracy (i.e. 1.0 NM for RNP 1), are allowable.

2.2.3.4 Prior to RNP APCH Operation

Airplane Minimum Configuration.....CHECK

- Check the airplane configuration complies with the applicable list below:
  - 1 FMS
  - 1 GPS
  - 1 MCDU
  - 4 Display Units
  - 2 RVSM Compliant Air Data Systems
  - 1 Flight Director

Note: VGP mode must be available for RNP APCH with BARO-VNAV.

NAV Database ..... VERIFY CURRENCY

- Verify that the Navigation Data Base is current for the duration of the flight.

FMS Position ..... INITIALISE

Flight Plan ..... LOAD and ACTIVATE

Procedure ..... CONFIRM

- Crew must confirm that the correct procedure has been selected by comparing the FMS waypoints with the approach chart, and ensure the reasonableness of track angles and distances, and other parameters that can be altered, such as altitude and speed constraints.

Note:

1. The procedure may subsequently be modified through the insertion or deletion of specific waypoints in response to ATC clearances. The manual entry or creation of new waypoints, by manual entry of latitude and longitude or rho/theta values is not permitted. Additionally, pilots must not change any database waypoint type from a fly-by to a fly-over or vice versa.

2. Differences of 3° or less between navigation information on the charts and the PFDs heading are acceptable.

RNP Predictive Performance Capability ..... CONFIRM

- The performance capability may be checked. If using the airplane capability, insert the appropriate GPS NOTAMS to allow for an accurate predictive RAIM.

NOTAM NAVAIDS ..... INSERT

- Insert the appropriate NAVAIDS in accordance with NOTAMs.

PFD NAV Source ..... SELECT FMS

LNAV ..... AS REQUIRED

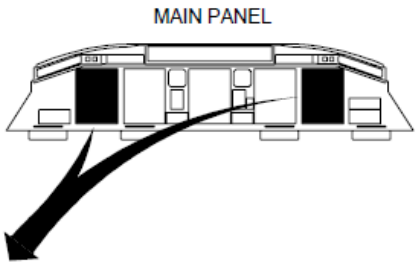
VNAV ..... AS REQUIRED

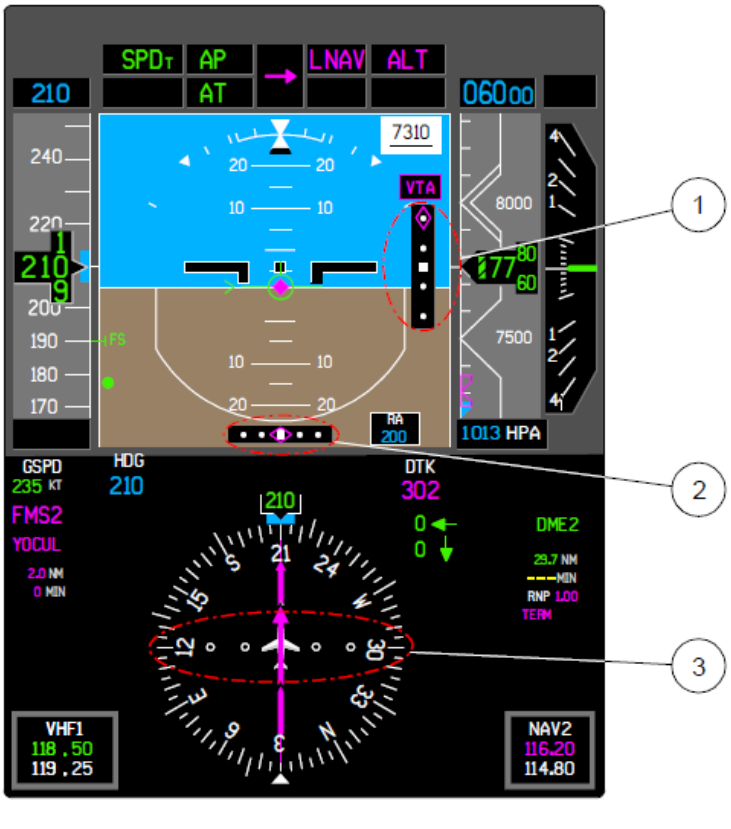
2.2.3.5 Approach

Track Deviation ..... MONITOR

- The deviation can be monitored through the vertical and lateral scales and CDI on PFD.

- Vertical deviation must not exceed 75 ft high or low during the approach segment. Lateral deviation must not exceed the half RNP value at any time during the approach.
- If the deviation exceeds the limits perform a missed approach.





1 – Vertical deviation scale.

2 – Lateral deviation scale.

3 – CDI lateral deviation scale.

In the horizontal deviation scale, full-scale deflection (two dots) corresponds to 1 x RNP lateral (both on the CDI and PFD).

The vertical deviation scale is 250 ft/dot during terminal operations. Upon reaching 2 NM from the FAF, the scale changes to 75 ft/dot during approach.

By the IAF:

Altimeters.....SET

- Obtain and set a current, local altimeter setting. If a current, local altimeter setting is not available, do not start the approach.

Note: The use of a remote altimeter setting is not authorised.

Altimeters.....COMPARE

- When crossing a known waypoint on the approach procedure, crosscheck the primary barometric altimeters against one another. The difference between the altimeter indications must not exceed 100 ft. If the difference exceeds 100 ft, abandon the approach and begin a missed approach.

2 NM before the FAF:

APPR Annunciation.....CHECK

- The annunciation indicates that the EPU value is inside the RNP value and the GPS is functional.

1 – APPR Annunciation

Refer to **2.19.7** for approach profile alongside the approach guidance table at **2.19.3**.

2.2.3.6 Missed Approach

TOGA.....PRESS

Note: The MCDU displays a MISSED APPR prompt on the MISSED APPROACH page to allow for procedure activation after passing the IAF without pressing the TOGA button. However, the MISSED APPR prompt only activates the lateral part of the procedure, so the pilot is still responsible for selecting the vertical navigation mode

LNAV.....SELECT

- The pilot flying must immediately re-select LNAV after TOGA and follow the flight director guidance to ensure airplane compliance with the procedure track.

2.2.3.7 Use of VGP Mode

The information below applies to the use of VGP during approach operations.

Temperature Compensation

Due to the effect of nonstandard temperature on VGP operations, temperature limits may apply to some procedures (temperature limits presented in the notes section of the chart). By using the temperature compensation function it is possible to disregard those limits, provided the function is activated prior to commencing the approach.

Temperature compensation (if applicable).....ACTIVATE

- The temperature value used should be the current, local temperature for the airport and runway of intended landing.

Note:

1. Refer to OM-C Cold Temperature Corrections for Company temperature correction procedures.
2. Prior to applying temperature compensation, the flight crew must coordinate its use with ATC. Failure to do so could result in a loss of vertical separation with other traffic.

Loss of VGP

Should any system failure affect the VGP functionality, if a VNAV DA is in use, the crew must immediately revert to LNAV only DA or perform a go-around.

2.3 Normal Checklists and Set-Ups

2.3.1 Normal Checklists

2.3.1.1 Overview and Use of the Normal Checklist

The Normal Checklist is available on the BAV E190 OM-B DocStore.

The Normal Checklist has been divided and named according to the specific phases of flight. In case of interruption the pilot should halt the reading and when ready to restart, the Checklist must be read from the start again. The Normal Checklist comprises the following Checklists split over two pages:

Cockpit Safety Inspection Read and Do
To be completed on the first flight of the day or following a power down.

Power Up Read and Do
To be completed on the first flight of the day or following a power down.

Full Cockpit Preparation Combined Read and Do / Challenge and Response
There are two versions of the Full Cockpit Preparation Checklist:

- Full – To be used on the first flight of the day or following a change of crew, the full version duplicates items from the Cockpit Safety Inspection and Power Up Checklists and can be used in-lieu of these in an aircraft which has been powered up prior to crew arrival.
- Reduced – To be used for turnarounds when the aircraft has remained powered throughout and with no change of crew, this reduced checklist is shown by black arrows in the margin.

The final items of the checklist are to be completed as Challenge and Response when both crewmembers are present.

Before Start Challenge and Response
Divided into a first section completed ‘to the line’ and two sections to be completed ‘below the line’ with the second section to be completed following the briefing, receipt of the loadsheet, and completion of the vital data procedure, and the third section to be completed following the receipt of start clearance.

The Before Start Checklist incorporates the departure briefing aide-memoire.

After Start Challenge and Response
Completed following the After Start Set-Up.

Taxi Challenge and Response
Completed following receipt of the final loadsheet and the cabin report – the sterile light is set ON when the cabin is confirmed secure. Additionally, in the event of a single engine taxi, the second engine must be started prior to calling for the Checklist and the additional items in the Single Engine Taxi box completed.

Before Take-Off Read and Do
The FO shall complete the Before Take-Off Checklist upon receipt of line-up/take-off clearance.

After Take-Off Challenge and Response
Divided into two sections, to be completed ‘to the line’ following the selection of slats/flaps

zero and 'below the line' following the selection of standard pressure (1013 hPa) when first cleared to a flight level.

Descent Challenge and Response
Incorporates the arrival briefing aide-memoire with the Checklist to be completed following the transfer of control prior to top-of-descent.

Approach Challenge and Response
To be completed when cleared to descend to an altitude with QNH set. The section 'below the line' shall be completed when inside 25 nautical miles from the destination but, if called when already inside 25 nautical miles, the checklist can be run as a single checklist.

Before Landing Combined Challenge and Response / Read and Do
Divided into two sections for normal and steep approaches. For normal approaches the items for slats/flaps may be deferred until the selection of landing slat/flap (completed no later than the 1,000 ft RA auto-callout). The selection of nose lights ON is completed as a read and do item following receipt of landing clearance.

After Landing Self-Challenge and Response
Once clear of the runway the crew shall complete the After Landing Set-Up and the FO shall then complete the After Landing Checklist as a self-challenge and response.

The checklist shall not be stowed until it is complete following the approaching stand items.

Shutdown Challenge and Response
Completed following the Shutdown Set-Up.

Leaving Aircraft Read and Do
To be completed whenever the crew are leaving the aircraft unless the aircraft is being handed over directly to the next operating crew or a competent engineer. In particular, the APU must not be left running with the aircraft unattended by crew or an engineer.

2.3.1.2 Normal Checklist Use during Cold Weather Operations

During cold weather operations, following remote de-icing or when the selection of take-off slat/flap is delayed until shortly before take-off, the After Start Checklist must be re-run before the Before Take-Off Checklist.

Likewise, selection of slats/flaps 0 shall be deferred from the After Landing Checklist until the slat/flap mechanism has been confirmed clear of snow/slush/ice by an engineer on stand.

2.3.2 Set-Ups

The following set-ups are to be completed as 'flows' at the relevant trigger:

Start Approved

Captain		FO	
HYD Pump 3A	ON	Flight Deck Door	Lock
Beacon	ON	Transponder	ALT-ON
Signs	ON		

After Start

Captain		FO	
		Slats/Flaps	Set T/O
		APU	As Req'd
Flight Controls	Check	Controls Check	Monitor
Autobrake	RTO		

Passing FL100/10,000 ft – PM Actions

Climbing		Descending	
Lights	OFF	Speed Selector	MAN
Signs	As Req'd	Lights	ON
WX/Terrain	As Req'd	Signs	ON
Autotune/DME	Reset	WX/Terrain	As Req'd
VHF2	Set 121.5		

After Landing – Exiting Runway

Captain		FO	
Autothrottle	OFF	Lights	Set
		Transponder	ALT-ON
		Slats/Flaps	Set 0
		APU	Start

Shutdown

Captain		FO	
Thrust Levers	IDLE	Transponder	STBY
Parking Brake	Set	Flight Deck Door	Unlock
Electrical Check	APU/GPU		
START/STOP Selectors	STOP		
HYD Panel	Set		
Beacon	OFF		
Signs & Sterile	OFF		

2.4 Cockpit Safety Inspection

The Cockpit Safety Inspection procedures must be performed every first flight of the day or following a power down.

Cockpit Emergency Equipment ..... CHECK

- Check for the availability, status and proper location of the following equipment:
  - Protective Breathing Equipment (PBE)
  - Fire Extinguishers
  - Crash Axe
  - Life Vests
  - Escape Ropes
  - Flashlights

Cockpit Security Check ..... COMPLETE

- Check stowage compartments, library shelves, under seats and area around rudder pedals for suspicious objects.

ELECTRIC Panel ..... SET

- IDG 1 Selector ..... AUTO
- IDG 2 Selector ..... AUTO
- AC BUS TIES Selector ..... AUTO
- GPU Button ..... PUSHED OUT
- APU GEN Button ..... PUSHED IN
- TRU 1 ..... AUTO
- TRU ESS ..... AUTO
- TRU 2 ..... AUTO
- DC BUS TIES ..... AUTO
- Battery 1 Selector ..... OFF
- Battery 2 Selector ..... OFF

FUEL Panel ..... CHECK

- Verify all fuel pump knobs in AUTO position and XFEED in the OFF position.

WINDSHIELD WIPER Selectors ..... OFF

HYDRAULIC Panel ..... CHECK

- SYS 1 ENG PUMP SHUTOFF Button ..... PUSHED OUT
- PTU Selector ..... AUTO
- SYS 2 ENG PUMP SHUTOFF Button ..... PUSHED OUT
- SYS 1 and 2 ELEC PUMP Selectors ..... AUTO
- SYS 3 ELEC PUMP A Selector ..... OFF
- SYS 3 ELEC PUMP B Selector ..... AUTO

AIR COND/PNEUMATIC Panel ..... CHECK

- Verify all buttons PUSHED IN.

PASSENGER OXYGEN Panel ..... CHECK

- Verify Masks Deploy Selector Knob in AUTO.

ELT ..... ARM

Landing Gear Lever ..... **DOWN**

START/STOP Selectors ..... **STOP**

Speed Brake Lever ..... **CLOSED**

RAT Manual Deploy ..... **STOWED**

SLAT/FLAP Lever ..... **VERIFY POSITION**

- Verify and make sure that the actual SLAT/FLAP lever position agrees with the surface position.

Circuit Breakers ..... **CHECK**

- Verify both sidewall panels to ensure agreement with maintenance status.

2.5 Power Up

The Power Up procedures must be performed every first flight of the day or following a power down.

CAUTION: Ensure the airplane is not moved before the IESS is initialised.

Battery 1 ..... **ON**

Battery 2 ..... **ON**

- Verify that only displays 2 and 3 are available and no EICAS messages are displayed for the first 5 seconds.
- If more than displays 2 and 3 are available, the airplane must not be dispatched.

Battery Voltage ..... **CHECK**

CAUTION: Each battery voltage must be at least 22 volts prior to take-off.

- If batteries voltage is between 21 volts and 22 volts, recharge the batteries prior to take-off, through any AC source (including engines during taxi) for:
  - 30 minutes if batteries temperature is at or above 0°C or,
  - 35 minutes if batteries temperature is at or above −5°C and below 0°C or,
  - 40 minutes if batteries temperature is at or above −10°C and below −5°C or,
  - 50 minutes if batteries temperature is below −10°C.
- If batteries voltage is below 21 volts report to maintenance.

Note: Minimise the time airplane is left with batteries as the unique power source, to avoid discharging.

With Load 25 there is no requirement to wait for the EICAS to wake up before selecting an AC power source.

GPU Button ..... **PUSH IN / WAIT**

- Verify AVAIL light illuminated before pushing in. When GPU is not available, or is not necessary, maintain GPU Button pushed out.

The Electrical PBIT is automatically performed after the airplane is powered by any AC source and takes about 3 minutes to complete. The Electrical PBIT will be interrupted if any hydraulic pump is turned on, the FLIGHT CONTROLS MODE Panel switches are cycled or if AC power is interrupted while the test is running.

If displays 2 and/or 4 are configured as PFD, set the respective reversionary panel selector knob to MFD then to AUTO. After 8 seconds, the affected display will return to MFD.

Check that EICAS message wake-up occurs; wake up normally occurs 30 seconds after battery power is applied and is complete after the EICAS messages have displayed.

Note: With EPIC Load 25.4 and above the wake up can take up to 120 seconds.

Do not carry out the Fire Detection Test until wake-up has occurred. If the APU is running, extending the fire test beyond 10 seconds will cause the APU to auto shutdown.

FIRE EXTINGUISHER Panel ..... TEST

- Verify there are no fire protection fail messages displayed on the EICAS after Power Up.
- Press and hold the TEST button and observe the following EICAS messages, lights and warnings:
  - Aural warning.
  - Fire handles illuminated.
  - CARGO SMOKE FWD/AFT buttons illuminated.
  - APU button illuminated.
  - Upper half of the APU EMER STOP Button illuminated.
  - WARNING lights flashing.
  - 'CARGO FWD (AFT) SMOKE' EICAS message.
  - 'APU FIRE' EICAS message.
  - 'ENG 1 (2) FIRE' EICAS message.
  - 'FIRE' warning message displayed inside ITT indicators.

The following electrical transfer, annotated within the box, should be considered a memory action and can be delayed to any point prior to engine start as appropriate.

APU ..... AS REQUIRED

- Verify EMER STOP Button is pushed out and not illuminated.

Note: If AC source is lost, power down the airplane, wait 1 minute and perform the Power Up procedure

- To start the APU, turn the APU MASTER selector to ON, verify that APU EGT and RPM indications are presented on the EICAS, then momentarily turn the selector to START and then allow the knob to spring back to ON.

GPU Button ..... AVAIL LIGHT ON

- Shows that the APU has taken over the supply of AC power.

GPU Button ..... PUSH OUT

- This must be done even if the AVAIL light is ON prior to disconnection of the GPU.

Navigation Light ..... AS REQUIRED

HYDRAULIC Panel ..... AS REQUIRED

- Only after the electrical PBIT is completed and if the 'FLT CTRL BIT EXPIRED' EICAS message is displayed, perform the hydraulic panel checks:
  - Do not move any flight control surface.

- SYS 1 and 2 ELEC Pumps ON.
- SYS 3 ELEC PUMP A ON.
- Wait 1 minute.
- SYS 1 and 2 ELEC Pumps AUTO.
- SYS 3 ELEC PUMP A OFF.

– Confirm the accumulator pressure is sufficient to illuminate the PARK BRAKE light.

Electronic CBs.....CHECK

– Select CB OUT/LOCK page on MCDU and check the CBs status to ensure agreement with maintenance status.
– If the NEW TRIP prompt is displayed on the MCDU press it to check the electronic CBs status.

DVDR Panel.....CHECK

– Press TEST Button and verify no fail messages displayed on EICAS.

2.6 RESERVED – External Inspection

Section reserved.

2.7 Cockpit Preparation

There are two version of the Cockpit Preparation Checklist:

- Full – To be used on the first flight of the day or following change of crew, the full version duplicates items from the Cockpit Safety Inspection and Power Up Checklists and can be used in-lieu of these in an aircraft which has been powered up prior to crew arrival.
- Reduced – To be used for turnarounds when the aircraft has remained powered throughout and with no change of crew, this reduced checklist is shown by black arrows in the margin.

Note: The only specific requirement on a normal turnaround is to zero the flight time on the aircraft clock. This should be completed as a set-up by the First Officer.

Only the Full Cockpit Preparation Checklist is expanded below.

The final items of the checklist are to be completed as Challenge and Response when both crewmembers are present.

Aircraft Library ..... **COMPLETE**

- Check complete and in correct stowage (refer to **2.1.14**).

Gear Pins ..... **CHECKED**

Jump Seat Oxygen Mask ..... **CHECK**

- Carry out the test as follows:
  - Set the regulator control knob to 100%.
  - Press and hold the TEST/RESET button.
  - Verify a short illumination or ‘blink’ of the flow indicator.
  - Verify audible oxygen flow in the headset or loudspeakers.
  - Once the mask fully pressurises the indicator must go out, showing that the system is leak free.
  - Release the TEST/RESET button.

ELECTRIC Panel ..... **SET**

- IDG 1 Selector ..... AUTO
- IDG 2 Selector ..... AUTO
- AC BUS TIES Selector ..... AUTO
- GPU Button ..... AS REQUIRED
- APU GEN Button ..... PUSHED IN
- TRU 1 ..... AUTO
- TRU ESS ..... AUTO
- TRU 2 ..... AUTO
- DC BUS TIES ..... AUTO
- Battery 1 Selector ..... ON
- Battery 2 Selector ..... AUTO

COCKPIT LIGHTS Panel ..... **TEST / SET**

- Push ANNUNCIATORS TEST button and verify all associated lights.
- Adjust MAIN PNL, OVHD PNL and PEDESTAL lights.
- Set DOME light as required.

Engine 1 Fire Handle ..... STOWED

FUEL Panel ..... SET

- FUEL XFEED Selector ..... AS REQUIRED
- DC PUMP Selector ..... AUTO
- AC PUMP 1 and AC PUMP 2 Selectors ..... AUTO

Emergency Lights ..... TEST / ARM

- Emergency lights selector knob ON and verify EMERG LT ON and EMERG LT NOT ARMED appear on the EICAS.
- Emergency lights selector knob ARMED.

PASSENGER SIGNS Panel ..... SET

- NO SMKG ..... ON
- FSTN BELTS ..... ON after refuelling is finished
- STERILE ..... OFF

FIRE EXTINGUISHER Panel ..... CHECK

- CARGO SMOKE FWD/AFT buttons PUSHED OUT and no lights.
- API fire extinguishing button PUSHED OUT and no lights.

APU CONTROL Panel ..... AS REQUIRED

- Emergency stop not illuminated.

EXTERNAL LIGHTS Panel ..... AS REQUIRED

Engine 2 Fire Handle ..... STOWED

HYDRAULIC Panel ..... CHECK / 3A OFF

- ENG PUMP SHUTOFF 1 and 2 Buttons ..... NO LIGHTS and GUARDED
- PTU Selector ..... AUTO
- HYDRAULIC SYS 1 and 2 ELEC PUMPs ..... AUTO
- HYDRAULIC SYS 3 ELEC PUMP A ..... OFF
- HYDRAULIC SYS 3 ELEC PUMP B ..... AUTO

PRESSURISATION Panel ..... SET

- CABIN ALT Selector Knob ..... STOP
- MODE Selector Knob ..... AUTO
- DUMP Button ..... NO LIGHTS and GUARDED
- LFE Selector Knob ..... STOP

WINDSHIELD HEATING Button ..... PUSHED IN

ICE PROTECTION Panel ..... SET

- ENGINE 1, WING and ENGINE 2 Buttons ..... PUSHED IN
- MODE Selector Knob ..... AUTO
- TEST Selector Knob ..... OFF

AIR COND / PNEUMATIC Panel ..... SET

- COCKPIT and PAX CABIN temperature control as required.
- RECIRC, PACK 1, PACK 2, XBLEED, BLEED 1, APU BLEED and BLEED 2 buttons PUSHED IN.

GND PROX TERR INHIB Button ..... **CHECK**

- Verify button pushed out and no striped white bar illuminated.

EICAS ..... **CHECK**

- Check EICAS messages to ensure agreement with airplane status.

Clock ..... **SET**

- Select GPS on the GPS/INT/SET selector. If the clock displays dashes, adjust the clock INT position.

GND PROX G/S INHIB Button ..... **CHECK**

- Verify button pushed out and no striped white bar illuminated.

