

**Factual Report – Attachment 15**

**SEA Simulator Observation**

**OPERATIONAL FACTORS/HUMAN PERFORMANCE**

DCA18IA081



## **NATIONAL TRANSPORTATION SAFETY BOARD**

Office of Aviation Safety  
Washington, D.C. 20594

February 26, 2018

### **PUW Simulator Observation**

# **OPERATIONAL FACTORS/HUMAN PERFORMANCE**

**DCA18IA081**

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### A. INCIDENT

Location: Pullman/Moscow Regional Airport, Pullman/Moscow, Washington  
Date: December 29, 2017  
Time: 1840 Pacific Standard Time (PST)  
Airplane: Bombardier DHC-8-402; Registration N412QX  
Operator: Horizon Air

### B. SUMMARY

On December 29, 2017, about 1830 Pacific Standard Time, Horizon Air flight 2184, a Bombardier DHC-8-Q400, registration N412QX, landed on a taxiway of runway 6 at Pullman/Moscow Regional Airport (PUW), Pullman, Washington. Weather at the time of landing was reported as wind from the southeast, light rain, overcast ceiling with 5 miles visibility. There were no injuries to the 4 crew members or 42 passengers, and there was no damage to the airplane. After the airplane landed, the flightcrew observed that the runway lights were inoperative. The passenger flight was operating under 14 Code of Federal Regulation (CFR) Part 121 on an instrument flight rules flight plan and instrument meteorological

conditions (IMC) prevailed at the airport. The flight originated from Seattle/Tacoma International Airport (SEA), Seattle, Washington.

## C. SIMULATOR TEST PLAN

### Simulator Setup

**Location:** FlightSafety International (FSI), Seattle, Washington

**Date:** February 26, 2018

**Time:** 0800-1000 PST

#### **Overall Observations:**

- Observe simulator systems and alerts
- Observe normal Horizon Air RNAV procedures
- Observe HUD settings
  - Visual capabilities of the HUD
- Observe Q-400 cockpit displays
  - PFD and Airport (runway) display information
  - Observe various HUD displays

**Aircraft:** Q-400 (Level D)

|                      |                      |                                         |
|----------------------|----------------------|-----------------------------------------|
| <b>Participants:</b> | Simulator Operator:  | FSI Instructor - TBD                    |
|                      | Captain (Left) Seat: | Jason Atterbury (Horizon Air)           |
|                      | FO (Right) Seat:     | Dan Buckley (IBT)                       |
|                      | Test Conductors:     | David Lawrence, Katherine Wilson (NTSB) |
|                      | Observers:           | Dan Bower (NTSB – IIC)                  |
|                      |                      | Bob Hendrickson (FAA)                   |

#### **Initial Simulator Setup (Runs 1 and 2):**

- PUW RNAV (RNP) M 06 approach
- Position freeze 5 miles outside the IAF (OFXEF) on RNAV approach, 5,400 feet msl
- Speed; normal configuration speed (Vref: 114 knots)
- Configuration: Gear down, Flaps 35
- HUD
  - Combiner down; brightness set to AUTO
  - HCP: Primary mode
- Autopilot ON (NAV/FMS, ALT hold modes used)
  - Autopilot disconnected once runway visually obtained
- Approach Procedures/configurations: Per Horizon Air
- Weather:
  - METAR KPUW 300253Z AUTO 15010KT 5SM -RA BR FEW024 BKN030 OVC035 04/02 A2986 RMK AO2 SLP128 60027 T00440022 58019=

- Left seat pilot will be Pilot Flying (PF), right seat pilot will be Pilot Monitoring (PM)
- Simulator motion: OFF (5 person max seating in the sim for motion)
- Assumption: All turns made at standard rate (except where noted)
- Position/configuration for future runs (Snap shot)

#### **Weight and Balance/Performance:**

| <b>WEIGHT &amp; BALANCE / PERFORMANCE</b> |                                                                |                                                                 |
|-------------------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------|
|                                           | Basic Operating Weight                                         | 40207                                                           |
|                                           | Passenger Weight                                               | 7302                                                            |
|                                           | Baggage/Cargo Weight (Shown on Form)                           | 1560                                                            |
|                                           | Baggage/Cargo Weight (Actual Wreckage)                         | N/A                                                             |
|                                           | Zero Fuel Weight                                               | 49069                                                           |
|                                           | Maximum Zero Fuel Weight*                                      | 58000                                                           |
|                                           | Fuel Weight                                                    | 8260                                                            |
|                                           | Ramp Weight                                                    | 57469                                                           |
|                                           | Maximum Ramp Weight*                                           | 65400                                                           |
|                                           | Taxi Fuel Burn                                                 | 140                                                             |
|                                           | Actual Takeoff Weight                                          | 57329                                                           |
|                                           | Maximum Takeoff Weight                                         | 63866                                                           |
|                                           | Estimated Fuel Burn to Incident Site                           | N/A                                                             |
|                                           | Estimated Landing Weight                                       | 55463                                                           |
|                                           | Maximum Landing Weight                                         | 62000                                                           |
|                                           | CG                                                             | 31.12% MAC                                                      |
|                                           | CG Limits*                                                     | TO FWD LIMIT 15.58%, TO AFT LIMIT 34.58% MAC