LG WRN INHIB Button ..... **CHECK**

- Verify button pushed out and no striped white bar illuminated.

FLIGHT CONTROLS MODE Panel ..... **CHECK**

- Verify ELEVATORS, RUDDDER and SPOILER buttons pushed out, guarded and no striped white bars illuminated.

STALL WARNING Panel ..... **CHECK**

- Verify the SHAKER 1 CUTOUT and SHAKER 2 CUTOUT buttons are pushed out and no striped white bars illuminated.

IGNITION Selector Knobs ..... **AUTO**

EICAS FULL Button ..... **CHECK**

- Verify the EICAS FULL button is in the desired position (normally pushed out and no striped white bar illuminated to allow EICAS de-clutter).

Thrust Levers ..... **IDLE**

GND PROX FLAP OVRD ..... **CHECK**

- Verify button pushed out, guarded and no striped white bar illuminated.

SLATS / FLAPS ..... **CHECK 0 / 0**

TRIM Panel ..... **CHECK**

- Verify the ROLL, YAW and PITCH (MAIN and BACKUP) trims are operating correctly in both directions and verify the trim system 3-second protection operates correctly.
- Adjust YAW and ROLL trims to the neutral position and PITCH trim to the green band.

Flight Control Disconnect Handles ..... **CHECK**

Alternate Gear Extension Compartment ..... **CHECK**

- Verify the alternate gear extension lever is fully down and the electrical override switch is in the NORMAL position.

- Both Crew Present -

Flight Deck Door Inhibit_____CHECKED

- Lock the Flight Deck Door and then unlock from the cabin (30 sec delay).
- Lock the Flight Deck Door and then unlock from the cabin. Inhibit the open function from the Flight Deck and check function.
- Unlock the door from the Flight Deck.

Oxygen Masks_____CHECK

- Check masks for supply of oxygen and for microphone functionality.
- The MFD status page must be checked and the available oxygen supply and pressure must be adequate for use.
- Carry out the test as follows:
  - Set the regulator control knob to 100%.
  - Press and hold the TEST/RESET button.
  - Verify a short illumination or 'blink' of the flow indicator.
  - Verify audible oxygen flow in the headset or loudspeakers.
  - Once the mask fully pressurises the indicator must go out, showing that the system is leak free.
  - Release the TEST/RESET button.

REVERSIONARY Panel_____SET

- Displays selector knob in AUTO.
- Sensors selectors (ADS/IRS) as required.

Flight Instruments / IESS_____SET / CROSS-CHECKED

- Verify:
  - Airspeed tapes not showing speed.
  - EADIs levelled and flag-free.
  - Initial assigned altitude on the ALT SEL.
  - Altitude tape indications cross-check.
  - Both VSIs showing zero.
  - EHSIs with the courses selected according to the intended departure procedure and NAV source selected.
  - EHSIs and magnetic compass flag free and showing the same magnetic heading.
  - Heading bug set according to the proposed departure procedure.
  - Check IESS and adjust the altimeter setting.
  - Weather set on PFD and/or MFDs MAP page as required.
  - It is recommended that PM sets the Terrain on MFD up to MSA.
  - Set the MFDs MAP page menu as required.
  - TCAS should be always displayed on both MFDs.
  - Set BARO SET knob to actual pressure.
  - Push HSI button for Full Compass, ARC or MAP.
  - Select the FMS or V/L as the primary NAV source.
  - BRG circle (○) to OFF, VOR1, ADF1 or FMS1 as required.
  - BRG diamond (◊) to OFF, VOR2, ADF2 or FMS2 as required.

MFD_____SET / CROSS-CHECKED

- Verify:
  - On the status page ENG OIL LEVEL and BRAKES EMER ACCU pressure.
  - Decide which MFD will display terrain and which will display weather and set accordingly.
  - TCAS should be always displayed on both MFDs.

Note: The Captain must have the status page displayed for all ground handling to provide brake temperature indications.

Note: The Weather Radar must be set to Standby regardless of the above to achieve the required warm up period.

WARNING: THE WEATHER RADAR MUST NOT BE SET TO ON UNTIL APPROACHING THE RUNWAY IN CASE THE FORCED STANDBY FUNCTION FAILS.

AUDIO Panels_____SET

- Select the microphone and audio reception buttons as required and adjust the volume levels. To avoid background noise do not set the SPKR volume higher than 55.

At an appropriate point during the Cockpit Preparation procedure, the crew shall set-up the MCDU and Guidance Panel and initialise the ACARS. Whenever possible the crew should endeavour to request and receive an ATC departure clearance prior to commencing the Before Start Checklist and Departure Briefing.

2.8 Before Start

2.8.1 Before Start Preparations

When all preparation is complete, the Captain will call for the Before Start Checklist, this sequentially leads into the Departure Briefing. The checklist is read by the FO as Challenge and Response and is initially completed to the line:

Inspections and Security_____COMPLETE

- External, Internal and Security Inspections Completed.

Emergency/Parking Brake_____SET

- Confirm the Brake Light is illuminated.

Thrust Levers_____IDLE

MCDU (Initial)_____SET and CHECKED

- Confirm the following actions have been completed during Cockpit Preparation:
  - Flight ID and transponder code set on TCAS/XPDR page.
  - NAV IDENT page checked.
  - RTE pages set according to the flight plan and both pilots have checked waypoints, courses, and distances.
  - Departure runway and SID inserted from DEPARTURE pages and both pilots have checked the accuracy of the loaded procedure waypoints, courses, and distances.
  - Initial performance data entered on PERFORMANCE INIT pages:
    - PERF INIT 1: Confirm TAIL # and PERF FACTOR; enter FUEL RESERVE in kg from the flight plan; leave TO/LDG FUEL at 0/0 and ALTERNATE FUEL blank.
    - PERF INIT 2: Enter CRZ ALT, CRZ WINDS and ISA DEV.
    - PERF INIT 3: Enter 270/.73 CLIMB SPEED, 300/.78 CRUISE SPEED, 270/.76 DESCENT SPEED.

ACARS_____INITIALISED

QNH_____SET and CROSS-CHECKED

- QNH set on main and standby altimeters and indicating airfield elevation.

LFE Panel_____CHECKED

- Ensure Landing Field Elevation indicated is correct. If not, manually set and check the MCDU destination.

- Briefing -

2.8.2 Departure Briefing

The P1 is required to conduct a briefing before take-off.

The aim of the briefing is to:

- Develop high crew situation awareness,
- Identify potential problems or threats, and
- Develop strategies required to deal with them in both normal and non-normal situations.

This is best achieved through an open and interactive briefing style that allows all crew members to participate and share their experiences. An effective briefing will:

- Be concise, relevant and conducted at a time of lower workload.
- Include open questions to share experiences and compare mental models.
- Establish gates and bottom lines.
- Review automation handling and use of relevant modes including intervention techniques.
- Anticipate and plan for potential high workload situations.
- Identify potential threats and errors.

The following guide, incorporated into the Before Start Checklist, provides a framework to enable crew to construct a relevant and effective brief:

Threats –	Identify relevant BAV Safety Plan threats
MEL –	Both crew should review the tech log together to confirm MEL/DDG deficiencies and to assess their effect on the flight.
AIS –	Review AIS and NOTAMs to assess the effect of promulgated airfield and navaid deficiencies.
Weather –	Review wind direction and strength, temperature, visibility, precipitation, expected turbulence, windshear, temperature inversions and any other considerations that may affect the flight. Consider: • Requirement for de/anti-ice. • Delaying cabin crew release/cabin service. • Windshear avoidance and escape manoeuvre.
Return Alternate –	Review the requirement for a take-off alternate, bearing in mind weather, aircraft status and landing weight.
Runway –	Review the expected taxi route and departure runway and identify any pertinent details including hotspots, lighting, intersection departures, length.
Flap –	Review setting to be used, climb sequence and retraction schedule.
Terrain –	Discuss the local area and en-route terrain considerations.
Performance –	Discuss performance considerations including power reductions, emergency turns, acceleration altitude, non-standard climb outs, bank angle settings, noise abatement. If departing with packs off (REF ECS OFF) brief for the APU to remain on until the After Take-Off Checks.
SSA/MSA –	State the local SSA and the MSA from the OFP to the Top of Climb.
Transition Altitude –	Review and check entry on the MCDU CLIMB page.

SID –	Review expected clearance including horizontal and vertical profile constraints/requirements, stop altitude and speed profiling. Review use of FMS to achieve the route/profile.
MCDU –	Confirm SID correctly set. Discuss expected guidance panel mode selections and radio aids required – ensure correct use of Autotune (normally deselected), back up navaids tuned and first course bar set with PREV per RNAV-1 contingency procedure. Set any relevant ETP points as a fix with associated hold tracks.
Emergencies –	For the first flight of the day, review SOPs for rejected and continued take-off following an engine failure, including the effect of wind direction, aircraft performance, available extra engine power and any other relevant factors. An abnormal emergency procedure should be chosen for more detailed discussion, preferably one which is pertinent to the departure, for example windshear. Subsequent briefs should include any changes to the operation which might affect a safe outcome of the departure. For all departures brief specific considerations for emergency profiles, for example the use of BANK mode if OEI.
Review –	Review SOPs for any abnormal operation, confirm the climb sequence, use of the guidance panel and configuration changes, requirement for weather radar and terrain displays. If the weather radar is required during initial departure then the radar warm up period must be considered. Brief special considerations, airfield delays and slot times. Invite questions and check full understanding of the brief.

2.8.3 Vital Data Procedure

2.8.3.1 Calculation, Cross-Check and Entry of Vital Data

The Vital Data Procedure is only to be performed after fuel loading has been completed and the loadsheet (provisional or final) is available.

Departure performance figures are obtained from the EFB ePerf function. In order to expedite departure, a provisional loadsheet should always be accepted where offered. For a provisional loadsheet, 500 kg shall be added to the take-off weight given in order to calculate take-off performance.

Note: A loadsheet is required for every flight.

Vital Data Procedure		
	Captain	**First Officer**
Review of loadsheet	Check loadsheet details and state if it is provisional or final. **Note:** For provisional loadsheets 500 kg shall be added to the take-off weight.	Query any discrepancies.

	Read out the payload and zero-fuel weights.	Annotate the OFP and compare OFP figures with the loadsheet figures. Enter the ZFW on the MCDU PERF INIT 2 page.
		Read out the calculated GROSS WT from the MCDU PERF INIT 2 page.
	Confirm the MCDU calculated gross weight corresponds to the take-off weight from the loadsheet – any difference greater than taxi fuel must be explained.	
	Read out the landing weight and payload/passenger numbers.	Annotate the OFP and compare OFP figures with the loadsheet figures.
	Sign/acknowledge the loadsheet.	
Calculation of vital data	Agree runway, ambient conditions, aircraft configuration, take-off weight. Independently calculate take-off performance using EFB. Compare and agree thrust setting (de-rate and/or flex) and V-speeds to be used.	
	<u>It is essential that both pilots independently calculate the vital data</u>	
MCDU set-up	Monitor date entry into MCDU.	Enter agreed figures into MCDU. On the T/O DATASET MENU page: • Select TO-1, TO-2 or TO-3 • Enter TO TEMP • Select ATTCS to ON or OFF • Select REF ECS to ON or OFF • Select REF A/I to OFF, ENG or ALL • Select FLEX T/O to ON or OFF • Enter FLEX TEMP if performing a flex take-off • Select the ENTER prompt to confirm the settings. On the TAKEOFF INIT 2 page: • Select FLAPS • Confirm the displayed data (TO CG, TO TEMP, FLEX TO and DATASET) is correct. On the TAKEOFF page: • Enter V1, V2, VR and VFS • Confirm the correct entry under FLAPS • Note the TO PITCH.
	<u>It is essential that both pilots participate in data entry</u>	

Pitch trim	Read out or calculate the pitch trim setting. **Note:** If the EFB does not provide a pitch trim setting, this can be calculated using the QRH from the take-off flap setting and the take-off %MAC/CG.	Set the pitch trim.
Confirm data entry	Having verified correct data entry and pitch trim setting, press the TOGA push-button and confirm ROLL and TO green are annunciated on the FMA.	

The Captain will then call for "**BELOW THE LINE**" which is read by the First Officer as Challenge and Response:

- Loadsheet -

Fuel Quantity_____CHECKED

- Fuel total on gauges agrees with tech log and OFP requirement.

MCDU (Perf)_____SET

- Confirm the following actions have been completed during the Vital Data Procedure:
  - ZFW entered on the MCDU PERF INIT 2 page
  - On the T/O DATASET MENU page the following have been entered/selected:
    - TO-1, TO-2 or TO-3 selected
    - TO TEMP entered
    - ATTCS selected to ON or OFF
    - REF ECS selected to ON or OFF
    - REF A/I selected to OFF, ENG or ALL
    - FLEX T/O selected to ON or OFF
    - FLEX TEMP entered if performing a flex take-off
  - On the TAKEOFF INIT 2 page:
    - FLAPS selected
    - Displayed data (TO CG, TO TEMP, FLEX TO and DATASET) is correct
  - On the TAKEOFF page:
    - V1, V2, VR and VFS entered
    - FLAPS confirmed as correct and TO PITCH noted for cross-check against the flight director.

SPEED Selector_____MANUAL

- Confirm the SPEED selector knob is set to MANUAL.
- Confirm the SELECTED AIRSPEED BUG is set to either V2 + 10 or VFS in accordance with the Performance Manual.

Note: The speed to be set at LCY is V2 + 10.

Note: In the absence of a Performance Manual entry, the speed to be set is VFS unless performing a NADP 1 departure or departures requiring close-in turns in which case set V2 + 10.

PFD_____TOGA

- Confirm ROLL and TO green are annunciated on the FMA.

Note: Verify that the flight director pitch cross bar agrees with the TO PITCH indicated on the MCDU TAKEOFF page.

- Confirm FMA armed modes as required for departure.

Note: LNAV and VNAV automatically arm when the TOGA push-button is selected. They can be de-armed by use of the relevant mode push-button on the Guidance Panel (for example, deselect LNAV when the departure consists of a turn to a heading).

- Check the PFD display for all information/guidance required for departure.

TRIM Panel_____SET / 0 / 0

- Confirm the PITCH trim is set per the loadsheet and verify YAW and ROLL trims in the neutral position.

Mobile Devices_____Flight Mode

2.8.3.2 SOP for Take-Off Performance Calculations

The following SOP shall be used for take-off performance calculations:

Note: All packs off (REF ECS OFF) departures are to be conducted with the APU selected ON. The packs will transfer to the APU when take-off power is applied and transition back to engine bleeds at 500 ft AFE. If wing anti-ice is selected ON then the packs will turn OFF when take-off power is applied. This procedure reduces nuisance EICAS 'BLEED 1(2) OVERPRESS' cautions.

LCY Departures – TOW 40,000 kg or below:

Configuration	
Thrust Mode	TO-2
ATTCS	ON
REF ECS	OFF
REF A/I	AS REQ'D
FLEX T/O	NO
SLATS/FLAPS	4
APU - ON	

LCY Departures – TOW greater than 40,000 kg:

Configuration	
Thrust Mode	TO-1
ATTCS	OFF
REF ECS	OFF
REF A/I	AS REQ'D
FLEX T/O	NO
SLATS/FLAPS	4
APU - ON	

Departures from all other stations:

Configuration	
Thrust Mode	OPTIMUM
ATTCS	ON
REF ECS	ON
REF A/I	AS REQ'D
FLEX T/O	YES
SLATS/FLAPS	OPTIMUM
APU - OFF	

↓

If Performance Precludes

↓

Configuration	
Thrust Mode	OPTIMUM
ATTCS	ON
REF ECS	OFF
REF A/I	AS REQ'D
FLEX T/O	ON
SLATS/FLAPS	OPTIMUM
APU - ON	

2.8.4 Start Approved

The First Officer obtains the start and/or push clearance from ATC. Communication with the Ground Crew is in accordance with the standard procedure detailed in the OM Part A.

To prevent misunderstanding by the ground engineer, the pilots should not use the intercom to talk to each other until after the pushback has been completed.

After receiving the start and/or push clearance the crew perform the following Set-Up:

Captain		FO	
HYD Pump 3A	ON	Flight Deck Door	Lock
Beacon	ON	Transponder	ALT-ON
Signs	ON		

The Captain will then call for continuation of the checklist "**BELOW THE LINE**" which is read by the First Officer as Challenge and Response:

- - - - - - - - - - - - - - - - - - - Start Approved - - - - - - - - - - - - - - - - - - -

Doors and Windows_____CLOSED

- Both pilots must verify that their respective cockpit window is closed (a red pin protrudes near the opening handled when the window is NOT locked in the closed position) and the MFD status page should be checked for all airplane doors closed

Note: The MFD display of the four aircraft exits indicate the relevant vent flap position rather than the door closed. Provided the ground crew and cabin crew have both confirmed that the doors are secure it is acceptable to push with the doors still indicating red. The indication must be green before entering the runway.

Cockpit Door_____CLOSED / LOCKED

- Check the cockpit door is securely closed.

Hydraulic Pump_____ON

- Confirm the SYS 3 ELEC PUMP A Selector is set to ON.

Red Beacon_____ON

Signs_____ON

- Confirm NO SMKG and FSTN BELTS selected ON.

Steering_____OFF

- If a push back is to be performed simultaneously with the engine start press and release the steering disengage switch to disengage the nose wheel steering even if the message 'STEER OFF' is presented on the EICAS.

Transponder_____ALT–ON (1 or 2)

- Set the Transponder to ALT–ON via the MCDU RADIO Page and confirm the PF transponder is in use for RVSM.

2.9 Engine Starting

2.9.1 Requirements for Engine Starting

Obtain ATC and ground crew clearance.

Check that the jetway and/or stairs are removed and all passenger and cargo doors are closed prior to activating the Red Beacon Light and commencing engine start. The interphone shall only be used for cockpit - ground communication (not for pilot - pilot communication) until after the ground crew have disconnected in order to avoid any misunderstanding. The Captain will communicate with the ground crew during the engine start and pushback.

Engine start may be performed simultaneously with the push back procedure, requiring the parking brake is released and disengagement of the steering (verify 'STEER OFF' EICAS message). In case of a static engine start be sure that the parking brake is set.

If the ground crew do not have a headset, engines will be started on stand prior to commencement of pushback using standard hand signals.

2.9.2 Engine Start Procedure

Note: During ground starts only, the transition of the START/STOP selector from STOP to START must be less than 30 seconds or the FADEC will prevent an engine start until the switch is cycled through STOP again.

Engine Start – Actions and Callouts		
	Captain	**First Officer**
Engine Start Sequence	Call out "**STARTING ENGINE 2 (1)**" Turn the START/STOP selector to START momentarily (at least 2 sec) and back to RUN. Start clock.	
	Verify N2 rising.	Check N2 rising.
	Monitor IGN A (B) at 7% N2, fuel flow at approximately 20% N2.	Check clock with fuel flow indication and verify ITT rise within 15 seconds.
	Verify N2 and N1 accelerate normally and that positive oil pressure is indicated. Stop clock at 50% N2 (starter limitation).	Verify the annunciation IGN A (B) goes out at approximately 50% N2.
	Verify that the engine stabilises at idle (this is indicated by the ITT max bug resetting). Callout "**GOOD START**"	

Callouts are shown in bold text.

Note:

1. Before pushback, when the ground crew request for the brakes to be released, the Captain will release the brakes and check the pressure gauge is zero and then communicate with the ground crew.

2. The Captain performs the engine start.

3. The packs will automatically close during engine start to maximise bleed air available. However, in hot conditions and when using the APU for start, due to the pack valves reaction time being slower than the engine start command, the APU may be overloaded for a few seconds during engine start. To avoid this condition, if the APU EGT is greater than 550°C prior to engine start, the packs should be manually closed and then re-opened after start.

4. When starting an engine, the Captain starts their stopwatch in order to monitor starter limitations.

5. If the engine is warm prior to start, the automated start sequence will delay the fuel flow until the ITT has reached 120°C or below. In effect, the engine is performing a dry motoring run prior to start. Provided the starter limits are not exceeded (90 secs) then this is acceptable.

6. During engine start with a tailwind, if a positive increase of N1 is not indicated before starter cutout (50% N2), the airplane should be repositioned prior to a further attempted engine start.

WARNING: IF THE APU IS SWITCHED OFF BEFORE BOTH ENGINES STABILISE, THEN AN ELECTRICAL POWER INTERRUPTION WILL PROBABLY OCCUR. THIS MAY LEAD TO VARIOUS SYSTEM FAULTS NOT NECESSARILY EVIDENT UNTIL LATER IN THE FLIGHT.

2.9.3 Abnormal Engine Start Indications

Although the FADEC provides automatic over-temperature protection and will automatically abort the start in the event of a hot start, hot re-start or hung start, the engine start must be manually aborted if:

- No positive oil pressure indication within 10 seconds after N2 speed starts to increase.
- No ITT indication 15 seconds after the FADEC commands both ignitors on and fuel is applied.
- ITT exceeds start limit (740°C).
- If oil pressure stabilises below the engine limits.
- N1 and/or N2 failing to accelerate to stable idle speed (hung start).
- An intermittent electrical, pneumatic or starter malfunction occurs before the starter disengagement.

Note: In case an automatic abort occurs or engine start is manually aborted due to abnormal engine indications, its cause must be investigated and corrected before further attempts to start the engines.

All BAV CityFlyer E190 are equipped with FADEC v5.50 or v5.60 software. The FADEC commands an automatic abort when ITT is 10°C lower than the engine hot start limit. This will prevent 'ENG EXCEEDANCE' EICAS message being displayed. In this case, two additional starts are allowed without any maintenance investigation.

2.9.4 Aborted Engine Start

Engine starts should be aborted automatically by the FADEC if limitations are exceeded.

If this occurs, the START/STOP selector should be left at RUN for the full 90 seconds of the starter limit for dry motoring. By 90 seconds the selector must be turned to STOP.

A dry motoring run will be required if there is any positive fuel flow after this period. This must be performed with reference to the Engine Abnormal Start checklist.

2.9.5 No Break Power Transfer (NBPT)

To avoid power interruptions, it is recommended to wait 30 seconds after the N2 stabilises before shutting the APU down or GPU disconnection. Alternatively, use the electrical synoptic page to follow the power transfer.

It is recommended that the electrical synoptic page is selected on the FO's MFD prior to engine start. When both IDG indications are green after engine start, the power source has transferred and it is safe to shut down the APU or disconnect the GPU.

2.9.6 Engine Warm-Up

In order to allow thermal stabilisation of the engines, operate them at or near to IDLE for at least 2 minutes before selecting higher thrust settings. Taxi time at or near IDLE can be included in the warm-up period.

2.9.7 Engine Vibration

During the first minute after engine start, the vibration level amber band will start at 5.0 instead of 4.0 units, as long as the thrust levers are kept at IDLE.

2.10 After Start

Once both engines have been successfully started and a stabilised condition has been achieved the following Set-Up is completed:

Captain	FO
	Slats/Flaps ..... Set T/O
	APU ..... As Req'd
Flight Controls ..... Check	Controls Check ..... Monitor
Autobrake ..... RTO	

The Captain will then call for the After Start Checklist which is read by the First Officer as Challenge and Response:

AUTOBRAKE _____ RTO

- The Captain and FO should ensure that the indicated autobrake status on the EICAS screen is 'RTO'.

Flight Controls _____ CHECKED

- The Captain should press the STEERING DISENGAGE switch and then check the control column and rudder pedals. The FO should follow the Captain during the rudder check.

Note: When testing the rudder controls the tiller should be held down to avoid nosewheel deflection, particularly if the tow bar is still attached.

- Flight controls should be checked for freedom of movement in a smooth and continuous manner.
- Select the MFD flight control synoptic and monitor:
  - Elevator – full up, neutral, full down and neutral.
  - Aileron – full left, neutral, full right and neutral.
  - Rudder – full left, neutral, full right and neutral.
  - A full green box indication on the synoptic page is not a requirement for a successful check.

Note: The Hydraulic P-BIT starts when all the three hydraulic systems are pressurised and takes about one minute to complete. Performing the flight controls check while the Hydraulic P-BIT is running may interrupt the P-BIT. A 'FLT CTL TEST IN PROG' EICAS message is displayed to indicate that the Hydraulic P-BIT is in progress.

Ground Equipment _____ REMOVED

- The Captain must be sure that the parking brake is set and that the nose gear/RAT pins and ground equipment have been removed.
- Once all ground equipment is clear, the Captain should re-engage steering via the tiller and check EICAS.

Note: After the first steering activation following the airplane power-up an automatic Steering Hardover Protection Test is performed. If the above-mentioned test is performed with the airplane in movement, the 'STEER FAIL' caution message may be triggered. This event will not happen if the first steering activation following power-up is performed with the airplane stationary.

SLAT/FLAP_____SET __ and CHECKED

- Confirm SLAT/FLAP set to the briefed take-off configuration.

Note: Unless contaminated conditions exist or remote de-icing is required, take-off flap must be set before the Captain commences taxi.

APU_____AS REQUIRED

- Confirm the APU is set to ON or OFF as required for departure.

Note: It is acceptable to commence taxy with the APU running during its automatic cooldown period. This is confirmed by the EICAS message 'APU SHUTTING DOWN'. If this is the case, the EICAS must be confirmed clear during the Before Take-Off Checklist.

Note: 30 seconds after N2 stabilisation and before shutting down the APU, confirm electrical transfer has been achieved using the MFD Electrical Synoptic Page

If contaminated conditions exist, selection of the flaps should be delayed in accordance with de-icing procedures. When setting flaps, ensure the flap setting is the same as that listed on the relevant performance calculation result on ePerf.

Check 'A-I ENG 1 (2) VLV OPEN' message is presented on EICAS when REF A/I is selected ENG or ALL on MCDU.

The Captain must have the MFD status page displayed during taxi for brake indications.

There is a large area near the aircraft where personnel, obstacles or guidelines on the ground cannot be seen, particularly in the oblique view across the cockpit. Special care must be exercised in the parking area and while taxiing. When parked, the pilot should rely on ground crew communications to a greater extent to ensure a safe, co-ordinated operation.

Thrust use during ground operation demands sound judgement and technique. Even at idle thrust, the air blast effect from the engines can be destructive and cause injury. Aircraft response to thrust lever movement is slow, particularly at high weights. Engine noise level in the cockpit is low and not indicative of thrust output. Idle thrust is adequate for taxiing under most conditions. At high weights a slightly higher thrust setting may be required to begin taxiing. Higher thrust settings may be used as necessary when clear of the terminal ramp area, for example to expedite when cleared to cross active runways.

2.11 Taxi

2.11.1 Taxi Technique

Before releasing the brakes ensure the nosewheel is centred. After brake release taxi a little forward before commencing any turn. Check normal brakes operation.

Taxi can normally be initiated without increasing thrust at light and medium weights. To avoid FOD damage from ingestion, avoid the application of large amounts of thrust and avoid taxiing too close behind other aircraft. It is desirable to limit the thrust to 40% N1 and avoid rapid accelerations and decelerations. For normal operations, 30% N1 will be sufficient for ground manoeuvring.

Do not maintain brakes partially applied during taxi to control the speed. Let the aeroplane accelerate to a maximum safe speed, then use the brakes in one steady medium pressure brake application. Minimise the number of brake applications when practical. The number of brake applications governs carbon brake wear.

All taxiing must be carried out with due consideration for the conditions and with sympathy to the resultant stresses on the landing gear structure. For straight ahead taxiing or for small changes of direction, the use of rudder pedal steering may be used. At speeds above 20 kts, the steering should only be used if necessary and care should be exercised as it is very responsive.

Maximum taxi speeds:

Straight

- DRY ..... 30 knots
- LVPs, WET or CONTAMINATED ..... 10 knots

Turns

- DRY ..... 10 knots
- WET or CONTAMINATED ..... 5 knots

Caution: Due to the potential to create excessive loads on the nose landing gear, it is imperative that the maximum speeds in the turn are adhered to.

At speeds between 17 kts and 21 kts, a slight vibration may occur. Accelerating or reducing the speed to avoid this speed range increases passenger comfort. To reduce cockpit workload during taxiing, flight crew should plan and brief taxi operations carefully making full use of airport charts and notes. The PM shall monitor the taxi route on the airport chart and be prepared to offer guidance and directions when necessary.

2.11.2 Single Engine Taxi Out

To improve fuel savings a single engine taxi can be used, delaying the start of the second engine prior to take-off. Single engine taxi may be performed with either engine operating. The cross-side (i.e. Pump 1 if Engine 2 is started and Pump 2 if Engine 1 is started) Electric Hydraulic Pump selector shall be set to ON to provide cross-side hydraulic pressure in-lieu of the inoperative Engine Driven Pump.

Consider airplane weight, uphill slopes, time to warm-up the engine and time to the active runway. Consider evaluating the turns along the taxi route when selecting which engine to start prior to taxi.

When performing the Flight Controls Check with one engine only, check one surface at a time (aileron, rudder, or elevator) to avoid spurious 'FLT CTRL NO DISPATCH' message display.

Single Engine Taxi is **prohibited** in the following circumstances:

- Departing LCY or where otherwise noted in the OM-C.
- When operating on slippery or contaminated taxiways.
- LVPs in force.
- APU or APU BLEED or APU GEN inoperative.

Single engine taxi may be performed when operating under icing conditions provided that the Engine Run-Up Procedure is completed before take-off.

After Engine (1 / 2) start, complete the following procedure:

Electric Hydraulic Pump (2 / 1) Selector Knob ..... ON

- Select the inoperative engine-side Electric Hydraulic Pump to ON.

MFD Hydraulic Status ..... Confirm Pump Running

- If the Electric Hydraulic Pump is not running dispatch is **not** authorised.

- Complete the After Start Checks -

Second Engine Start ..... ACCOMPLISH

- Start the second engine with available time from take-off to allow 2 minutes of thermal stabilization. Taxi time at or near IDLE can be included in the engine warm-up period.
- The engine start should be preferably performed with the airplane static to avoid heads down condition during taxi.

Electric Hydraulic Pump (2 / 1) Selector Knob ..... AUTO

- Select the relevant Electric Hydraulic Pump to AUTO.

APU ..... AS REQUIRED

- Confirm the APU is set to ON or OFF as required for departure.

During taxi, smoothly increase thrust to move the airplane until enough forward speed has been attained. If possible, start slight turn in the direction of the non-operating engine, causing less stress in nose gear structure. Otherwise, a higher thrust setting is necessary with the incoming risks of the jet blast and foreign object ingestion in the engine. Maintain constant pressure on the tiller, due to asymmetric thrust during taxi. The appropriate taxi speed depends on the turn radius and surface condition.

2.11.3 Late Close Out Procedure (Provisional Loadsheets)

The normal departure process is based upon Late Close Out Procedures. The transmission of the final loadsheet is completed automatically using ACARS. A provisional loadsheet will be presented to the Captain for checking and signature (at London City the provisional loadsheet will be delivered by STD – 20).

During the Before Start Checks, the provisional loadsheet figures are to be used to calculate take-off performance figures for the provisional TOW + 500 kg which are entered into the FMS. BAV Operations will then transmit an ACARS 'IN COMPLIANCE' or 'REVISIONS TO' message detailing the final figures for ZFW, TOW, PAX, MACZFW and MACTOW.

An 'IN COMPLIANCE' messages indicates that the actual TOW is within +500 kg or –500 kg of the provisional TOW and the %MAC is within 1% of the provisional MAC. Under these circumstances there is no requirement to re-bug speeds, re-calculate take-off performance, re-set stab trim or enter the new ZFW figure into the MCDU before take-off.

A 'REVISIONS TO' message indicates that the actual TOW and/or %MAC are outside the tolerances mentioned above. Under these circumstances, at a suitable point prior to entering the runway for take-off, the aircraft must be stopped and both pilots must check the final figures and re-complete the Vital Data Procedure as per **2.8.3** and then check/re-set the take-off N1/speeds/stab trim settings.

If the ACARS 'IN COMPLIANCE' or 'REVISIONS TO' message has not been received by pushback + 5, or STD – 8 at LCY, the PM should request the final figures. Due to limited space at LCY, it is recommended not to move off stand until final figures have been received.

2.11.4 Taxi Checklist

Once taxiing has commenced, and at a suitable point, the Captain will call for the Taxi Checklist which is read by the First Officer as Challenge and Response:

Taxi Light _____ **ON**

- Side Taxi lights shall be ON during ground movement.

Final Loadsheet _____ **RECEIVED**

- Confirm final loadsheet figures have been received and actioned as per Late Close Out Procedure.

The items in the dashed box are to be completed following a **Single Engine Taxi**, in which case the whole Taxi Checklist should be called once the second engine has been started.

Second Engine _____ **STARTED**

- Start the second engine with available time from take-off to allow 2 minutes of thermal stabilization. Taxi time at or near IDLE can be included in the engine warm-up period.

Hydraulic Pumps _____ **AUTO**

- Verify HYDRAULIC SYS 1 and 2 ELECTRIC PUMPs set to AUTO.

APU _____ **AS REQUIRED**

- Confirm the APU is set to ON or OFF as required for departure.

Vital Data / Review _____ **AS REQUIRED**

- The Captain shall scan the EICAS screen from top to bottom and announce:
  - Take-Off Thrust Rating (TO-1, TO-2 or TO-3) and FLEX TEMP
  - ECS Packs Condition
  - Engine and Wing Anti-Ice Condition
  - Autobrake Status
  - Slats/Flaps Setting
  - Pitch Trim Setting
- The Captain shall then scan the PFD and announce:
  - V-Speeds
  - Selected Airspeed Bug Setting (V2 + 10 or VFS as required)
  - Selected Altitude set to SID stop altitude/cleared level

- The FO shall verify against the calculated data and highlight any discrepancies. The FO shall then confirm the expected SID and confirm the squawk code set in the MCDU.

Cabin Report_____RECEIVED

- Check cabin report received.

Sterile Light _____ON

- Sterile Light set ON once the cabin report has been received.

2.11.5 Crossing Active Runways

The transponder must be selected to TA/RA when crossing active runways to improve situational awareness and selected back to ALT-ON once clear.

The strobe lights must be ON for crossing to improve visibility to other aircraft.

2.12 Before Take-Off

2.12.1 Before Take-Off Procedure

The Before Take-Off Procedure and Checklist must be performed when cleared to line up on the runway. The FO completes the checklist as Read and Do. All checks should normally be complete before the aircraft makes the final turn onto the runway. The selection of external lights at night may be delayed so as not to blind other users at the holding area. Avoid maximum rate turns when lining up on the runway – this reduces tyre and seal wear and is more comfortable for passengers in the rear cabin.

Use all available information such as heading and FMS course indication (PFD), lateral profile (MFD) and departure runway (MCDU) to ensure the airplane is at the assigned runway for take-off. In Low Visibility Operations the ILS beam bar must be checked to confirm the runway in use.

Cabin Crew ..... ADVISE

- The Cabin Crew are warned by slowly cycling the FSTN BELTS sign to generate at least two chimes.

Lights/Strobes ..... ON

- On entering an active runway, Landing and Stroke Lights should be switched on.

Note: The Nose Landing Light should be switched on once cleared to take-off.

Brake Temperature ..... CHECK

- Brake temperature indication must be in the green range for take-off.

Transponder ..... TA/RA

- Confirm that the indication on the PFD changes from 'TCAS Off' to 'TA Only'. If the indication is 'TCAS Fail' then a Ground Reset must be attempted before departure by reference to the Ground Reset Guide.

Take-Off Configuration ..... CHECK

- Press the T/O CONFIG button, the 'TAKE-OFF OK' synthetic message must be heard.

Autothrottle ..... ARM

MFD ..... MAP (select WX/TERR as required)

- Both MFDs must now display Map mode, and if briefed, weather radar should be activated leading to Forced Standby mode whilst on the ground. If weather display is needed before take-off, select override once pointing down the runway.
- If terrain indication is required, this should have been previously activated during the briefing.

EICAS ..... CHECK

- Check:
  - No unexpected EICAS messages displayed
  - Thrust Rating Mode (TO-1, TO-2 or TO-3)
  - ATTCS as applicable
  - FLEX TEMP as applicable
  - Autobrake Status
  - Engine Indications

2.12.2 Brake Temperatures

2.12.2.1 Brake Temperature Monitoring System (BTMS)

The BTMS was designed to permit the crew to determine if the brake system is able to perform a maximum energy rejected take-off (RTO) regarding heat absorbing capability. When all Brake Temperature indicators in the MFD Status Page are in the green range, it is safe for take-off. However, if any of those indicators reaches the amber range, the associated brake must be allowed to cool down. The amber range may be reached in normal operation and it does not represent any potential risk to the brake system.

2.12.2.2 Uneven Brake Temperatures

Brake temperature is affected by lots of operational parameters such as brake kinetic energy absorption when using the brakes on taxi stops, turns and landing stops. The wind conditions may help to cool down one brake assembly more than the other, depending on wind orientation and intensity. In addition, worn brakes may reach higher temperatures than new brakes, which may cause uneven brake temperatures. The operational procedures may also contribute to uneven brake temperatures.

Unintentional brake applications while using the rudder to keep heading, differential brake applications during ground manoeuvres to steer the airplane or to control it when there is crosswind, may also lead to different temperatures in the brake assemblies.

While taxiing with Engine 2 running, the single engine procedure should be accomplished according to this manual. Otherwise, the outboard brakes will not have hydraulic pressure available, and the inboard brakes may reach higher temperatures than the outboard brakes.

2.12.2.3 Usual Brake Temperature Differences on E-Jets

Differential brake temperatures are normal and are expected in normal operation. Temperature differences between brakes of the same landing gear leg may reach up to 200ºC. Within this range, they are considered normal and do not represent any potential risk to the airplane braking capability.

Temperature differences between brakes of RH and LH landing gear legs can be even higher than 200ºC, for the reasons previously mentioned.

Immediate maintenance action is required if the temperature in any of the brake assemblies exceeds 419°C. In this case, the ‘BRK OVERHEAT’ message will be displayed in the EICAS. Also, if the temperature in any of the brake assemblies exceeds 739°C, the ‘LG TEMP EXCEEDANCE’ message will be displayed in the EICAS. ‘BRK OVERHEAT’ and ‘LG TEMP EXCEEDANCE’ EICAS messages may be caused by high energy brake stops. If these messages occur without high energy brake stops, a possible severe uncommanded or dragging brake condition may be evident. Therefore, immediate maintenance action is required including troubleshooting to identify the root causes.

If the airplane shows a tendency to turn to the side of the brake with higher temperature, it may be an indication of dragging brake. In this case, maintenance shall be informed, regardless of any EICAS message mentioned before.

2.13 Take-Off and Climb-Out

2.13.1 General

2.13.1.1 Types of Take-Off Roll

There are three types of take-off roll relevant to the E190:

Rolling Start: The aircraft is cleared to line up and take-off and does so without applying any brakes to stop on the runway. The thrust must still be raised to 40% to stabilise before setting take-off power.

Static Start: The aircraft is cleared to line up and wait and as such holds on the brakes at the take-off point. Once cleared to take-off, the brakes are released and the thrust applied to stabilise at 40% before setting take-off power.

Standing Start: Irrespective of the clearance, the aircraft is lined up and held on the brakes. A specific thrust is then set before releasing the brakes to commence the take-off roll. There are two examples of a Standing Start:

- In icing conditions, the thrust must be set to 54% for 30 seconds before releasing the brakes.
- At LCY the thrust must stabilise and be approaching 60% before releasing the brakes.

2.13.1.2 Tail Strike Considerations

Although tail strikes are more common during landing phase of flight, it may also occur during take-off. The major causes identified of a tail strike during take-offs are:

- Improper stabiliser trim,
- Improper rotation speed,
- Excessive rotation rate,
- Improper Flight Director guidance.

Improper Stabiliser Trim

A mis-trimmed stabiliser may be a result erroneous input data – like loading weights for balance load sheet calculation or even an incorrect stab trim setting.

In any case, the stabiliser could be wrongly set to nose up which may induce the airplane attempting to fly before V1.

Improper Rotation Speed

Wrong speed computations or rotating earlier than rotation speed could result in nose up without wing lift enough to fly exposing the airplane to a tail strike.

2.13.1.3 Take-Offs and Bleed Overpressure

EICAS ‘BLEED 1 (2) OVERPRESS’ cautions may occur when departing with REF ECS OFF selected on the MCDU TO DATASET MENU. All departures should be conducted in accordance with the SOP specified in **2.8.3.2**. Any departure requiring REF ECS OFF shall be conducted with the APU ON to reduce the likelihood of a nuisance caution. The APU remains on after start in order to provide bleed air for take-off and must be selected OFF during the After Take-Off Checklist.

2.13.2 Take-Off Technique

2.13.2.1 General Principles

Flight Director guidance must be used for all take-offs except on approved special procedures. The Autothrottle must be used (when serviceable) for all take-offs. If the Autopilot is to be used, it should be engaged only after selecting the desired vertical mode at thrust reduction altitude/acceleration altitude.

Make sure that the thrust levers are set to the TOGA position and take-off thrust is achieved before 60 kt. The PF is to use the rudder pedals to steer the airplane for normal take-off.

Any abnormalities must be called out in a loud and clear voice.

If the Captain decides to continue they must call out "**GO**" and place hands on the thrust levers to ensure they are not retarded.

If the Captain decides to abort the take-off, they must call out "**STOP, STOP**" and place hands on the control wheel to prevent inadvertent rotation.

2.13.2.2 Thrust Lever Handling During Take-Off

The PF, either left or right hand seat, will maintain control of the thrust levers throughout the take-off manoeuvre.

2.13.2.3 Take-Off Roll

The PM shall confirm the correct indications on the FMA, EICAS, flight and engine instruments during the take-off roll. A take-off may be rejected for any malfunction up to 80 kts. Above 80 kts the aircraft enters the high-speed regime and a take-off should only be rejected in the case of fire, an engine failure (confirmed by two parameters, one of which must be internal), severe engine vibration, smoke on the flight deck, blocked runway, structural failure or doubt that the aircraft can safely fly.

V1 is the maximum speed at which the first ACTION must be taken to stop the aircraft within the ASDA. Attempting to stop from a speed above V1 will almost certainly result in a runway excursion. The PM should, therefore, make the "**V1**" call approximately 1-2 seconds before the V1 speed is reached in order to be sure that the PF's hand has been removed from the thrust levers as V1 speed passes. The speed trend vector on the PFD speed tape represents the airspeed in 10 seconds at the current acceleration rate and thus provides a good guide as to when the V1 call should be made.

The actions in the event of a rejected take-off are detailed in Section 3.

The critical engine is the engine on the upwind side.

2.13.2.4 Rotation and Lift Off

Take-off and initial climb performance depend on rotating at the correct airspeed and proper rate to the rotation target attitude demanded by the flight director. An early rotation or too rapid rotation rate create the risk of tail strike. A late rotation or too slow rotation rate increases take-off ground roll. Furthermore, late or slow rotation may cause the initial flight director pitch to be excessive as the system attempts to reduce excess speed to V2 + 10. Improper rotation degrades initial climb performance.

For **all** take-offs the aircraft should be rotated steadily at a rate of 3° per second until the Flight Director pitch demand is achieved. This is typically about 18° AEO and 10° OEI but will vary according to flap setting and TOW. If the Flight Director pitch demand is not achieved the required climb profile may not be achieved.

2.13.2.5 Crosswind Take-Off

The airplane has a good crosswind control capability during take-off. There is no special procedure, however, runway alignment and smooth symmetrical thrust application are quite important, especially when operating on contaminated runways.

Maintain directional control using positive rudder and small control wheel inputs.

Large control wheel inputs (more than 4° control wheel displacement) may increase drag due to spoiler extension. Command control wheel into the wind to maintain wings level throughout the take-off roll. The required control wheel input decreases as speed increases.

2.13.2.6 Tailwind Take-Off

The following technique shall be used for take-off with a tailwind component above 10 kts. A standing start technique is used to reduce the take-off roll with 60% N1 set. TO-1 must be used with no FLEX TEMP.

Note: No additional data entry is required with ePerf to calculate a tailwind component greater than 10 kts (up to a maximum of 15 kts).

Brakes.....APPLY

Thrust Levers.....SET 60% N1

Note: If the Autothrottle 'takes' the thrust levers before 60% then release the brakes and continue as normal.

When engines stabilised at 60% N1:

Brakes.....RELEASE

"**SETTING THRUST**"

- Advance, or make sure the AT has advanced, the thrust levers to the TOGA detent.

2.13.3 Take-Off Actions and Callouts

Take-Off – Actions and Callouts		
	PF	**PM**
Airplane on the runway	Advance thrust levers to 40% N1 to allow engine stabilisation. **Note:** For take-off in icing conditions, it is required that take-off power be set to approximately 54% N1. If vibration is not presented, take-off can be continued. If vibration is encountered (as a guide this will be when the engine LP vibration is higher than normal), hold N1 at 54% for 30 seconds or until vibration returns to normal range whichever is longer and then, take-off.	

	Note: At LCY advance thrust to 60% N1 for stabilisation whilst holding the aircraft on the brakes. Then release the brakes and set power as normal. If the Autothrottle 'takes' the levers before 60% then release the brakes and continue as normal. "**SETTING THRUST**" Advance, or make sure the AT has advanced, the thrust levers to the TOGA detent before 60 kts. Rest hand on the thrust levers in case of RTO.	Verify that the N1 reached is the target N1, the engine parameters are normal, and that ATTCS status is as required. "**THRUST SET**"
Airplane accelerates past 80 KIAS	"**CHECKED**"	"**EIGHTY KNOTS**"
Airplane passes V1 and VR	Remove hand from thrust levers.	"**V1**" "**ROTATE**"
Positive Rate of Climb	Confirm positive rate of climb. "**GEAR UP**"	Verify positive rate of climb: "**POSITIVE RATE**" "**GEAR UP**" Position gear lever up.
400 ft AGL	Verify LNAV engagement if armed: "**LNAV MAGENTA**" *or* "**SELECT HEADING / NAV**" then verify lateral mode engaged: "**HEADING GREEN / LNAV MAGENTA**"	Confirm LNAV engagement if armed. *or* Select requested lateral mode and then confirm lateral mode engagement.
Thrust Reduction Altitude / AA	"**CLIMB SEQUENCE**" Verify vertical mode: "**FLIGHT LEVEL CHANGE GREEN/MAGENTA**" Verify autopilot engagement: "**AUTOPILOT ENGAGED**"	Confirm VNAV engagement if armed *or* Select FLCH and then confirm vertical mode engagement. Set IAS. Select automatics. Retract flaps on schedule. When flaps are zero call: "**FLAPS ZERO**"

Callouts are shown in **bold** text.

The PM should call "**POSITIVE CLIMB**" when a positive climb has been established by reference to the Radio Altimeter.

LNAV and VNAV are armed automatically whenever the TOGA button is pushed. This is indicated on the FMA with LNAV and VNAV displayed in white in the FD armed modes windows. LNAV will then engage at 200 ft AGL and VFLCH will engage at the height set in the VNAV CAP AFE field on the MCDU DEPARTURE LIMIT page.

If required, for example if instructed to fly a heading after departure or if the use of VNAV is not desired, either mode can be disarmed prior to departure using the relevant Guidance Panel button.

The Climb Sequence is to be performed by the PM when requested by the PF in a continuous manner and ends when the slats/flaps reach the zero position. The Climb Sequence comprises:

- PM confirms VNAV engagement if armed *or* selects FLCH.
- PM selects the required IAS on the SELECTED AIRSPEED BUG. Normally this is 210 kts, however for take-offs with flaps greater than 2 (or during a go-around) the speed selected should be 170 kts initially (or VFS if greater for a flaps 3 take-off). This is increased to 190 kts once flaps 3 is selected and then 210 kts when flaps 2 is selected.
- PM selects Autopilot (and Autothrottle is not already engaged) unless the PF has pre-briefed a period of manual flight on departure during the Departure Briefing.
- PM retracts the flaps on schedule in accordance with the F-Bug reference. At each change, the PM must announce the configuration to the PF. For example: "**FLAP 3 SET, SPEED CHECKED FLAP 2, SETTING 210 KNOTS**".

The F-Bug calculation algorithm is designed so as to meet minimum safe margins to VFE and Stick Shaker speed. A minimum margin of 20% above the stall speed is set for the next flap. If the F-Bug is not available then the slat/flaps can be retracted by following the Green Dot + 10 kts or by using the retraction schedule below:

	Select Flaps at Speed			
T/O Flap	**3**	**2**	**1**	**Zero**
4	V2 + 8	V2 + 16	V2 + 24	VFS − 23
3		V2 + 8	V2 + 16	VFS − 23
2			V2 + 8	VFS − 23
1				VFS − 23

2.13.4 Flap Retraction and Noise Abatement

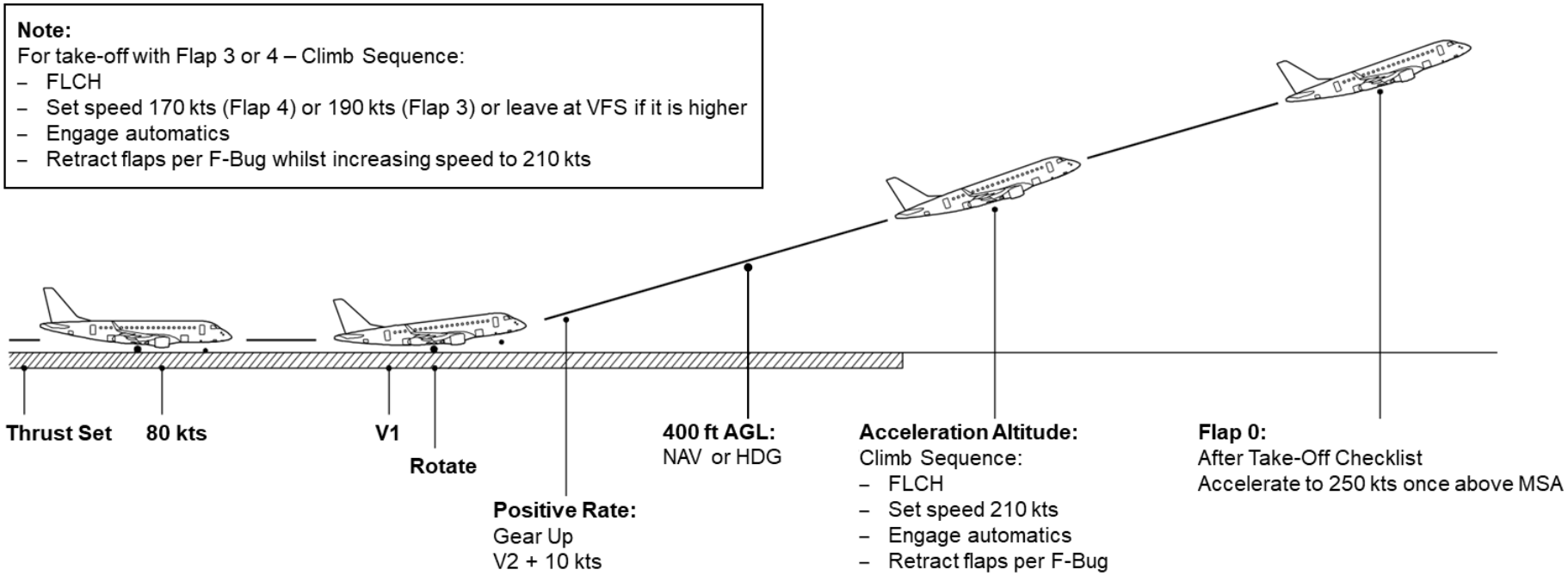
The normal Thrust Reduction Altitude (TRA) and Acceleration Altitude (AA) is 1,000 ft above airfield level rounded up to the nearest 100 ft, this procedure meets the requirement for NADP 2 departures. The Performance Manual will specify if a higher AA or NADP 1 profile is required.

For NADP 1 procedures the following changes to the normal profile should be followed:

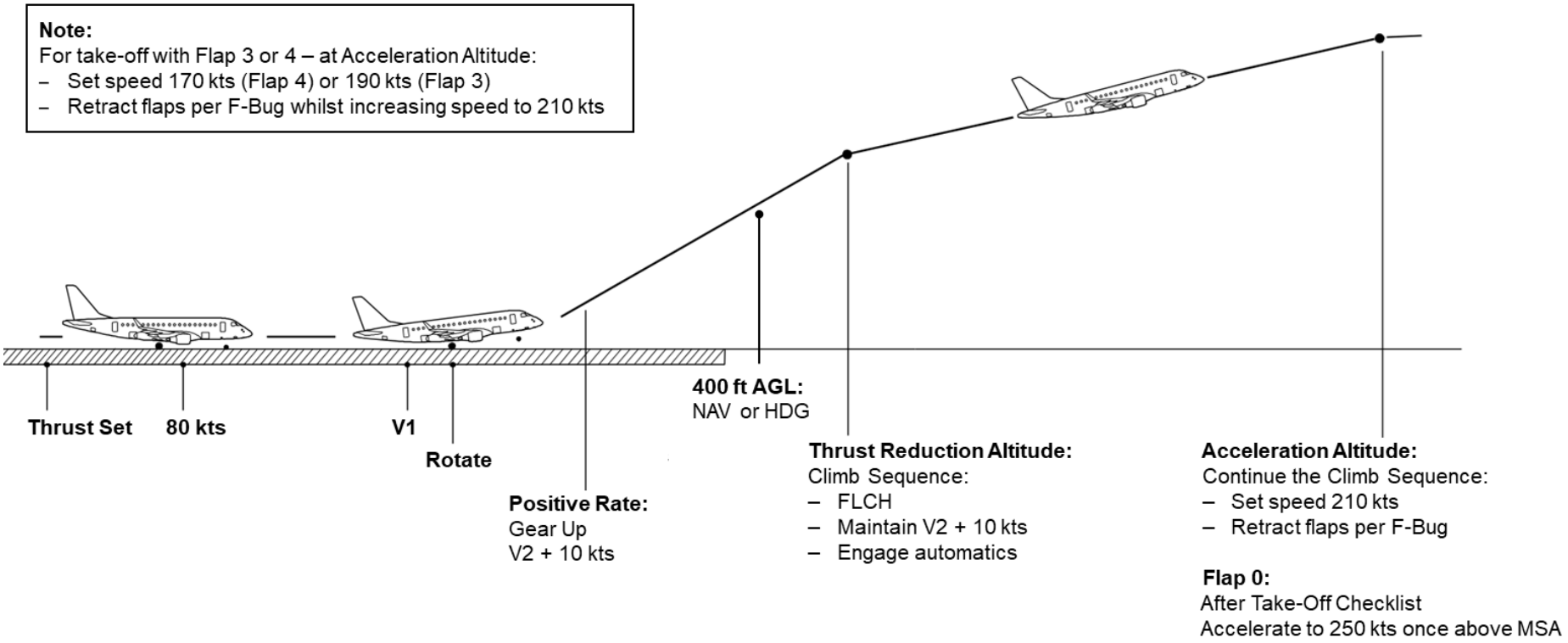
- Before Start – Set V2 + 10 on the SELECTED AIRSPEED BUG.
- At 400 ft AGL – Confirm/select lateral mode.
- At 1,500 ft AAL or specified TRA – Confirm/select vertical mode but maintain V2 + 10.
- At 3,000 ft AAL or specified AA – Select 210 kts and retract flaps per schedule.

Where there is a possibility of not achieving the vertical profile of a SID, crews should delay accelerating and maintain V2 +10 (AA is the minimum acceleration altitude) until they have achieved 3,000 ft or the gradient/altitude restrictions of the SID (whichever is the greater).

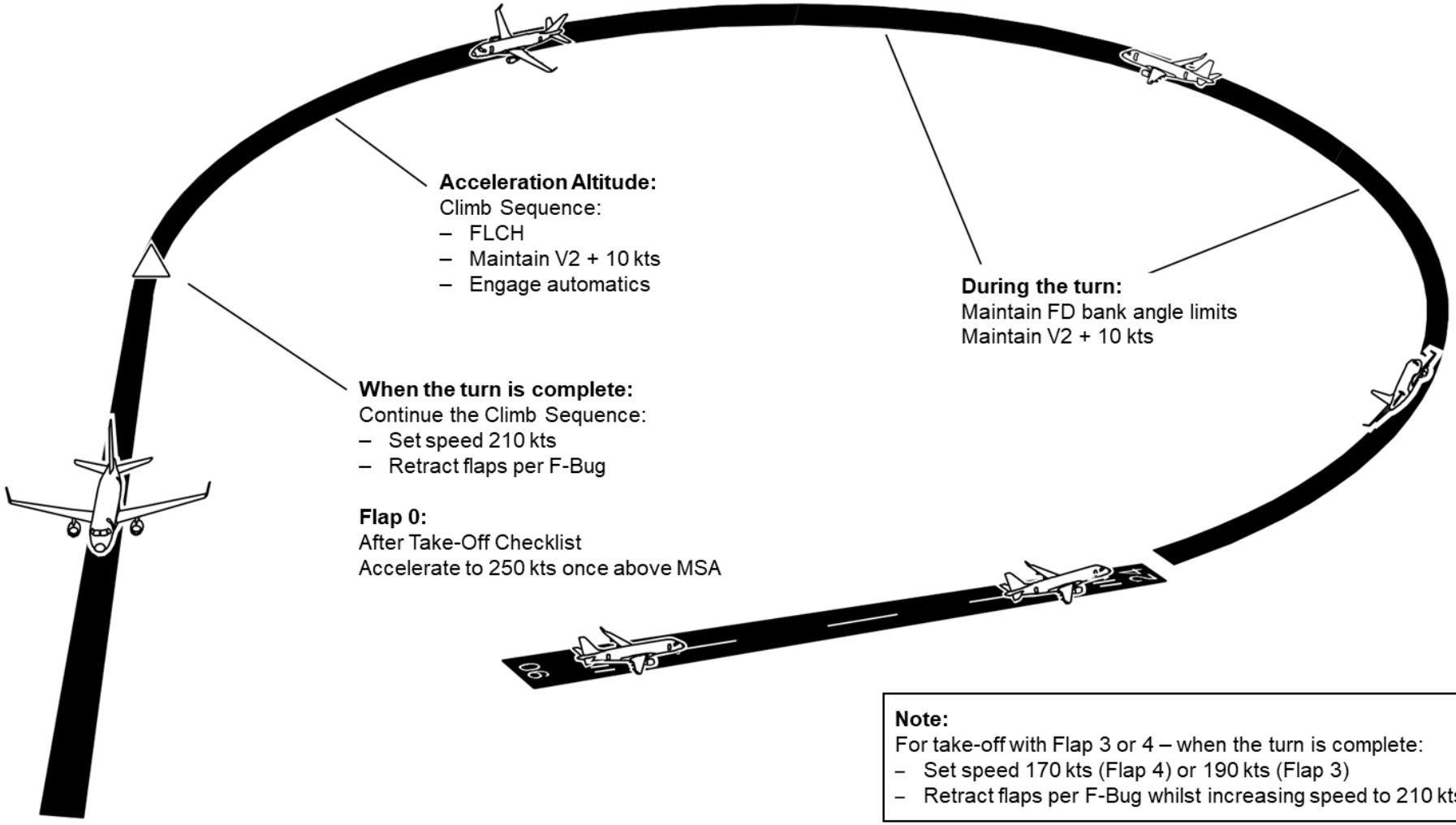
2.13.5 Normal Take-Off Profile



2.13.6 Noise Abatement Profile – NADP 1



2.13.7 Close-In Turn Profile



Note:
For take-off with Flap 3 or 4 – when the turn is complete:
– Set speed 170 kts (Flap 4) or 190 kts (Flap 3)
– Retract flaps per F-Bug whilst increasing speed to 210 kts

2.14 After Take-Off

Once above MSA and having achieved the vertical profile of the SID, airspeed can be increased to 250 kts. Some SID profiles do not allow acceleration as soon as flap retraction is complete; this is normally promulgated in the Performance Manual. For passenger comfort and to avoid track violations on SIDs where early turns are required through greater than 90 degrees, acceleration from 210 kts to 250 kts once above MSA should be delayed until established on track. In any event, the aircraft should not be accelerated beyond the SLAT/FLAP 1 placard speed of 230 kts until both flaps and slats are confirmed at zero on the EICAS screen. The aircraft can be flown faster in accordance with the aircraft limitations, but 250 kts must be the maximum if bird activity is a concern.

The recommended maximum angle speed is VFS.

The recommended maximum rate speed is VFS + 50 kt / Mach 0.60.

This checklist should be initiated as soon as possible after SLAT/FLAP are retracted. The checks are to be requested by the PF and read out by the PM as Challenge and Response.

Until cleared to a flight level the checklist should be actioned "**TO THE LINE**". The After Take-Off Checklist must be completed before crew resolve any subsequent emergency checklist drills.

Landing Gear _____ **UP**

- Confirm the three white UP indications on the EICAS (or EICAS de-clutter).

SLAT/FLAP _____ **0**

- Confirm the both the slats and the flaps are at zero on the EICAS (or EICAS de-clutter).

Thrust Rating _____ **AS REQUIRED**

- Confirm required thrust rating. This may be adjusted if required, for example an increase to CLB-1 for improved climb performance. Refer to **2.17.2 – Climb Thrust Settings** for guidance.

Air Conditioning and Pressurisation _____ **CHECK**

- Check for the proper air conditioning and pressurisation settings and parameters.

APU _____ **AS REQUIRED**

- Set the APU ON or OFF according to the electrical and pressurisation systems requirements.

- Standard (1013) -

Altimeters _____ **STD SET and CROSS-CHECKED**

- Both pilots set the altimeters to standard.

Note: The aircraft must be climbing before changing the altimeter sub-scale.

Note: The Standby Altimeter should remain set to local QNH until above MSA.

The checklist can only be called complete when the altimeters have been set to standard, this should be completed after clearance has been received to climb to a flight level.

2.15 Climb

2.15.1 Climb Procedures

Once above 1500 ft, with the After Take-Off Checklist complete and in smooth flying conditions, the FSTN BELTS switch should be cycled OFF/ON to indicate that the Cabin Crew may leave their seats.

The PF is to call "**SET STANDARD**" when initially cleared to climb to a flight level and "**CLEARANCE ABOVE MSA**" when cleared above the MSA. The PM is to reply to both these calls.

Altimeter checks are to be carried out every 10,000 ft and prior to entering RVSM airspace. On passing FL100/FL200/FL300 the PM should ensure that both main altimeters are set to standard, confirm the cleared level, and check the pressurisation.

Note: The maximum tolerance for RVSM compliance is 200 ft difference between altimeter 1 and 2. The aircraft monitoring will provide a comparison caution if the difference is 200 ft or more.

When passing FL100/10,000 ft the PM should complete the following Set-Up:

Climbing through FL100/10,000 ft	
Lights (Landing/Taxi/Sterile/Logo)	OFF
Signs	As Required
WX/Terrain	As Required
Autotune/DME	Reset
VHF2	Set 121.5

All external lights, except Navigation, Strobe and Red Beacon lights, should be set to OFF unless required for safety reasons. The Sterile light shall be set OFF to indicate to the Cabin Crew that the aircraft has passed 10,000 ft. The FSTN BELTS switch should be set OFF unless required for safety reasons, for example due to turbulence.

The 1,000 ft prior to any altitude capture should be considered as a critical phase of flight. In order to reduce the likelihood of high-vertical-rate TCAS events, ICAO PANS-OPS requires that the vertical rate within 1,000 ft of the cleared level be less than 1,500 ft/minute unless ATC have assigned a higher rate. In order to increase awareness and allow time for PF to intervene and reduce the vertical rate if required, the PM should make an alert call "**2,000 TO GO**" alongside the "**1,000 TO GO**" if it appears likely that the vertical speed will be greater than 1,500 ft/minute within 1,000 ft of the cleared level.

When changing cleared levels, the new level required is set in the ALT SEL window on the PFDs, both pilots should confirm that the entry is correct in accordance with **2.1.12.8 – Change of Altitude or Flight Level**.

2.15.2 Climb Thrust Settings

OFP fuel figures are based on a CLB-2 thrust rating. Use of CLB-2 reduces engine wear and maintenance costs, for this reason CLB-2 should be used as the default choice. Use of CLB-1 thrust reduces overall fuel consumption by achieving cruise level sooner.

CLB-1 should be selected if required due to local terrain (the Performance Manual identifies airports requiring mandatory use of CLB-1 below MSA) or if the rate of climb reduces below 1,000 feet per minute.

2.15.3 Climb Speed Profile

Below MSA, consider the following guidance:

- Obstacle/Terrain Considerations: Recommend VFS (maximum angle of climb speed) until MSA or above,
- Weather Considerations: Recommend VFS + 50 kts (approximately maximum rate of climb speed) to clear low altitude turbulence.

The standard climb speed profile is:

- 210 kts up to MSA
- 250 kts between MSA and FL100/10,000 ft (once the flaps are at zero)
- 270 kts above FL100/10,000 ft until reaching Mach 0.73 (at approximately FL290)
- Mach 0.73 until cruising altitude
- Mach 0.78 for cruise.

Note:

1. If there is a significant period of level flight below FL100/10,000 ft, it is permissible to accelerate to 270 kts (with ATC approval) unless bird activity is a concern.

2. If unable to achieve climb performance, select CLB-1 and/or reduce speed as required but do **not** reduce below Green Dot speed / Mach 0.60.

3. OFP fuel and time figures are based on a Mach 0.78 cruise. If an early arrival is forecast, slow to Long Range Cruise (LRC) speed (with ATC approval).

4. Use of LRC may lead to large speed changes from the climb and descent profile, this should be managed manually in the FMS.

2.15.4 Use of FMS Speeds

The use of FMS Speeds is approved above FL100/10,000 ft only.

The FL100 Set-Up may be used to transfer to FMS Speeds in the climb at the earliest, and again in the descent as the latest point that manual speeds must be set.

Note: The FMS must be set for the above profile speeds in the MCDU PERF INIT page during the Before Start Preparations (**2.8.1**).

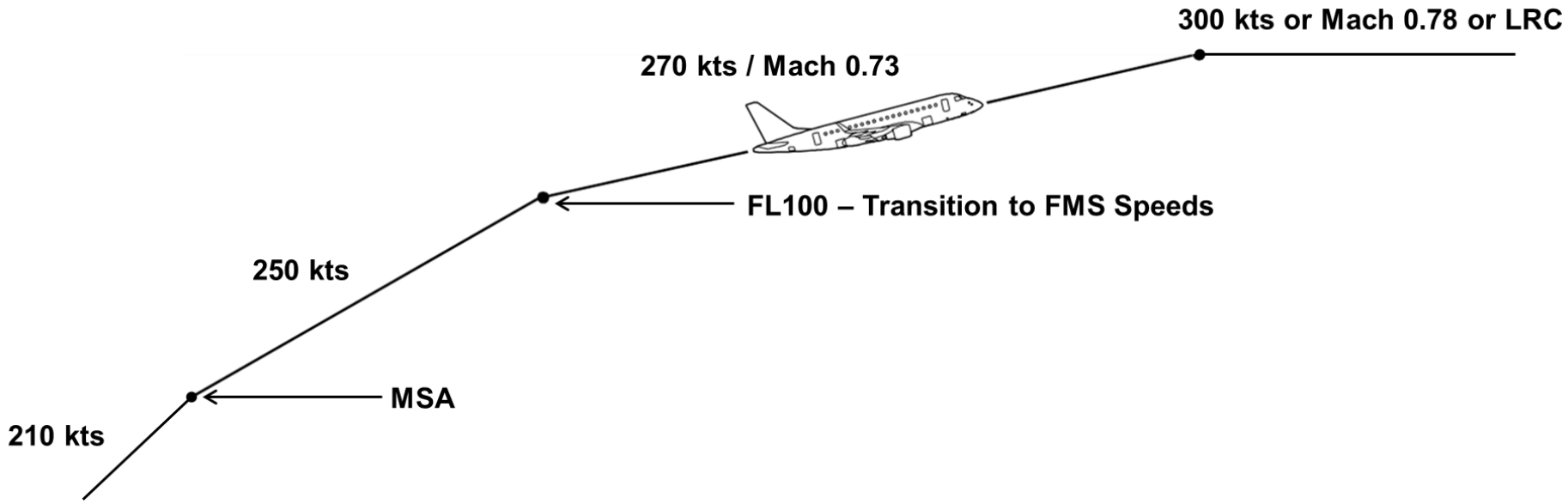
2.15.5 Wing Anti-Ice without Icing Conditions

In the following conditions the Wing Anti-Ice System will activate on the E190 even if not in icing conditions. In this case the EICAS will display ‘AI-WING VLV OPEN’ but the ‘ICE CONDITION’ message will not be displayed:

- Altitude below 22,000 ft
- Combination of certain air temperature, altitude and airspeed indications
- Vertical speed between −200 ft/min and +200 ft/min

If all these conditions exist for 2 minutes the system will activate and remain active for a further 2 minutes after the end of these conditions.

2.15.6 Climb Profile



2.16 Cruise

2.16.1 Cruise Procedures

The ATC Flight Plan cruise altitude will be the same as the OFP generated cruise altitude, which is calculated as the most efficient taking into temperature, winds and specific fuel consumption. When turbulence is experienced or unexpected strong headwinds above FL270, a headwind component reduction of 20 kts will generally favour a cruise 2,000 ft lower, whilst a decrease of 40 kts would favour a cruise 4,000 ft lower.

If operating behind schedule, continue at Mach 0.78 cruise and seek ATC shortcuts to make up any delay. If operating ahead of schedule, slow to LRC speed (with ATC approval).

Normally the P1, as PF, will operate the aircraft during the cruise, managing the fuel system, and monitoring the performance of the FMS. The P1 will also make the en-route PA. The P2 is responsible for conducting communication with ATC and obtaining weather information. One pilot must always be monitoring the ATC frequency and if the P2 is off frequency then a positive handover of the responsibility for communicating with ATC to the P1 must be made. The P2 is also responsible for conducting the en-route fuel checks.

Note: The cruise speeds in the MCDU PERF INIT page should be adjusted to actual cruise speeds to more accurately reflect the expected fuel plan.

Note: The cruise altitude must be set for actual level achieved on the MCDU PERF INT page. This setting feeds the pressurisation control and thrust settings.

2.16.2 En-route Navigation

En-route charts should be used to cross check the flight plan waypoints, and review expected ATC handover boundaries and frequencies.

2.16.3 Flight in Turbulence

If severe turbulence is being experienced or anticipated the aircraft may have to be descended to a lower altitude, to ensure buffet margins are preserved. Careful monitoring is required when experiencing speed fluctuations associated with atmospheric disturbances, with or without turbulence. Consideration should be given to reducing the airspeed to the turbulence penetration speed to protect structural integrity during severe turbulence encounters.

Turbulent Air Penetration Speed:

Below 10,000 ft	250 KIAS
At or above 10,000 ft	MAX 270 KIAS/0.76 M WHICHEVER IS LOWER

Note:

1. Do not chase altitude. Let both altitude and airspeed vary and maintain attitude.
2. If severe turbulence cannot be avoided disconnect Autothrottle and make an initial thrust setting for the target speed. Maintain attitude and pitch Trim setting.

3. During climb or descent with variations in indicated airspeed, the use of FLCH mode may result in airplane pitch changes. The use of FPA mode is recommended to maintain airplane attitude.

Levels of Turbulence		
Intensity	**Airplane Reaction**	**Effects on Occupants**
Light	Small, erratic changes in altitude and/or attitude.	Passengers and crew can fell a small strain against seat belts. Loose objects can be slightly displaced. Food can be served. Little or no difficult to walk.
Moderate	Changes in altitude and/or attitude occur, but the airplane stays in a positive control at all times. Usually causes variations in the indicated airspeed.	Passengers and crew can fell a small strain against seat belts. Loose objects are dislodged. Food cannot be served. There is difficulty to walk.
Severe	Large, abrupt changes in altitude and/or attitude. It usually causes large variations in the indicated airspeed. Airplane may be momentarily out of control.	Passengers and crew are forced against seat belts. Loose objects are tossed about. It is not possible to serve food or walk.

2.16.4 Fuel Monitoring

A fuel check should be carried out at the first waypoint after passing the top of the climb and at regular waypoints thereafter. During cruise, when crossing suitable waypoints, enter remaining fuel by the fuel required figure on the OFP, perform the subtraction and compare with the planned remainder at touchdown, and with the appropriate FMS value. If extra fuel is carried, this should be included in the planned remainder.

2.17 Descent

2.17.1 Approach Briefing and Transfer of Control

Ideally at least 10 minutes before top of descent, the P1 carries out the approach briefing and then transfers control of the aircraft to the P2.

The brief should cover all relevant aspects of the descent, approach and landing including any applicable aircraft limitations, the intended speed profile, Guidance Panel programming and expected configuration changes.

Before conducting the approach briefing, the P1 must assess the likely weather conditions and workload expected for landing and brief for the type of approach and procedure to be used. If it is anticipated that the required visual reference for landing will not be achieved by the 1,000 ft RA auto-callout, maximum use must be made of the Autopilot, any available precision approach aids and, in more limiting weather conditions, Autoland. Manual approaches may be practiced only in suitable weather and workload conditions.

The P2 will control the aircraft for descent and approach so that the P1 may complete the intended type of landing. The P1 will resume control at or above DA/H, provided that visual contact with the airfield has been established and the visual reference requirements can be maintained. Due consideration should be given to checklist status, when resuming control at an early stage. In any case, the P1 should not resume control before the 1,000 ft RA auto-callout except in exceptional circumstances – for example a circling approach in marginal conditions.

- Briefing -

The aim of the briefing is to:

- Develop high crew situation awareness,
- Identify potential problems or threats, and
- Develop strategies required to deal with them in both normal and non-normal situations.

This is best achieved through an open and interactive briefing style that allows all crew members to participate and share their experiences. An effective briefing will:

- Be concise, relevant and conducted at a time of lower workload.
- Include open questions to share experiences and compare mental models.
- Establish gates and bottom lines.
- Review automation handling and use of relevant modes including intervention techniques.
- Anticipate and plan for potential high workload situations.
- Identify potential threats and errors.

Crews must refer to the aide-memoire contained in the Decent Checklist as they brief to ensure that all items have been covered sequentially. The briefing aide-memoire should not be regarded as exhaustive, crews are expected to add to it as the situation warrants. Clearly some items need not be fully briefed if there is full understanding of those points, perhaps having covered them on a previous flight. Items to be covered under these headings are as follows:

Threats –	Identify relevant BAV Safety Plan threats
Configuration –	State the intended configuration for landing (for example, "**STEEP APPROACH, FLAP FULL, MANUAL LANDING**") including planned use of weather radar and EGPWS terrain display. For steep approaches arm Steep Approach Mode and confirm (both crew) that STEEP is armed in white on the FMA. Review the status of the aircraft, including any problems, which have arisen in flight. Discuss any other unusual circumstances, which have a bearing on the operation.
AIS –	Review AIS and NOTAMs to assess the effect of promulgated airfield and navaid deficiencies.
Weather –	Review and discuss the arrival weather, actual and forecast, for destination and alternates. Discuss as necessary: • Potential turbulence or icing. • Cloud base/visibility. • Winds including windshear avoidance and escape manoeuvre.
QNH –	Review and discuss effect on descent profile. Set the destination QNH on the standby altimeter.
Transition Level –	Review and check entry on the MCDU DESCENT page.
MSA/SSA –	State the local SSA and the MSA from the OFP and the anticipated points on the arrival where they will be encountered.
Terrain –	Confirm and discuss terrain in relation to planned aircraft track. Review the expected position of the 2,500 ft RA auto-callout and associated position check.
Airfield Elevation –	Confirm and review the expected position of the 1,000 ft RA auto-callout.
STAR –	Review and discuss the anticipated arrival routing and any speed or altitude restrictions including use of the MCDU and VNAV. Discuss the expected speed profile, planned configuration change points and planned use of the Guidance Panel. Identify and confirm approach gates. Consider the use of additional speed or altitude restrictions within the FMS to assist descent planning.
Approach Type –	Review and discuss the planned approach to be flown including use of the MCDU and Guidance Panel. Discuss approach check points and altitudes/heights. Confirm expected FMA approach status annunciation. Set the approach and missed approach radio aid frequencies after deselecting autotune in the MCDU. Set preview for approach track and select the appropriate final approach course.
Minima –	Confirm the relevant minima (BARO or RA) and set on both PFDs.
Missed Approach –	Review and discuss the missed approach profile and procedure including initial configuration changes, acceleration altitude, climb-sequence (clean-up) and planned

	holding facility. When necessary confirm available missed approach climb gradient against procedure requirements using the Performance Manual.
Runway –	Discuss the anticipated runway including length, width, slope, elevation, contamination, lighting, displaced threshold, intended vacating point and any other factors.
Flap –	Confirm flap setting for landing and check entry on the MCDU LANDING INIT page.
Speeds –	Obtain V_{RF}/V_{AC} and V_{FS} from the Operational Aide Memoire and derive V_{AP} in accordance with **2.19.2**. Confirm speeds entry on the MCDU LANDING page.
Stopping –	Complete in-flight landing distance check and compare against landing distance available. Discuss the planned runway exit and planned use of autobrakes and manual braking to achieve it.
Airfield –	Review anticipated taxi route, stand allocation and airfield facilities (stand entry guidance, GPU availability). Consider the potential for a single engine taxi in.
Radio Aids –	Confirm planned use of radio navaids and confirm they have been selected/tuned.
Alternate –	Discuss the alternate(s) including distance, time, direction, commercial preference and Company advice.
Fuel Capability –	Discuss and review options for holding and/or diversion.
Review –	Review airfield delays and any other special considerations. Invite questions and check full understanding of the brief. If crews intend to manually fly the aircraft during the approach the intended altitude from which this will commence should be pre-briefed at this point.

Complexity of the arrival routing, weather, in-flight workload, recency and aircraft serviceability should all be taken into consideration before crews elect to fly the aircraft manually. The FD should normally be switched on and followed except during training flights when it may be switched off in order to practise basic instrument flying skills during circuit flying.

There will normally be a transfer of aircraft control to the P2 approaching top of descent. Handover should comprise of an explanation of Guidance Panel modes in use and any cleared levels. The Guidance Panel source must be changed to achieve the handover. This will lead to reversion to modes ROLL and FPA. This must be corrected before proceeding.

Note: There is no need to transfer the transponder source unless the initial descent will **not** exit RVSM airspace.

WARNING: THE DIFFERENCE BETWEEN ALTIMETER 1 AND 2 CAN BE AS HIGH AS 200 FT. WHEN CHANGING THE GP SOURCE, THE AIRCRAFT WILL ADJUST TO THE NEW REFERENCE ALTIMETER, WHICH MAY CREATE A NOTICEABLE PITCH MOVEMENT. THIS CAN BE AVOIDED BY CHANGING THE GP SOURCE DURING THE INITIAL DESCENT RATHER THAN DURING THE CRUISE.

2.17.2 Descent Checklist

On handover of control the PF (P2) should request the Descent Checklist, which is completed as Challenge and Response.

MCDU _____ SET

- Confirm the following actions have been completed during descent preparation:
  - Destination airport RUNWAY, APPR, STAR, APPR TRANS and APPR VIA inserted as required/applicable.
  - Speed and altitude constraints confirmed, altitude constraints reviewed against MSA.
  - Additional speed or altitude constraints inserted as required to achieve descent profile.
  - DISCONTINUITIES removed and flight plan activated/closed.
  - Descent speeds confirmed/modified as required.
  - Approach and landing speeds (V_{RF}, V_{AP}, V_{AC} and V_{FS}) derived from the Operational Aide Memoire and inserted on the MCDU LANDING page.
  - MCDU missed approach procedure checked.
  - Navaids set as required on the MCDU RADIO or PROG page.

Minima _____ SET

- Confirm both PFD display the correct minima including reference (BARO or RA).

Steep Approach _____ AS REQUIRED

- If conducting a steep approach, confirm the STEEP APPROACH button on the control pedestal has been selected and confirm STEEP is armed in white on the FMA (both crew).

PF Source _____ SET TO PF

- Confirm the Guidance Panel source has been set to the PF side.

2.17.3 Descent Planning

The FMS may be programmed and used to follow the STAR and should be programmed for a 3.5-degree descent as a fixed profile.

The descent speeds to be used are 0.76 Mach/270 kts down to FL100/10,000 ft and 250 kts maximum thereafter. To achieve this transition, on passing FL120 the aircraft should be decelerated to achieve 250 kts by FL100/10,000 ft. Subject to ATC approval and provided bird activity is not a concern, speeds above 250 kts below FL100/10,000 ft may be used.

Notes:

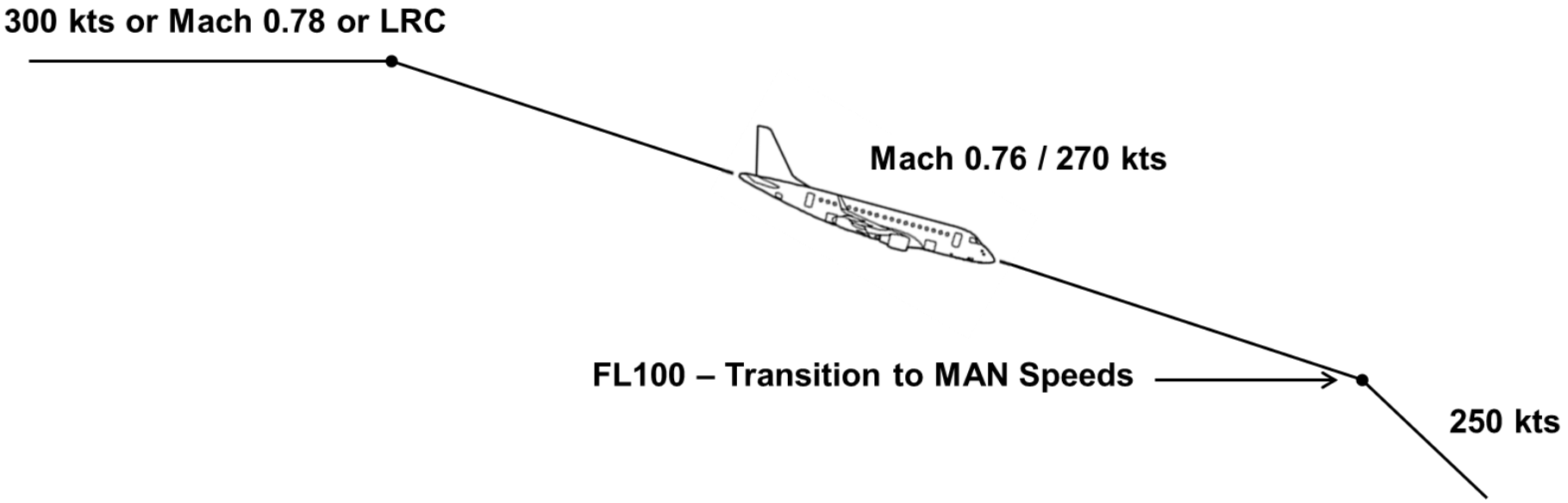
1. The VMO reduces to 300 kts below 10,000 ft so reducing to at least 290 kts is required if operating at ‘high-speed’ below 10,000 ft.

2. Planning is required to enable the aircraft rate of descent to be reduced between FL120 and FL100/10,000 ft for deceleration.

3. The aircraft may accelerate above 270 kts with a 3.5° FPA due to tailwind, icing or weight. The speed must be controlled by adjusting the ROD and the descent planning adjusted accordingly.

For more detailed planning see **2.17.5 – Initial Distance to Descent**.

2.17.4 Descent Profile



2.17.5 Initial Distance to Descent

The initial distance to descent can be found as follows:

If descent is accomplished in idle:

1. Calculate the difference between actual flight level and the desired flight level. Divide this value by 10.

2. Multiply the value found in item 1 by 2 and adds 15.

$$Dist = 2 \times \left(\frac{FL_{Difference}}{10}\right) + 15$$

If a descent angle of 3° is taken:

1. Calculate the difference between actual flight level and the desired flight level. Divide this value by 10 and multiply by 3.

$$Dist = 3 \times \left(\frac{FL_{Difference}}{10}\right)$$

Notes:

1. Deceleration from normal descent speed to 250 kt was considered.

2. Deceleration segment and wind effects were not considered.

2.17.6 Distance on Deceleration Segment

The initial distance to descent can be found as follows:

If the segment is accomplished levelled:

- 1 NM for each 10 kts without speed brakes.
- 0.5 NM for each 10 kts with speed brakes.

If the segment is accomplished with a rate of descent of 1000 ft/min:

- 2 NM for each 10 kts without speed brakes.
- 1 NM for each 10 kts with speed brakes.

To correct for wind effect:

- Add 1 NM for each 10 kts of tailwind.
- Subtract 1 NM for each 10 kts of headwind.

2.17.7 Descent Procedures

The PM shall normally make the "**CABIN CREW, 10 MINUTES TO LANDING**" PA and select the FSTN BELTS signs to ON prior to passing FL100/10,000 ft.

When passing FL100/10,000 ft the PM should complete the following Set-Up:

Descending through FL100/10,000 ft	
Speed Selector	MANUAL
Lights (Sterile/Side Landing and Taxi/Logo (at night)	ON
Signs	ON
WX/Terrain	As Required

For short sector lengths with an early descent or if extended mid-level holding is anticipated, in benign weather conditions, the FSTN BELTS … ON may be delayed until 10 minutes before landing rather than at FL100/10,000 ft. This will allow the cabin crew to complete the in-flight service.

2.17.8 Holding

Holding should generally be conducted at 210 kts in the clean configuration unless fuel is at a premium in which case Performance Manual figures should be used.

Note: Green Dot may be used to approximate Performance Manual figures whilst they are obtained from the manual.

In turbulent conditions the turbulent air penetration speed should be used for holding.

2.17.9 RNAV-1 STARs and Approach Transitions

For RNAV-1 STARs and approach transitions, the PF must use the FMS as the primary navigation reference, with LNAV engaged until either ATC discontinue the planned routing with radar vectors or the aircraft is established at the final approach fix. At this point a transition shall be made to the appropriate navigation aid(s) for the approach as per **2.19.3 – Approach Guidance Table**.

2.18 Approach

2.18.1 Approach Procedure and Checklist

When cleared below the Transition Level on the QNH, or when cleared for the approach from a Flight Level, the PF shall call for the altimeters to be set to QNH. Following this, the PF shall call for the Approach Checklist, which is read by the PM as Challenge and Response.

The 'below the line' items are to be completed inside 25 NM of the airfield to ensure that approach aids can be received and identified.

Altimeters_____SET and CROSS-CHECKED

- Set the altimeters to QNH no later than the Transition Altitude.

Note: The aircraft must be descending before changing the altimeter sub-scale, otherwise the Autopilot will react to the change of datum and attempt to maintain the selected altitude.

SPEED Selector_____MANUAL

- Check the SPEED Selector is set to Manual.

AUTOBRAKE_____SET

- Set the autobrake to LOW, MED or HI in accordance with the in-flight landing distance check. The use of HI should only be required in exceptional circumstances.

LIGHT_____ON

- Side Taxi, Side Landing and STERILE lights set ON. Logo light set ON at night.

SIGNS_____SET

- Check the FSTN BELTS sign is set ON.

Note: The Cabin Crew must be advised by PA of the expected duration until landing.

- - - - - - - - - - - - - - - - - - - 25 NM from Destination - - - - - - - - - - - - - - - - - - -

Approach Aids_____SET and CROSS-CHECKED

- Verify that the frequencies and courses that were pre-selected are correct for the intended approach.
- Ensure that both PFDs are displaying appropriate information. Pressing the PREV button cycles between on-side NAV course, cross-side NAV course and deselecting preview mode.
- Verify that the FMS are correctly set up for the intended approach including the missed approach procedure.
- ADF/VOR BRG needles can be displayed to aid situational awareness.

FUEL Panel_____SET

- Check the FUEL Panel is set as normal. The aircraft cannot be landed with crossfeed operating.

2.18.2 Continuous Descent Approach and Approach Gates

During the descent and approach a continuous assessment of aircraft altitude and position, in relation to terrain clearance and track miles to touchdown, must be made. Unless ATC

require an early descent, crews should plan for an idle thrust descent. Below FL100/10,000 ft it is recommended that crews transition to VS or FPA modes as appropriate to achieve the following profile/gates:

Distance	Height	Speed	Configuration
25	6000	250	Clean
15	3600	210	Clean
12	3100	190	Flap 1
10	2800	180	Flap 2
8	2400	160	Gear / Flap 3

When operating with the Autothrottle in SPD_T mode (during VS or FPA descents), the selected airspeed should be adjusted in a timely manner to minimise unnecessary thrust during the descent. This reduces cabin noise levels and increases fuel efficiency. When flaps and landing gear are extended, the next lower speed should be selected just as the additional configuration drag takes effect. Delaying the speed selection will cause an increase in thrust, while selecting the lower speed too quickly will cause thrust to decrease, then increase with resultant high pitch attitudes.

If any crewmember assesses the aircraft approach profile as inappropriate this must be verbalised and appropriate action taken by the PF. Note that the advisory gates are appropriate for still air conditions with engine anti-ice OFF. If ice protection systems operate during the descent, the increased engine bleed and thrust will affect the descent profile. Prompt action, or preferably anticipation during the brief and descent planning, is required to achieve an accurate profile.

2.18.3 Initial Approach

Initial positioning should be conducted inside 15 NM at 210 kts clean on the downwind leg. When approaching 12 NM from touchdown, the PF should call for Flap 1 and select speed 190 kts. After checking the speed, the PM will select Flap 1 and call completion of the configuration change.

On receiving a valid Radio Altimeter reading, the PF is to call for a "**POSITION CHECK**" and the PM shall make a positive statement which justifies continuing the approach after comparing significant factors in relation to terrain.

When given an intercept heading the PF should call for Flap 2 and select speed 180 kts. After checking the speed, the PM will select Flap 2 and call completion of the configuration change.

When on the inbound course and one dot below glideslope intercept (ILS approach) or 2 NM before the FAF (non-precision approach), the PF should call for Landing Gear down, Flap 3 and will select speed 160 kts. After checking the speed, the PM will select the Landing Gear down and Flap 3 and call completion of the configuration change. The PF will then call for the Before Landing Checklist, which the PM will call out as a combined challenge and response / read and do list down to the line.

On receipt of the Cabin Crew's call that the cabin is secure for landing the PM is to move the slider to the 'Secure for Landing' position. If the cabin has not been confirmed as secure by approximately 5 minutes prior to landing, the FSTN BELTS sign should be cycled to generate at least two chimes to inform the Cabin Crew that landing is imminent. The Cabin Crew should then contact the flight deck to confirm cabin secure.

By 4 NM on the final approach the PF should call for Landing Flap and select speed V_{AP}. After checking the speed, the PM will select the briefed Landing Flap and call completion of the configuration change. The Before Landing Checklist shall then be completed with the Nose Lights selected on with the landing clearance.

2.18.4 Flap Extension

The minimum manoeuvring speed for each configuration is displayed on the speed tape by the Green Dot. However, during normal operations the following speed schedule shall be used to reduce the aircraft pitch angle and to ensure an adequate margin on minimum manoeuvring speeds for all weights up to Maximum Landing Weight:

Flap Setting	Minimum Manoeuvring Speed (up to 30° of bank)
0	210 kts
1	190 kts
2	180 kts
3	160 kts
5	V_{AP} or 140 kts for circling
FULL	V_{AP}

During flap extension, when the next position has been selected and the additional drag begins to take effect it is important to reduce the speed selected promptly to the next minimum manoeuvring speed.

2.18.5 Glidepath Verification Check

A glidepath verification check shall be completed at 4 NM, the Outer Marker, or another specified altitude on the approach chart and agreed by the crew. This will be announced by the PF and cross-checked by the PM.

2.19 Final Approach

2.19.1 Selection of Landing Flap

Landing may be accomplished with either Flap 5 or FULL except that:

- Steep approaches can only be conducted with Flap FULL,
- Autoland, CAT II and CAT III approaches can only be conducted with Flap 5.

The use of Flaps 5 provides lower fuel consumption and reduced approach noise levels. In a comparison, a final approach segment with Flaps 5 burns 10 kg less than a Flaps FULL landing. Flaps 5 shall be selected if the potential for windshear is suspected unless limited by approach type (steep approach) or landing performance.

Consider using Flaps FULL when the field length requires its use. Additional runway limitations, such as known slippery conditions may require its use. Also consider Flaps FULL when the STALL PROT ICE SPEED is present in the EICAS.

2.19.2 Final Approach Speeds

2.19.2.1 CAT I, Non-Precision and Visual Approaches

Slat/Flap Setting: 5 or Full

V_{RF} Setting	If icing conditions are expected during the approach or the 'STALL PROT ICE SPEEDS' is displayed on the EICAS, V_{RF} shall be adjusted for ice accretion.
V_{AP} Setting	V_{AP} = V_{RF} + 1/2 steady headwind component + gust increment • Minimum V_{AP} = V_{RF} + 5 kts and maximum V_{AP} = V_{RF} + 20 kts. • With icing conditions / 'STALL PROT ICE SPEEDS': Minimum V_{AP} = V_{RF} + 0 kts and maximum V_{AP} = V_{RF} + 20 kts. Note: Performance values consider the threshold is crossed at the screen height and at V_{RF}.
V_{AC} Setting	EASA requires V_{AC} to be equal to V_{RF}.

2.19.2.2 Autoland, CAT II and CAT III Approaches

Slat/Flap Setting: 5

V_{RF} Setting	The reference speed for CAT II and CAT III approaches or AUTOLAND procedures are the same and are not adjusted for anticipated icing conditions or if the 'STALL PROT ICE SPEEDS' message is displayed on the EICAS.
V_{AP} Setting	V_{AP} = V_{RF} + 1/2 steady headwind component + gust increment • Minimum V_{AP} = V_{RF} + 0 kts and maximum V_{AP} = V_{RF} + 20 kts. Note: Performance values consider the threshold is crossed at the screen height and at V_{RF}.
V_{AC} Setting	EASA requires V_{AC} to be equal to V_{RF} CAT III.

2.19.3 Approach Guidance Table

Approach Type	Minima	Primary Nav Source	Prior to Arm	Arm	FMA	During G/A Select
CAT I ILS	Baro	ILS	PREV or V/L	APP[1]	LOC GS	FMS[2] then NAV or HDG
CAT II/III ILS	RA	ILS	PREV or V/L	APP[1]	LOC GS	FMS[2] then NAV or HDG
LOC Only	Baro	LOC	PREV	V/L then NAV	LOC FPA or VS	FMS[2] then NAV or HDG
VOR[3]	Baro	FMS	PREV[4]	NAV	LNAV FPA or VS	NAV or HDG
			-	APP[5]	LNAV GP	
		Raw Data	PREV or V/L	-	HDG FPA or VS	FMS[6] then NAV or HDG
NDB[3]	Baro	FMS	-	NAV	LNAV FPA or VS	NAV or HDG
				APP	LNAV GP	
		Raw Data		-	HDG FPA or VS	
RNP[3] (LNAV)	Baro	FMS	-	NAV	LNAV FPA or VS	NAV or HDG
			-	APP	LNAV GP	
RNP (LNAV/VNAV)	Baro	FMS	-	APP	LNAV GP	NAV or HDG
RNP/RNAV Visual	Baro	FMS[7]	-	APP	LNAV GP	NAV or HDG

Note:

1. If cleared to establish the localiser but not for the ILS, select V/L then NAV to arm LOC. Once cleared to descend on the ILS, select APP to arm GS.
2. FMS must be re-selected as the navigation source for LNAV to be available following a go-around.
3. LNAV/GP is the recommended approach guidance for VOR, NDB and RNP (LNAV) approaches.
4. The preview mode can be used as a method to monitor the course bar for the VOR while FMS is the primary source. The VOR mode cannot be captured as it is not a capability of the Primus EPIC system.
5. If preview mode is active, pressing APP button will not arm LNAV. It is necessary to arm using the NAV button.
6. If V/L is selected, FMS must be re-selected as the navigation source for LNAV to be available following a go-around.
7. FMS guidance within the visual segment is advisory only and visual references must be used as the primary navigation reference.

2.19.4 Approach Monitoring

The PM is responsible for monitoring all phases of the approach and shall call out any observed discrepancies:

- Any deviation from the flight director guidance – "**GUIDANCE**"
- Rate of descent in excess of 900 ft/min (1,500ft/min for steep approach) – "**SINK RATE**"
- Airspeed above target speed + 10 kts – "**SPEED**"
- Airspeed below target speed – 5 kt or below VRF, whichever is higher – "**SPEED**"
- Localiser deviation in absence of flight director – "**LOC**"
- Glideslope or FMS vertical deviation in absence of the flight director – "**GLIDE**"
- Any Autopilot malfunction – call the failure
- Flight director failure to arm or to engage the next expected mode – call the failure
- Perform call outs in case the EGPWS fails to do so automatically.

The PM shall monitor the airspeed and pitch attitude throughout the final part of the approach and flare and call out any excursion from V_{AP}. If the pitch attitude during the flare is 10° or greater the PM shall call out "**ATTITUDE**". If the corrective action taken by PF fails to correct the speed trend or pitch attitude, or if the approach becomes unstable, the PM shall call "**GO-AROUND**" and a missed approach must be flown.

2.19.5 Stable Approach Criteria

Crews shall comply with the stable approach criteria documented at **OM-A 4.3.15.9.2**. To summarise, on all approaches the aircraft must be stable by the 1,000 RA auto-callout or any approach specific variation documented in the OM-C. All of the following criteria must be met:

- In the planned landing configuration
- Stabilised on the correct vertical and lateral profile
- Stabilised at the target approach speed.

If the stable approach criteria have not been met by the 1,000 ft RA auto-callout or approach specific variation, a go-around must be flown. Exceptionally, when gusts, turbulence or compliance with an appropriate ATC speed restriction (for example, 160 kts to 4 DME) prevents speed stability from being achieved, the approach may be continued only if the speed is no greater than 20 kts above V_{AP} and reducing. In this case, a callout of "**SPEED**" shall be made, and the aircraft must then achieve speed stability before 500 ft RA.

2.19.6 Control Handover at DA

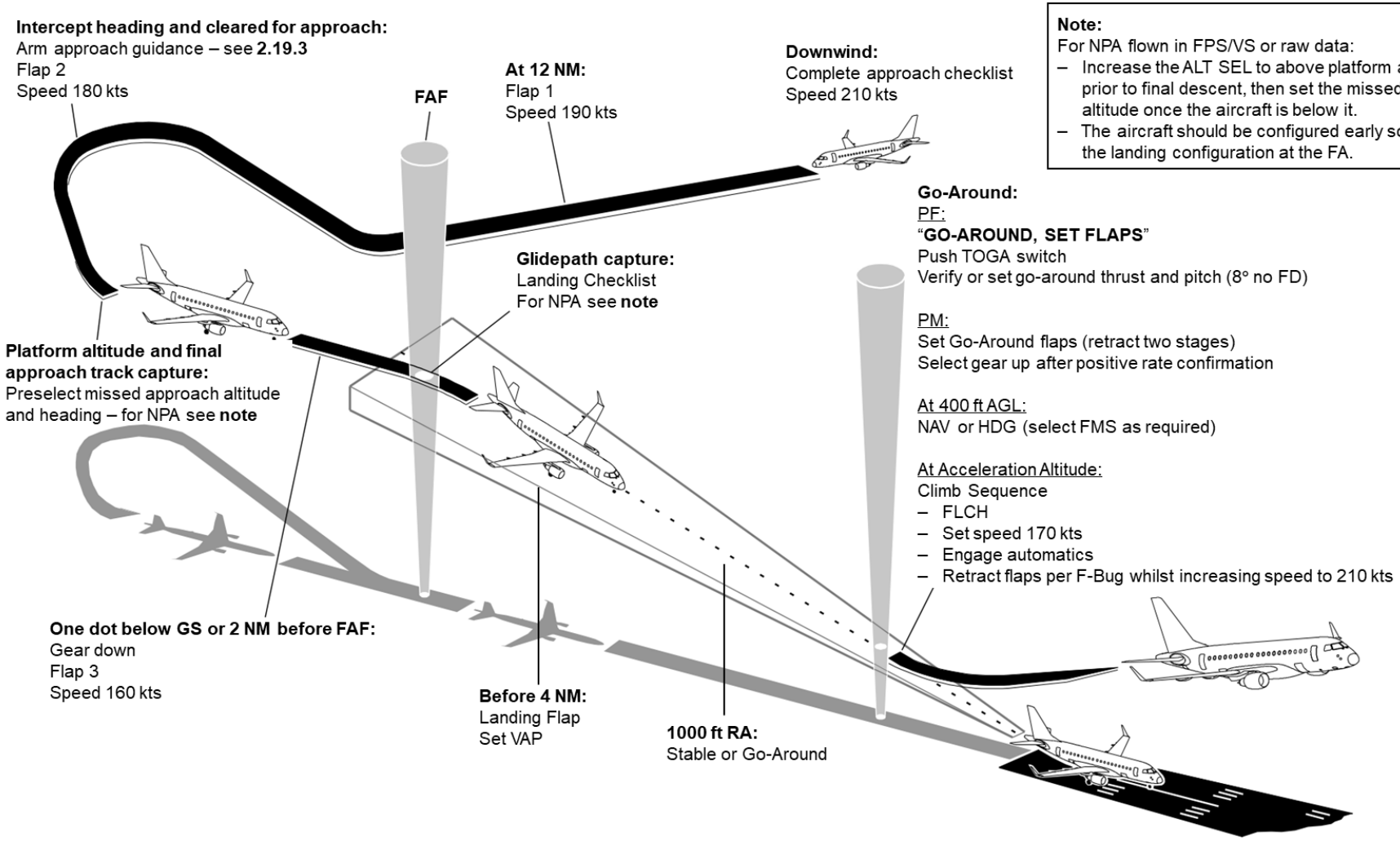
At the Decision Altitude the PF will call "**DECIDE**" and the PM will reply with "**CONTINUE, I HAVE CONTROL**" or "**GO-AROUND**". If the decision is to land, then the P1 will take control and become PF for the landing. P2 will revert to PM and continue to monitor the remainder of the approach and landing.

The P1 may take control earlier in the approach if:

- They are visual, **and**
- The stable approach criteria have been achieved.

In this instance, the P1 is to make a call of "**VISUAL, I HAVE CONTROL**". Careful consideration must then be given to whether all the checks have been completed or whether the checklist needs to be handed over to the P2 for completion.

2.19.7 Final Approach Profile



Note:
For NPA flown in FPS/VS or raw data:
- Increase the ALT SEL to above platform altitude prior to final descent, then set the missed approach altitude once the aircraft is below it.
- The aircraft should be configured early so that it is in the landing configuration at the FA.

2.19.8 Final Approach and Landing Actions and Callouts

Approach and Landing – Actions and Callouts		
	PF	**PM**
Downwind or 12 NM	Speed to 210 kts "**FLAP 1**" Set 190 kts	 Check speed "**SPEED CHECKED**" "**FLAP 1**" – Select Flap 1 Monitor extension "**FLAP 1 SET**"
Base leg or intercept heading	"**FLAP 2**" Set 180 kts	Check speed "**SPEED CHECKED**" "**FLAP 2**" – Select Flap 2 Monitor extension "**FLAP 2 SET**"
Cleared for approach	Arm approach per the approach guidance table (2.20.2) "**APPROACH ARMED**" "**LOC CAPTURE**" or "**LNAV MAGENTA**" **Note 3** Preselect missed approach heading and altitude **Note 4**	 "**CHECK**" "**LOC ACTIVE**" or "**COURSE ACTIVE**" **Notes 1 and 2** "**CHECK**" "**GLIDE SLOPE ACTIVE**" or "**APPROACHING GLIDE PATH**" **Notes 2 and 5**
One dot below GS or 2 NM before FAF	"**GEAR DOWN, FLAP 3**" Set 160 kts	Check speed "**SPEED CHECKED**" "**GEAR DOWN**" – Select gear "**FLAP 3**" – Select Flap 3 Monitor extension "**GEAR IS DOWN**" "**FLAP 3 SET**"
Glidepath capture	"**GS CAPTURE**" or "**GLIDE PATH MAGENTA**" or "**FPA / VS GREEN"** **Note 6** "**LANDING CHECKLIST**"	 "**CHECK**" Commence Landing Checklist
Glidepath verification	"**PASSING [ ] FT**"	 "**CHECKED**"
Before 4 NM	"**LANDING FLAP**" Set V_{AP}	Check speed "**SPEED CHECKED**" "**FLAP [ ]**" – Select Landing Flap Monitor extension "**FLAP [ ] SET**"

1,000 ft RA auto-callout		**"STABLE"** **Note 7** **"MANLAND [ ] BARO/RADIO"** or **"AUTOLAND [ ] RADIO, AUTOLAND GREEN"** **Note 8**
Landing clearance		Set nose lights ON **"LANDING CHECKLIST COMPLETE"**
100 ft above DA/H	**"100 ABOVE"** **Notes 9 and 10**	**"CHECK"**
DA/H	**"DECIDE"** **Notes 9 and 10**	**"CONTINUE, I HAVE CONTROL"**
HANDOVER OF CONTROL		
Landing roll	Select reverse thrust Select thrust idle Deselect autobrakes	Confirm ground spoilers deployed **"SPOILERS"** Confirm reverse operating **"REVERSE"** **"60 KNOTS"**
If FO landing	P1 – FO	P2 – Captain
	Vacate on high-speed exit using rudder pedal steering or Slow to normal taxi speed **"YOU HAVE CONTROL"**	 Once normal taxi speed is achieved **"I HAVE CONTROL"**

Note:

1. Call "**LOC ACTIVE**" for ILS and LOC approaches or "**COURSE ACTIVE**" for VOR, NDB and RNP approaches.

2. When the aircraft is being flown manually or a raw data approach is being conducted, "**LOC ACTIVE / COURSE ACTIVE**" and "**GLIDE SLOPE ACTIVE / APPROACHING GLIDE PATH**" will be called by both pilots.

3. Call "**LOC CAPTURE**" when LOC becomes active on the FMA for ILS and LOC approaches or "**LNAV MAGENTA**" when LNAV becomes active on the FMA for VOR, NDB and RNP approaches flown in LNAV.

4. The aircraft must be level at the platform altitude before preselecting the missed approach altitude. If conducting a non-precision approach in VS or FPA modes, do not preselect the missed approach altitude until the aircraft has descended below it, otherwise the aircraft will inadvertently level off in ASEL during the final approach.

5. Call "**GLIDE SLOPE ACTIVE**" for ILS approaches or "**APPROACHING GLIDE PATH**" at 2 NM before the FAF for non-precision approaches regardless of the vertical guidance being used.

6. Call "**GS CAPTURE**" when GS becomes active on the FMA for ILS approaches, or "**GLIDE PATH MAGENTA**" when GP becomes active on the FMA for non-precision approaches flown in GP mode, otherwise call "**FPA**" or "**VS**" depending on the vertical mode used.

7. A call of "**SPEED**" may be made per **2.19.5** with a subsequent call of "**STABLE**" before 500 ft RA.

8. These calls are to be made only once stable but may be combined with the 1,000 ft RA call if stable at this point. When conducting an Autoland, confirm AUTOLAND 1 is engaged in green on the FMA. A "**MANLAND [ ] BARO**" call is omitted if a "**VISUAL**" call is made prior.

9. If the P1 has called "**VISUAL, I HAVE CONTROL**" prior to DA/H then the P2 will make the "**100 ABOVE**" and "**DECIDE**" calls and the P1 will call "**LAND**" or "**GO-AROUND**".

10. If a visual approach is being made, then a nominal 300 ft AAL will be used for the "**100 ABOVE**" call and 200 ft AAL for the "**DECIDE**" call.

Prior to landing, there are four requirements that must be achieved during the final approach:

- The aerodrome RVRs must permit continuing past the approach ban point (1,000 ft AAL) in accordance with **OM-A 4.1.4.10**.
- The glidepath verification check must be made as described at **2.18.5** alongside the requirements of **OM-A 4.3.15.18**.
- The stable approach criteria are achieved in accordance with **OM-A 4.3.15.9.2**.
- There has been a confirmation of landing intention ("**MANLAND…**" or "**AUTOLAND…**" callout) and, if conducting an Autoland, AUTOLAND 1 is engaged in green on the FMA.

If any of these requirements are not met then a go-around must be conducted.

2.20 Steep Approaches

The steep approach procedure is applicable to approaches where the angle of descent on final path for landing is greater than or equal to 4.5°. BAV CityFlyer have operational approval to conduct steep approaches only at LCY.

Alongside the procedures below, crew must follow the standards applicable for the type of approach being conducted at LCY, be that ILS, LOC or radar to visual.

2.20.1 Landing Configuration

The SLAT/FLAP setting for steep approaches is FULL.

2.20.2 Steep Approach Procedure

Plan to be in landing configuration at or immediately after intercepting the final approach descent path because of the lower deceleration rate attainable during steep descents.

The aircraft should reach the descent point configuring for landing, with landing gear down, SLAT/FLAP 5 at least, steep approach mode armed and with the speed reducing to V_{AP} for steep approach. During the final configuration change, the PM should select Flap 5 initially because the Flap FULL limiting speed is 165 kts. Once the speed starts reducing then Flap FULL can be selected.

Avoid an early selection of Flap FULL prior to descent because the spoilers will deploy in level flight with a resultant increase in drag.

Speed control is critical when conducting steep approaches as once established on the final approach with the landing gear selected down and Flap FULL selected there is very little opportunity to reduce a high approach speed without retarding the thrust levers to an unacceptably low setting.

Autothrottle should be used throughout, but the PF must be prepared to override.
The Autopilot can be used until 167 ft AGL.

2.20.3 Steep Approach Conditions of Operation

To arm steep approach mode, the following conditions must be met:

- STEEP APPR button is pushed
- Both thrust levers are set below 70° (TOGA detent)
- Angle of attack is less than stick-shaker firing angles – 1°
- TOGA buttons not pushed
- Autoland is not engaged.

To engage steep approach mode, the following conditions must be met:

- Steep approach mode is armed
- Three weight-on-wheel (WOW) sensors indicate ‘In-Air’
- Flaps reach FULL

2.20.4 Wind Limitations

The crosswind limitation for steep approaches is 25 kts.

The tailwind limitation for steep approaches is 5 kts.

2.20.5 Use of Automation

The use of Auto Pilot and Auto Throttle is recommended; however, no restrictions apply for steep approaches conducted with the Autopilot and/or Autothrottle disengaged

2.20.6 London City Landing Roll

Aircraft landing performance at LCY with autobrake leads to a restricted MLW, which is not the case for manual braking. In order to achieve the higher MLW associated with manual braking whilst retaining the safety benefits of autobrake, crews shall:

- Select Autobrake MED
- Make an early transition to manual braking when compared to operating on longer runways.

Note: There is no restriction to operating into LCY without Autobrakes. The performance figures are for manual braking and the SOP for using Autobrake MEDIUM is purely to aid safety and comfort during the landing roll rather than a requirement.

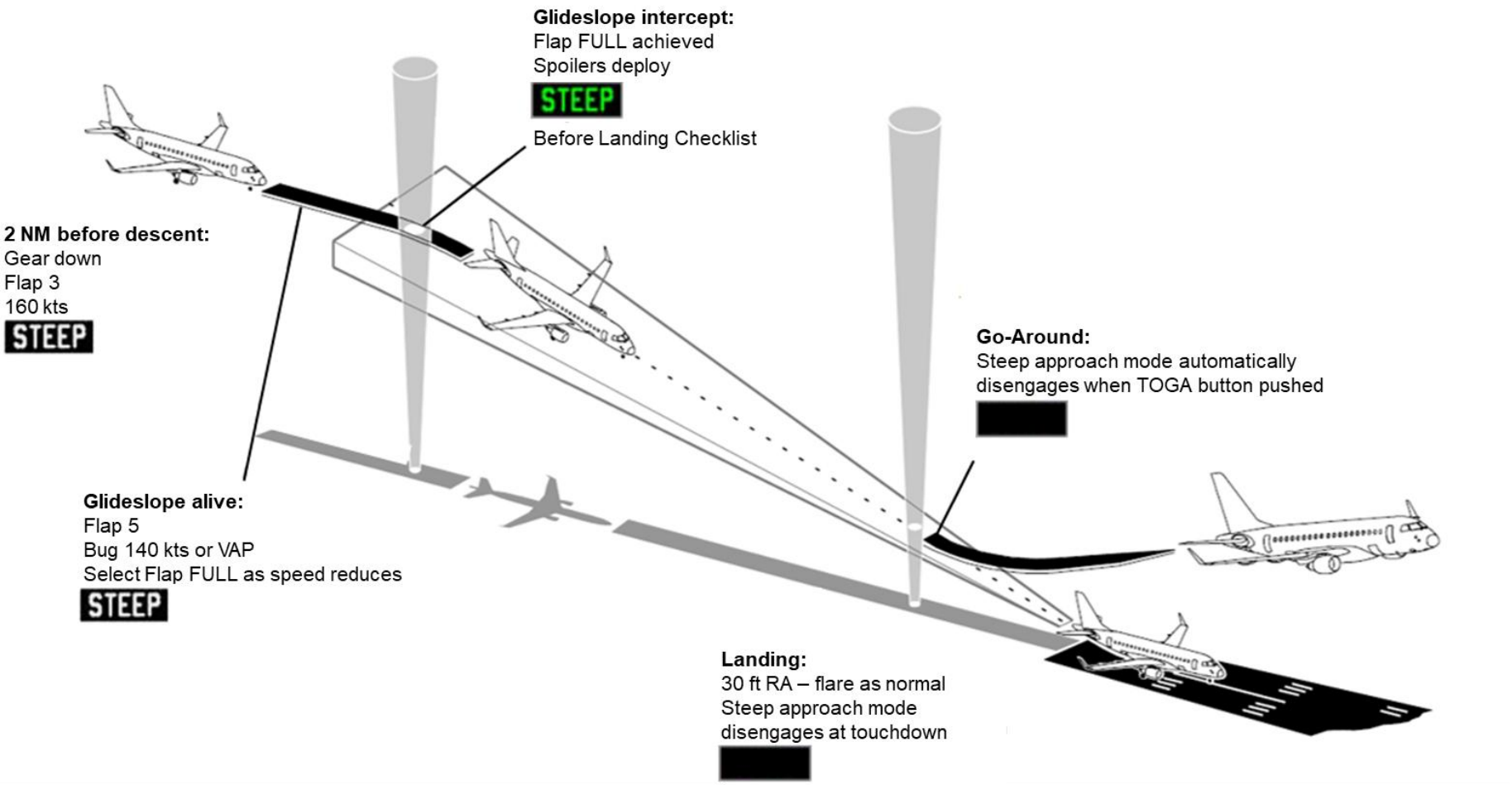
2.20.7 System and Engine Failures

Any failure of the steep approach mode on final should lead to a go-around unless it is immediately obvious that the remainder of the approach can be conducted without the steep approach capability, for example on short final.

An engine failure above DA shall lead to a go-around. Below DA, the approach may by continued maintaining the current aircraft configuration.

The demonstrated height loss during a go-around after engine failure is 120 ft with or without the use of the Autopilot.

2.20.8 Steep Approach Profile



2.21 Non-Precision Approaches

2.21.1 Introduction

These procedures are applicable to VOR, NDB, LOC and RNP approaches and should be referenced alongside the approach guidance table at **2.19.3**.

With the exception of LOC approaches, it is recommended that all non-precision approaches are flown in LNAV using the FMS as the primary source of navigation.

It is recommended that the VNAV GP (VGP) mode is used to conduct the final descent. However, this can also be completed using either FPA or VS mode. When using LNAV and VGP mode, arm the approach using the APP button. Confirm LNAV and GP engage at the appropriate points and then monitor the lateral and vertical deviation scales alongside published step-down altitudes. Configure the aircraft as per the profile at **2.19.7**.

When using FPA or VS mode, approaching the descent point the procedure may be continued provided that the aircraft is within 5 degrees of the inbound radial. The aircraft should be configured early so that it is in the landing configuration at the FAF per the note in the profile at **2.19.7**. The ALT SEL should be increased above the platform altitude prior to initiation of the descent and then reset to the missed approach altitude once the aircraft is below it. The appropriate FPA or VS should be selected 0.2 NM before the descent point. If using FPA, preselect FPA zero degrees before the descent point in preparation. This should be done after the configuration change to avoid associated ballooning. The PM shall call altitude against distance during the approach and the PF adjusts the FPA or VS value as required. If the approach is being flown manually, the PM should change the FPA or VS setting on the PF's command.

When using FPA the corrections required roughly equate to 0.1 degree to every 10 ft deviation. For example, if you are 50 ft high, then the FPA should be adjusted by 0.5 degrees.

2.21.2 FMS as Primary Navigation Source

The FMS supports the following non-precision approach types: VOR, VOR/DME, NDB, NDB/DME and RNP.

Final approach segment of ILS, LOC, visual, and radar final approaches using the FMS as the navigation source for guidance are prohibited.

Note: RNAV/RNP Visual approaches are authorised and may be flown using LNAV and VNAV, however, FMS guidance within the visual segment is advisory only and visual references must be used as the primary navigation reference.

When conducting a VOR or NDB approach, the FMS must be operated as at least a single system, with a minimum of one PFD and one MFD operational prior to commencing an approach. Equipment requirements for RNP approaches are documented at **2.2.3.4**.

For RNP approaches the FMS IS the sole navigation source. For VOR and NDB approaches, the primary radio navaid that defines the final approach track and the associated on-board receiver must be verified as operational prior to commencing an approach. The primary radio aid is to be identified and monitored during the approach to provide a raw data cross-check. Both pilots must tune the required navaid and display bearing pointers or course preview as appropriate.

Refer to **2.2.3** for FMS operation guidance for approaches conducted using FMS guidance.

2.21.3 FMS Database

The procedure to be flown must be retrieved from the FMS database and a thorough verification of all waypoints, tracks, distances, glideslope angles, altitude constraints and threshold crossing altitudes is to be conducted as part of the approach briefing.

2.21.4 Pilot Interventions to the Database

2.21.4.1 Lateral

No changes in the lateral flight plan are allowed beyond the IAF.

Under radar vectors the use of the ACTIVATE VECTORS prompt is permitted but no changes are allowed beyond FAF.

2.21.4.2 Vertical

Altitude constraints may be modified to higher altitudes but the platform altitude over the FAF must not be changed since it will result in a change to the final path descent angle.

2.21.5 Vectors to Final

When under radar vectors to a final approach to be flown using the FMS as the primary source of navigation, the following recommendations apply:

- Use HDG lateral mode and either FPA or VS vertical mode until cleared to intercept the final approach course.
- On the downwind leg it is recommended to use the ACTIVATE VECTORS prompt to extend the final approach track.
- Arm LNAV using the APP or NAV button only when on the final heading to intercept the final approach course – see approach guidance table for appropriate procedure.

2.21.6 LOC Only Approaches

During a LOC only approach, when cleared to intercept the localiser, a transition from LNAV and VNAV modes must be completed as follows:

- Select an appropriate vertical mode.
- Select HDG mode.
- Change the PFD navigation source to V/L.
- Arm LOC mode using the NAV button.

2.21.7 Continuous Descent Final Approach Technique

Except where specifically authorised in the OM-A and corresponding OM-C entry, descent from the platform altitude to the MDA(H)/DA(H) shall be conducted using the Continuous Descent Final Approach (CDFA) technique.

The company has authorisation to treat an MDA(H) as a DA(H) with no height add-on subject to the criteria specified at **OM-A 4.1.4.6.2**.

2.21.8 Non-Precision Approach Profile

Refer to **2.19.7 – Final Approach Profile** and **2.19.3 – Approach Guidance Table**.

2.22 Circling Approaches

2.22.1 Overview

A Circling Approach will normally only be flown when the available instrument approaches do not serve the landing runway or when a straight-in approach is not authorised.

During the approach the configuration is maintained at Flaps 5 with the landing gear down and a speed of 140 kts. The circling minima is to be set in the ALT SEL so that the FD, and Autopilot if engaged, will ensure capture of the circling altitude.

Note: If the initial approach is an ILS, the aircraft will not capture the ALT SEL in GS mode. Instead, the procedure for a LOC approach using FPA or VS modes shall be used per the approach guidance table to avoid descending below the circling minima. Glideslope information may still be used for vertical guidance prior to levelling off at circling minima.

Following altitude capture at the circling minima, the ALT SEL shall be set to the appropriate missed approach altitude.

The direction of the circuit should be chosen to allow maximum visibility of the airfield by the pilot flying the approach, normally P2, and is flown at the published minima or 1000 ft AAL whichever greater. In the event of a strong crosswind, it is advisable to fly the circuit downwind if possible, to avoid the risk of a tightening final turn.

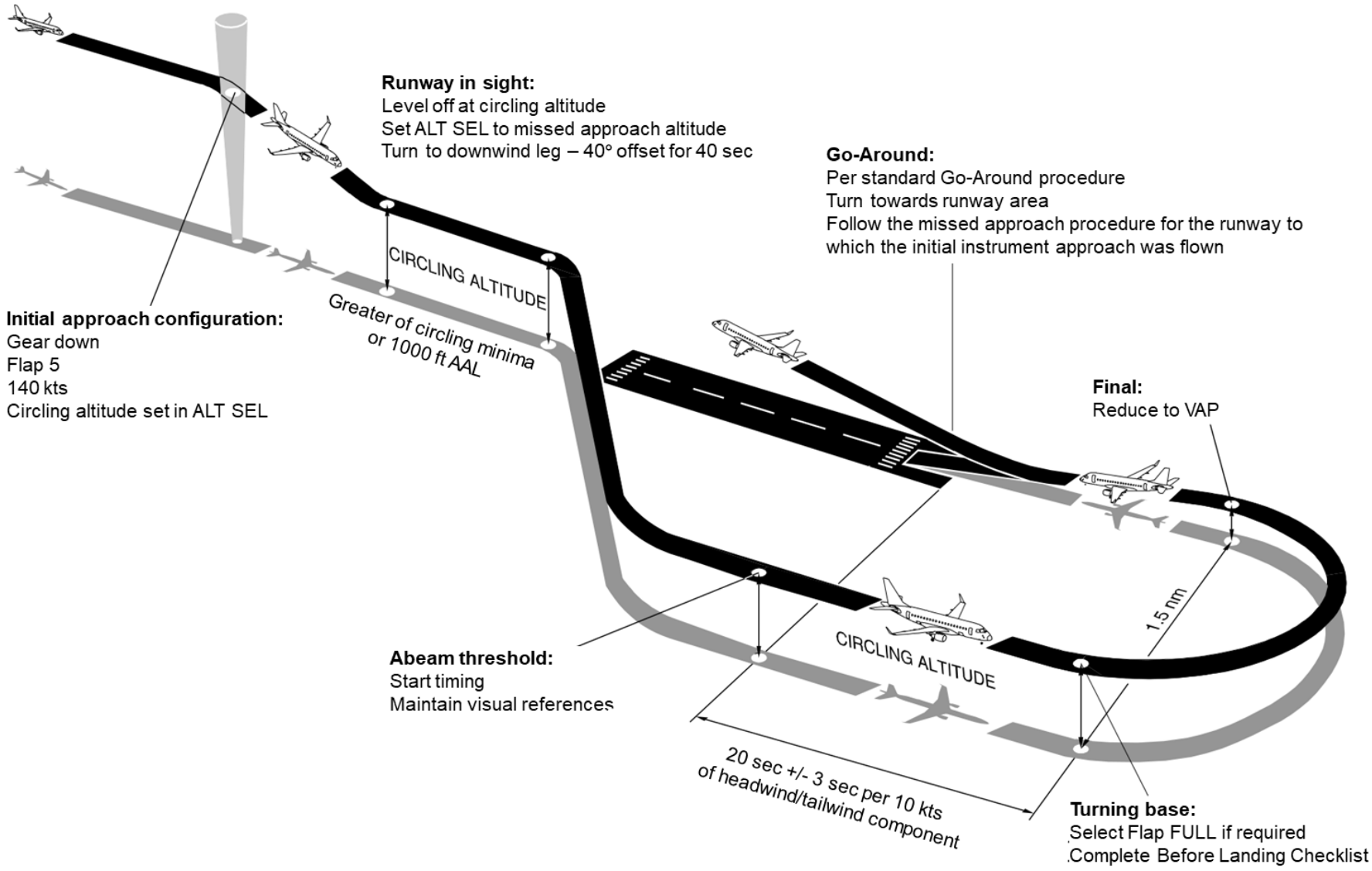
Although a circling approach may start from various intercept angles to the landing runway, the pattern to be flown after passing abeam the landing runway should always be standard. A standard rate turn onto a track of 40° offset from the runway extended centreline to be maintained for 40 seconds from the start of the turn will provide an adequate offset for the downwind leg. In still air, the downwind leg should be maintained for 20 seconds beyond the runway threshold before starting the final turn. This should be adjusted by 3 seconds for every 10 knots of headwind or tailwind component – with a headwind component increase the downwind timing; with a tailwind component decrease the downwind timing.

The aircraft must not be descended from the circling altitude, or the landing configuration selected, until the runway is in sight. The P1 should not normally take control until the threshold is in view and a landing is assured. However, in marginal weather or other limiting conditions, where a choice of circuit direction is available, consideration should be given to the visual manoeuvring being flown by the aircraft commander. At the briefing stage an appropriate time for the handover of control should be discussed and consideration given to the appropriate response and its meaning at the “**DECIDE**” call.

If a further flap change is required (that is, a Flap FULL landing) this will be selected whilst turning onto base leg and then, on final, speed is reduced to V_{AP}.

In the event of a go-around during a circling approach the aircraft should be turned towards the runway area and then positioned to follow the missed approach procedure for the runway to which the initial instrument approach was flown.

2.22.2 Circling Approach Profile



2.23 Visual Approaches

2.23.1 Overview

Visual approaches should not normally be flown when an instrument approach procedure is available. If a visual approach is conducted, the stabilised approach criteria must still be achieved by 1,000 ft RA and any local noise abatement or visual prescribed track procedures must be strictly complied with.

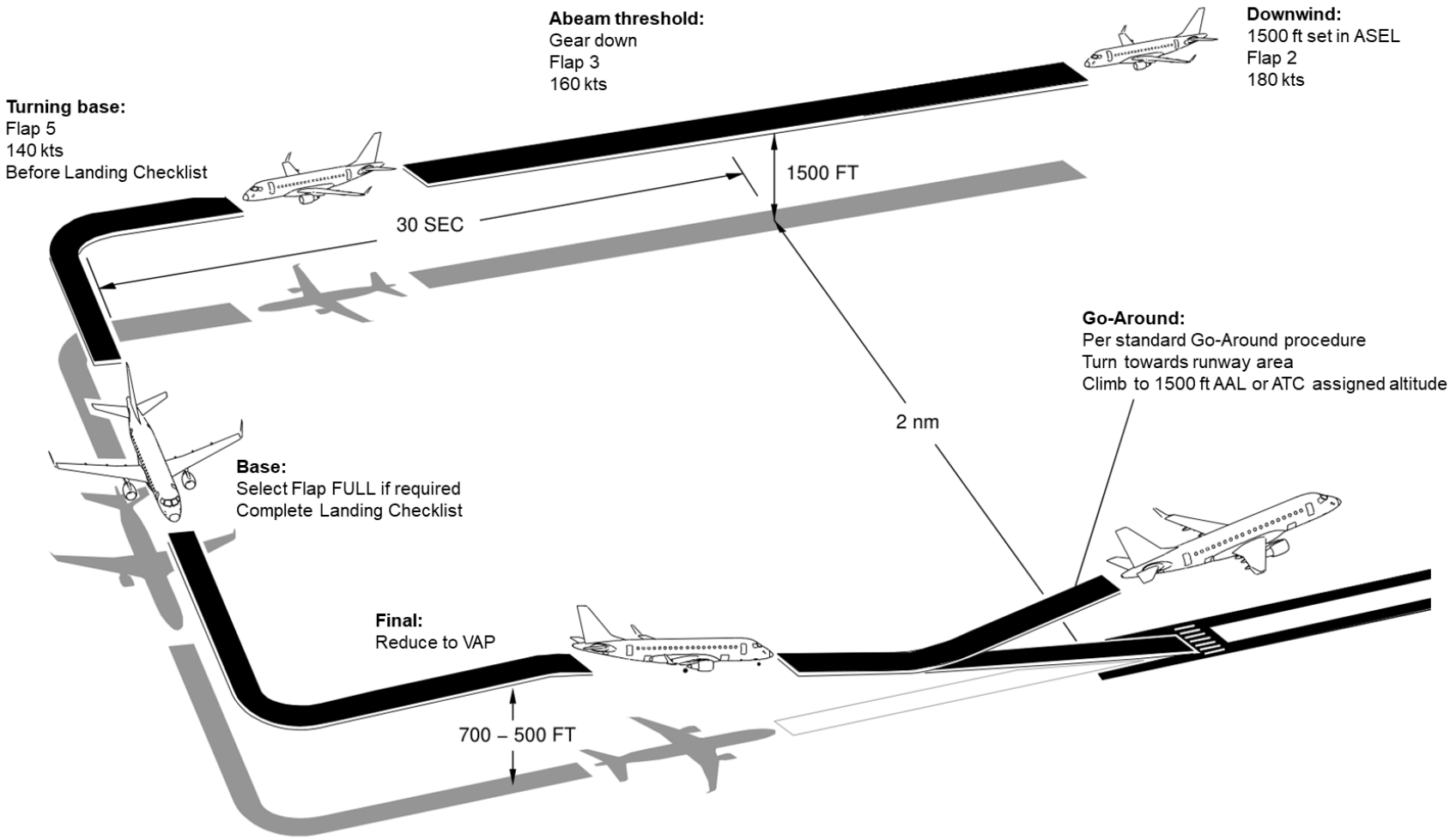
If a visual or circling approach is anticipated, in order to take maximum advantage of the available view from the aircraft, left-hand circuits should normally be flown from the left-hand seat and right-hand circuits from the right-hand seat.

Subsequently, where there is a change of control to the landing pilot, this should be delayed until they have acquired suitable visual reference of the runway which will be maintained to touchdown. This must be no later than 300 ft AAL.

If a visual approach is being made, then a nominal 300 ft AAL will be used for the "**100 ABOVE**" call and 200 ft AAL for the "**DECIDE**" call.

WARNING: WHEN MANUAL FLYING WITH FLCH SELECTED, THE SPEED CONTROL IS PROVIDED BY PITCH (SPD_E MODE). THEREFORE, THE AUTOTHROTTLE WILL REMAIN AT IDLE EVEN WHEN TRYING TO LEVEL OFF. THIS WILL RESULT IN A RAPID SPEED REDUCTION.

2.23.2 Visual Approach Profile



2.24 Landing

2.24.1 Before Landing Checklist

The Before Landing Checklist is read by the PM as a combined challenge and response and read and do:

Cabin Report ..... RECEIVED

- Check the cabin report has been received and 'Secure for Landing' displayed.

Landing Gear _____ DOWN

- Check gear lever is in the down positions with three green indicators.

Missed Approach Data _____ SET

- Confirm the missed approach altitude is set in the ALT SEL.
- Confirm a suitable heading is selected.
- Confirm GA is indicated as the Thrust Rating Mode.

- - - - - - - - - - - - - - - - - - - By 1000 ft - - - - - - - - - - - - - - - - - - -

SLAT/FLAP _____ LANDING SET

- Confirm correct landing slats and flaps are set and indicated.

Nose Lights ..... ON

- When cleared to land, select nose landing and nose taxi lights ON.

Steep Approach Before Landing Checklist

The checklist for a steep approach is amended as follows to ensure correct system configuration:

Cabin Report ..... RECEIVED

- Check the cabin report has been received and 'Secure for Landing' displayed.

Landing Gear _____ DOWN

- Check gear lever is in the down positions with three green indicators.

Missed Approach Data _____ SET

- Confirm the missed approach altitude is set in the ALT SEL.
- Confirm a suitable heading is selected.
- Confirm GA is indicated as the Thrust Rating Mode.

SLAT/FLAP _____ FULL

- Confirm slats and flaps FULL are set and indicated.

STEEP Approach _____ GREEN

- Confirm the steep approach mode has activated.

Nose Lights ..... ON

- When cleared to land, select nose landing and nose taxi lights ON.

2.24.2 Landing Technique

After control handover the PF shall maintain the correct visual approach path using the PAPIs, backed up with ILS information. Flying the PAPIs will help to ensure the aircraft lands in the touch down zone. It is not acceptable to allow the aircraft to dip into three reds, in order to expedite runway vacation. Any deviation from two whites / two reds shall be brought to the attention of the PF by the PM. Corrective action shall be taken by the PF to place the aircraft on the correct vertical profile.

Airspeed, power and descent rate should be stabilised early. Avoid power off approaches. Fly the airplane on a stable glideslope towards the touch down point. Large changes in airspeed require large changes in thrust and attitude to correct. Speed must be kept within + 10 kts / − 5 kts relative to the target approach speed, but never less than V_{RF}.

Avoid excessive rates of descent during final approach. If an excessive rate of descent develops, a missed approach must be performed immediately. Make sure that the airplane is properly trimmed during the approach. This maximises elevator authority for the flare or in the event of a missed approach.

The V_{AP} must be bled off in such a way that over the threshold, the target speed will be V_{RF}. Crossing the threshold with V_{RF} assures the performance values.

Note: Performance values consider the threshold is crossed at the screen height and at V_{RF}.

As the airplane approaches the touch down point, reduce the rate of descent with the flare starting at 30 ft RA and slowly reduce the thrust levers to idle so that they are at idle when the airplane touches down. Plan to touch down no later than the 1000 ft point. Do not allow the airplane to float in ground effect, which unnecessarily increases the landing distance and risk of a tail strike.

Note: At Flap 5 and with no ice increment the E190 is slow and particularly nose up when landing.

Use the pedal steering to control the airplane until reaching the taxi speed. The pedal steering maybe used by the FO when PF to turn onto a high-speed exit prior to the transfer of control to the Captain for the taxi in.

2.24.3 Crosswind Landing

Four methods for crosswind landing can be used on the E190:

Sideslip	Downwind rudder combined with aileron applied into the wind. The upwind wheels touch down before downwind wheels.
Crab	Proper rudder and upwind aileron. On very slippery runways the crab may be maintained to touchdown which reduces drift toward the downwind at touchdown.
De-crab	On final approach the crab is accomplished and just prior to touchdown while flaring, downwind rudder is applied to align the airplane with the runway centreline simultaneously with aileron control to maintain wings level. Both main landing gear touchdown simultaneously.

Crab and sideslip	The crab method is applied until the touchdown. When the upwind wheels touchdown, a slight increase in downwind rudder simultaneous with aileron aligns the airplane with the runway centreline while keeping the wings level. This combined method may be used during strong crosswind.

2.24.4 Landing with Tailwind above 10 kts

All landings with a tailwind component greater than 10 kts will be a Captains only landing.

When landing with a tailwind component of greater than 10 kts up to a maximum of 15 kts, the following procedures shall be applied:

SLAT/FLAP ..... **FULL**

Autobrake ..... **MEDIUM**

If operational reasons require a landing with a tail wind greater than 10 kts, the technique with Flap FULL requires a minimal flare. Crews are to ensure that any extra speed that has been added has been bled off when entering the flare.

They are also to ensure that the aircraft does not enter a prolonged flare and if the main wheels have not touched down within the landing zone a baulked landing procedure must be commenced.

2.24.5 Tail Strike Considerations

The possible causes of a tail strike on landing are:

- Approach at improper pitch, speed, thrust and glideslope angle
- Prolonged flare
- Improper crosswind correction during the flare
- Over-rotation during a touch and go.

Lack or poor handling of the landing technique can lead to a destabilised approach which increases the tail strike risk.

If the pitch attitude during the flare is 10° or greater the PM shall call out "**ATTITUDE**". If the corrective action taken by PF fails to correct the pitch attitude the PM shall call "**GO-AROUND**" and a missed approach must be flown.

2.24.6 Bounced Landing

In case of a bounced landing the go-around procedure is recommended since it is very difficult to evaluate landing distance remaining and airplane energy. If the airspeed has dropped below V_{RF}, initiate the go-around procedure and retract the flaps only when the airspeed becomes greater than V_{RF} + 5 kts.

2.24.7 Wing or Engine Strikes during Landing

A wing tip or engine nacelle strike will occur if the bank angle exceeds 18° at touchdown or 16° when the gear strut is compressed.

2.25 Missed Approaches

2.25.1 Go-Arounds and Missed Approaches

A go-around typically occurs in one of two situations. It may be necessary to discontinue the approach whilst the P2 is acting as the PF, either because there is inadequate visual reference at DA/DH for the P1 to take control for landing or there may be other circumstances such as an unstable approach or RVR deterioration which require the approach to be terminated. This is generally regarded as a typical missed approach.

Under less common circumstances, it will be necessary for the approach to be terminated after the P1 has taken control. The probability of being unable to complete the landing in this circumstance is low, and in effect a decision to land has been made. If this decision has to be reversed, the resulting go-around in which P1 is the PF is in effect a rejected landing. Pilots should bear in mind that psychologically it is easier to continue with a decision once made, than to reverse it, even if reversal becomes advisable. It is therefore harder to initiate a rejected landing than a missed approach. If there is any doubt as to whether circumstances will allow the landing to be completed safely, the P1 should delay taking control until approaching the DA/DH, and in any event, they should be mentally prepared to execute a go-around, as well as a landing, after taking control. If a go-around becomes necessary at or after touchdown, the crew shall follow the baulked landing procedure in Section 3.

Either pilot may command a go-around by calling out "**GO-AROUND**", the crew shall then follow the actions and callouts described below.

Due to the high workload involved in a missed approach, full use of the Autopilot and Autothrottle is recommended during a go-around manoeuvre. This will also give additional flap speed exceedance protection, if the flaps are not retracted in a timely manner. With the Autopilot and Autothrottle engaged, pressing the TOGA switch will command GA thrust, the GA vertical mode and the TRACK lateral mode. The automatics will advance the thrust levers to the TO/GA detent, pitch the aircraft up per the FD and maintain the aircraft ground track at TOGA engagement.

If the Autopilot is not engaged, the PF shall smoothly rotate the aircraft to the FD target, or 8° if the FD is not available. If the Autothrottle is not engaged, full go-around thrust must be applied if using manual thrust. Press the TOGA switch so that the FADEC can set the precise thrust schedule and advance the thrust levers to the TO/GA detent. At the acceleration altitude thrust may may be reduced.

Acceleration altitude is 1000 ft AAL unless specified otherwise in the Performance Manual. Aerodrome noise abatement procedures for take-off do not apply to missed approaches.

Once the missed approach is completed, a briefing should be given to the senior cabin crew member as soon as time permits followed by a PA to the passengers.

Missed approach procedures may vary at certain aerodromes and will be published in the OM-C as appropriate.

2.25.2 Go-Around Actions and Callouts

Go-Around – Actions and Callouts		
	PF	**PM**
Decision to Go-Around	"**GO-AROUND**" Press either TOGA switch. Verify thrust levers at TO/GA detent or move thrust levers to the TO/GA detent. With the airspeed above V_{RF}: "**SET FLAPS**" Verify rotation or rotate to FD GA pitch target.	Verify GA annunciations. Verify engines at go-around thrust. Select go-around flaps (retract two stages): Flap 5 landing → Select Flap 3. Flap FULL landing → Select Flap 4.
Positive Rate of Climb	Confirm positive rate of climb. "**GEAR UP**"	Verify positive rate of climb: "**POSITIVE RATE**" "**GEAR UP**" Position gear lever up. Advise ATC of go-around.
400 ft AGL	Verify LNAV engagement if armed: "**LNAV MAGENTA**" *or* "**SELECT FMS and NAV**" then verify lateral mode engaged: "**LNAV MAGENTA**" *or* "**SELECT HEADING**" then verify lateral mode engaged: "**HEADING GREEN**"	Confirm LNAV engagement if armed. *or* Select FMS on both PFDs and the requested lateral mode and then confirm lateral mode engagement. **Note:** The FMS may have automatically armed LNAV for the programmed MAP. In this case pressing the NAV button will revert to basic mode.
Thrust Reduction Altitude / AA	"**CLIMB SEQUENCE**" Verify vertical mode: "**FLIGHT LEVEL CHANGE GREEN/MAGENTA**" Verify autopilot engagement: "**AUTOPILOT ENGAGED**" Execute published missed approach or proceed as instructed by ATC.	Confirm VNAV engagement if armed *or* Select FLCH and then confirm vertical mode engagement. Set IAS (170 kts then per flap retraction schedule). Select automatics. **Note:** Beware deselecting automatics if already engaged. Retract flaps on schedule. When flaps are zero call: "**FLAPS ZERO**" Monitor missed approach procedure.

Callouts are shown in **bold** text.

Note:

1. If the flight director is inoperative, rotate the airplane to 8° nose up.

2. If an engine failure occurs during the go-around:
   Minimum Airspeed.....V_{RF}

3. If Autothrottle is disengaged, the PF must manually set GA thrust (advance thrust levers to the TO/GA detent) and the PM must verify GA thrust is set. If not, the EICAS message 'ENG TLA NOT TOGA' will be displayed.

4. If the approach was an ILS or LOC, then the PFD will need to be changed to magenta (FMS) with the priority being the source PFD. If the approach was non-precision, then the screen should already be in FMS mode unless flown in raw data. Selecting again will inadvertently cause the PFD to transfer to cross-side FMS (displayed in yellow).

The PM should call "**POSITIVE CLIMB**" when a positive climb has been established by reference to the Radio Altimeter.

LNAV and VNAV are armed automatically whenever the TOGA button is pushed. This is indicated on the FMA with LNAV and VNAV displayed in white in the FD armed modes windows. LNAV will then engage at 200 ft AGL and VFLCH will engage at the height set in the VNAV CAP AFE field on the MCDU GO-AROUND LIMIT page.

The Climb Sequence is to be performed by the PM when requested by the PF in a continuous manner and ends when the slats/flaps reach the zero position. The Climb Sequence comprises:

- PM confirms VNAV engagement if armed *or* selects FLCH.
- PM selects the required IAS on the SELECTED AIRSPEED BUG. The speed selected shall be 170 kts initially. This is increased to 190 kts once Flaps 3 is selected and then 210 kts when Flaps 2 is selected.
- PM selects Autopilot and Autothrottle if not already engaged.
- PM retracts the flaps on schedule in accordance with the F-Bug reference. At each change, the PM must announce the configuration to the PF. For example: "**FLAP 3 SET, SPEED CHECKED FLAP 2, SETTING 210 KNOTS**".

2.25.3 Discontinued Approach

During the initial phases of the approach, there may situations where the approach needs to be discontinued. If the airplane is at or near the missed approach altitude, or far from the missed approach point and not fully configured for landing, the go-around procedure may not be appropriate. The go-around can lead to an excess of thrust that may result in overshooting the missed approach altitude or result in a flap speed limit exceedance. Alternatively, the aircraft may be above the missed approach altitude. For this situation, a discontinued approach is recommended.

Whenever a discontinued approach is necessary, take the following actions:

- Press the ALT button to level-off.
- Verify or adjust the ALT SEL to the desired altitude.

- Select FMS if it is not the navigation source, select NAV to follow the missed approach procedure and activate the missed approach prompt on the MCDU. Alternatively, HDG mode may be used to comply with ATC instructions.
- Select the most appropriate vertical mode (FLCH, FPA or VS).
- Subject to any speed restrictions, select the climb sequence speed of 170, 190 or 210 based on the current flap setting, raise the gear, and then continue with the climb sequence and retract flap as appropriate.

Note: The lateral profile of the missed approach is not loaded automatically without TOGA button press. It is necessary to use the missed approach prompt displayed on the flight plan pager. This prompt appears after the IAF and allows the missed approach lateral profile to be activated without pressing the TOGA button.

Note: With Autoland engaged mode changes via the Guidance Panel are inhibited. Disengage the Autopilot first then select the most convenient mode or conduct a regular go around.

2.26 After Landing

2.26.1 Thrust Reversers

Thrust reverser is more effective at high speeds; the use of reverse below 60 kts increases the chances of foreign object ingestion by the engine. Full thrust reverser should be used when landing over contaminated runways. During a normal landing the thrust reverser should be closed by 60 kts. However, if necessary, the thrust reversers can be used until the airplane comes to a complete stop.

Any use of full reverse will require an engine cool down period of 6 minutes from the end of reverse thrust. Consequently, only MIN REV should be used unless performance requires a greater setting.

When the thrust levers are moved below IDLE, the thrust reverser is commanded to deploy and it takes a short time to reach more than 10% of total deployment. During this interval, if the pilot hesitates with thrust lever movements between IDLE and MIN REV, the Hydraulic Isolation Control Unit may be de-energised thereby turning off the hydraulic power and stopping the movement of the thrust reverser. In this situation the FADEC considers the thrust reverser to be stowed, even though it is not fully closed. However, the lock switches indicate thrust reverser open status and the messages ‘ENG 1 (2) NO DISPATCH’ and ‘ENG 1 (2) REV PROT FAULT’ are displayed on the EICAS. To avoid these nuisance messages, the thrust levers should be moved fully to the MIN REV position.

2.26.2 Brake Efficiency

The average temperature at which brake wear is minimised is around 200°C. To achieve this temperature, it is generally necessary to use more brakes than thrust reverser. As such, MIN REV is used as the routine setting.

Carbon brakes wear faster when they are cool, to minimise the brake exposure to low temperatures apply medium and continuous brake pressure after main wheels touchdown.

To maximise braking performance on dry or wet runways, if necessary, apply maximum continuous pressure on the brake pedals. The anti-skid system will modulate the brakes for an optimum braking performance. Do not pump the pedals.

2.26.3 Autobrake

With Autobrakes set to LO, MED or HI verify after touchdown the normal operation of the braking system and proper deceleration of the airplane.

Below 80 kts (or when deemed most suitable by the crew) disengage the Autobrakes via the brake pedals or the Autobrake knob and use the necessary braking force to reach a safe taxi speed.

Note: In normal condition the thrust reverse required should be MIN REV and the max autobrake setting required should be MED.

2.26.4 After Landing Checks

After landing, if the Captain is not the PF, they shall take over the aircraft controls when normal taxi speed is reached and call out “**I HAVE CONTROL**”. The FO shall respond “**YOU HAVE CONTROL**”. This transfer of control may occur on a high speed exit if the FO has used pedal steering to vacate.

No actions should be carried out until clear of the active runway with the Captain as PF. The Captain shall then call “AFTER LANDING CHECKS” and the crew will complete the following set-up:

Captain		FO	
Autothrottle	OFF	Lights	Set
		Transponder	ALT-ON
		Slats/Flaps	Set 0
		APU	Start

The FO shall then complete the After Landing Checklist to the line as self-challenge and response.

External Lights AS REQUIRED

- The strobe lights must be turned OFF as soon as the aircraft leaves the runway. However, the landing lights are switched off at the crew’s discretion and may be used as necessary. The side taxi lights must remain ON throughout the taxi regardless of the time of the day. The nose taxi light may be used as necessary.

Autothrottle OFF

Transponder ALT-ON

Weather Radar STBY

Note: Confirm the weather radar has automatically transitioned to standby or OFF on both sides, otherwise manually set to standby or OFF.

Slats / Flaps 0 / 0

- Confirm the Slats and Flaps are indicating zero.

APU AS REQUIRED

- The PM starts the APU when it is required so that is available on stand.

Note:

1. The Checklist must not be stowed until it is complete.
2. “**DOORS TO MANUAL AND CROSS-CHECKED**” must be a standalone PA and shall not be included with any arrival PA.

- Approaching Stand -

The below the line items should be actioned when agreed by the crew.

Taxi Lights OFF

Door to Manual and Cross-Checked CALLED

- Immediately prior to parking the PM will announce on the PA “**CABIN CREW, DOORS TO MANUAL AND CROSS-CHECKED**”.

2.26.5 Engine Cool-Down

In order to reduce engine wear, the engines should run at IDLE for at least 2 minutes before they are shut down. If full reverse is used a 6 minute cool-down period is required.

2.26.6 Single Engine Taxi In

To improve fuel savings a single engine taxi can be used. Single engine taxi should only be considered if the expected taxi time is greater than 2 minutes to allow for the engine cool down requirement (or 6 minutes if full reverse was used).

Single Engine Taxi is **prohibited** in the following circumstances:

- Arriving LCY or where otherwise noted in the OM-C.
- When operating on slippery or contaminated taxiways.
- LVPs in force.
- APU or APU BLEED or APU GEN inoperative.

Either engine may be shutdown after engine cool-down and with the APU running. The respective engine Electric Hydraulic Pump must be selected to ON and the APU start cycle must be complete before the selected engine is shutdown.

Complete the following procedure:

APU ..... **ON**

Electric Hydraulic Pump (1 / 2) Selector Knob ..... **ON**

- Select the Electric Hydraulic Pump for the selected engine for shutdown to ON.

MFD Hydraulic Status ..... **Confirm Pump Running**

- If the Electric Hydraulic Pump is not running, do not proceed with Single Engine Taxi.

START/STOP Selector (1 / 2) ..... **STOP**

Ensure the Electric Hydraulic Pump is returned to AUTO during Shutdown Checks.

2.27 Shutdown

2.27.1 Shutdown Set-Up

Engine shutdown is completed by the Captain. When the aircraft has come to a stop, the crew shall perform the following Set-Up:

Captain	FO
Thrust Levers ..... IDLE Parking Brake ..... Set – Ensure adequate brake pressure indicated. Electrical Check ..... APU/GPU START/STOP Selectors ..... STOP HYD Panel ..... Set – Perform HYD P-BIT as required. Beacon ..... OFF – Ensure N1 displays indicate zero and OFF before selecting Beacon light OFF. Signs & Sterile ..... OFF	Transponder ..... STBY Flight Deck Door ..... Unlock

Note:

1. Call "**LOC ACTIVE**" for ILS and LOC approaches or "**COURSE ACTIVE**" for VOR, NDB and RNP approaches.

2. When the aircraft is being flown manually or a raw data approach is being conducted, "**LOC ACTIVE / COURSE ACTIVE**" and "**GLIDE SLOPE ACTIVE / APPROACHING GLIDE PATH**" will be called by both pilots.

2.27.2 Hydraulic P-BIT Procedure

Check the Flight Controls Synoptic page for the time remaining before the next compulsory Hydraulic P-BIT. If this is less than 35 hours then the following procedure must be followed to manually generate a P-BIT and reset the period to 50 hours:

1. Display the HYDRAULIC synoptic page.
2. Wait until the pressure in all three systems is less than 250 PSI.
3. Pressurise all three systems by turning ELEC PUMPS 1, 2 and 3A to ON.
4. Allow the P-BIT to complete without moving the flight controls.
5. Display the FLIGHT CONTROL synoptic page to confirm the timer has reset.
6. Reset the HYDRAULIC PANEL (ELEC PUMPS 1 and 2 to AUTO; 3A to OFF).

2.27.3 Shutdown Checklist

The Captain shall call for the Shutdown Checklist which is to be read by the FO as challenge and response:

Emergency/Parking Brake_____SET / TEMP

- Pull the emergency/parking to the set position after the aircraft has stopped.
- Verify brake temperature. If close to the cautionary range, verify that chocks are on and release the emergency/parking brake to reduce brake cooling time.

Transponder_____STBY

N1_____OFF

- Check the N1 indications are zero and 'OFF'.

HYDRAULIC Panel_____SET

- Perform HYD P-BIT if required.
- Check panel correctly set, especially after single engine taxi (ELEC PUMPS 1 and 2 to AUTO; 3A to OFF).

Beacon_____OFF

- Check both N1s are at zero before turning the beacon off to warn ground crew of possible danger.

Signs and Sterile Light_____OFF

- Confirm that the escape slides are disarmed before turning the FSTN BELTS sign OFF.

Mobile Device_____FLIGHT MODE OFF

2.28 Leaving the Aircraft

The Leaving Aircraft Checklist shall be completed at the end of each sector unless the aircraft is being handed over directly to the next operating crew or a competent engineer. In circumstances when responsibility for the aircraft can be entrusted to a suitably qualified person, items on the Leaving Aircraft Checklist are to be completed as appropriate for the handover (for example, the emergency lights would only remain armed if passengers were on board). In these circumstances there must be a formal handover of responsibility and the status of the Leaving Aircraft Checklist must be clarified to all concerned.

The APU must not be left running with the aircraft unattended by crew or an engineer.

Either pilot shall complete the Leaving Aircraft Checklist in a read and do manner:

Pitch Trim ..... **FULL DOWN**

Emergency Lights ..... **OFF**

- Set EMERG LT to OFF.

External and Internal Lights ..... **OFF**

- Set STERILE, NO SMKG and FSTN BELTS to OFF.

APU / GPU ..... **OFF**

- If APU is available, turn off the APU by selecting the APU selector knob to OFF. Wait until the APU shuts down and the 'OFF' is displayed in the EICAS APU window before turning off the GPU and both batteries.
- If only GPU is available, push OUT the GPU button.

Note: If cabin lighting is still required, the Ground Services Panel should be activated immediately after the GPU is de-selected.

Windows ..... **CLOSED**

Screens ..... **DIM**

- Ensure all five screens are dimmed as required.

Batteries 1 and 2 ..... **OFF**

Note: The door vent flaps must be closed when the aircraft is unattended.

2.29 RESERVED – Hot Weather Operations

2.30 RESERVED – Icing Conditions, Cold Weather and Cold Soak Operations

2.31 RESERVED – Contaminated Runway Operations

2.32 RESERVED – Low Visibility Operations

2.33 RESERVED – Autoland and Non-Autoland CAT II Approaches

3 Abnormal and Emergency Procedures

3.1 Rejected Take-Off

3.1.1 Rejected Take-Off Decision Making

Up to 80 kts, either pilot shall call "**STOP, STOP**" for any malfunction.

Note: The configuration warning is supressed above 80 kts.

Note: If the thrust levers are not in the TOGA detent within the expected time the EICAS caution 'ENG TLA NOT TOGA' will be triggered. The QRH action is "*Move the thrust levers to TOGA position*" and this should be considered a memory item. The thrust levers should be set to the TOGA or MAX position and the take-off continued.

At or above 80 kts, either pilot shall call "**STOP, STOP**" for the following indications up to V1:

- Fire
- Engine Failure
- Severe Engine Vibrations
- Smoke on the Flight Deck
- Block Runway
- Structural Failure
- Aircraft Control Problems.

For any other indication, the Captain (only) may call "**STOP, STOP**" if they feel the safety of the aircraft is in doubt. If they consider it safe to continue they must call "**GO**". If the Captain decides to reject the take-off they must call out "**STOP, STOP**" and place hands on the control wheel to prevent inadvertent rotation. f the Captain decides to continue they must call out "**GO**" and place hands on the thrust levers to ensure they are not retarded.

The decision to reject a take-off in the high-speed regime above 80 kts carries a high risk and should not be taken lightly. On performance limiting runways in particular, pilots should be 'go minded'.

Note: A suspected engine failure must be confirmed by at least one internal indication (for example an N1 or ITT exceedance). An external noise and swing may well be the first indication of engine failure but must not be used in isolation. It is important not to confuse gear and tyre failure, or an engine surge with engine failure. A bang and a swing could be caused by these conditions and rejecting a take-off with failed gear or tyres or as a result of an engine surge is not advisable once in the high-speed phase of the take-off roll.

When a low-speed rejected take-off occurs, and it is considered appropriate to carry out another departure, the runway should be vacated. The aircraft should return to the holding point, and all items of the Taxi and Before Take-Off Checklists must be reconfirmed. Additionally:

- All FMS initialisation data must be verified and confirmed
- A review of Guidance Panel modes shall be completed
- Any brake cooling requirements must be met.

WARNING: THE FO WILL SET FLAPS 5 DURING THE RTO PROCEDURE. FLAPS MUST BE RE-SET TO THE TAKE-OFF SETTING BEFORE A DEPARTURE ATTEMPT.

3.1.2 Rejected Take-Off Manoeuvre

If "**STOP, STOP**" is called, without delay, rapidly and simultaneously:

The PF will:

- Maintain directional control
- Close the thrust levers and select reverse as appropriate
- Apply maximum braking if the Autobrake is not functioning correctly, transitioning to the normal landing roll procedure once a determination has been made that stopping on the remaining runway is assured.

The PM will monitor all actions and make the following calls:

"**AUTOBRAKE**"	Confirm that aircraft deceleration indicates Autobrake operation. If the Autobrake fails or disengages this shall be reported to the PF in case it was an inadvertent pedal application.
"**GROUND SPOILERS**"	Confirm that the ground spoilers have deployed. If ground spoilers do not operate normally this shall be reported to the PF. **Note:** Ground spoiler deployment requires either wheel speed above 45 kts or airspeed above 60 KIAS.
"**REVERSE**"	Confirm reverse operating – this should deactivate the AT automatically. If reverse does not operate normally this shall be reported to the PF.
"**60 KNOTS**"	Reverser should be closed at 60 kts but, if necessary to assure stopping distance, the reverser can be used until the airplane comes to a complete stop.

The PM shall then call ATC and report "**FLYER [ ] STOPPING**".

If the Captain is PM, at any time once a safe stop is assured, or at any time deemed suitable, the Captain will announce "**I HAVE CONTROL**" and take control of the thrust levers, brakes and steering. The aircraft should be brought to a stop and the parking brake applied before a review of the occurrence is conducted.

Once the Captain has taken control of the aircraft the FO will set Flaps 5 in anticipation of a possible emergency evacuation. Any emergency should be evaluated quickly to decide whether or not to taxi clear of the runway. If required, an evacuation must be initiated promptly.

Even in light winds, consideration should be given to turning the aircraft into wind as it is brought to a stop, especially in the event of an engine fire. The PM shall announce the wind direction and confirm the location of any fire. This consideration will also take into account other relevant factors, runway width, and supporting indications from both inside and outside of the aircraft. Generally, in headwind conditions any turn towards the engine fire will be beneficial. Similarly in a tailwind any turn away from the engine fire will be beneficial.

3.2 Baulked Landing

The actions and calls for a baulked landing differ from a normal go-around from DA/DH.

At very low heights, a mishandled baulked landing could cause a serious tail strike. Therefore, the baulked landing rotation rate must be the same as used for take-off (3° per second).

To reduce the risk of a tail strike during a baulked landing, when the airspeed is less than V_{RF} + 5 kts, the speed must be increased to V_{RF} + 5 kts before selecting go-around.

If a baulked landing is initiated after touchdown, the flight and ground spoilers will retract as thrust levers are advanced.

After reverse thrust is selected, a full stop landing must be completed.

Baulked Landing – Actions and Callouts		
	PF	**PM**
Decision to Go-Around	"**GO-AROUND**" Press either TOGA switch. Verify thrust levers at TO/GA detent or move thrust levers to the TO/GA detent. With the airspeed above V_{RF} + 5: "**SET FLAPS**" Verify rotation or rotate to FD GA pitch target.	Verify GA annunciations. Verify engines at go-around thrust. Monitor pitch and call "PITCH" if aircraft pitch exceeds 10° Select go-around flaps (retract two stages): Flap 5 landing → Select Flap 3. Flap FULL landing → Select Flap 4.
Positive Rate of Climb	Confirm positive rate of climb. "**GEAR UP**"	Verify positive rate of climb: "**POSITIVE RATE**" "**GEAR UP**" Position gear lever up. Advise ATC of go-around.
400 ft AGL	Verify LNAV engagement if armed: "**LNAV MAGENTA**" *or* "**SELECT FMS and NAV**" then verify lateral mode engaged: "**LNAV MAGENTA**" *or* "**SELECT HEADING**" then verify lateral mode engaged: "**HEADING GREEN**"	Confirm LNAV engagement if armed. *or* Select FMS on both PFDs and the requested lateral mode and then confirm lateral mode engagement. **Note:** The FMS may have automatically armed LNAV for the programmed MAP. In this case pressing the NAV button will revert to basic mode.
Thrust Reduction Altitude / AA	"**CLIMB SEQUENCE**" Verify vertical mode: "**FLIGHT LEVEL CHANGE GREEN/MAGENTA**"	Confirm VNAV engagement if armed *or*

	Verify autopilot engagement: "**AUTOPILOT ENGAGED**" Execute published missed approach or proceed as instructed by ATC.	Select FLCH and then confirm vertical mode engagement. Set IAS (170 kts then per flap retraction schedule). Select automatics. **Note:** Beware deselecting automatics if already engaged. Retract flaps on schedule. When flaps are zero call: "**FLAPS ZERO**" Monitor missed approach procedure.

Callouts are shown in **bold** text.

Review notes at section **2.25.2 – Go-Around Actions and Callouts**.

3.3 RESERVED – Stall Recovery Manoeuvre

3.4 RESERVED – EGPWS Terrain Escape Manoeuvre

3.5 RESERVED – TCAS

3.6 RESERVED – Upset Recovery Manoeuvre

3.7 RESERVED – Emergency Descent

3.8 RESERVED – Windshear

3.9 RESERVED – Engine Failure

3.10 RESERVED – Ditching

3.11 RESERVED – Unreliable Airspeed

3.12 RESERVED – Evacuation Procedure

3.13 RESERVED – Flight Director Off Take-Off Procedure

3.14 RESERVED – Engine Crossbleed Start Procedure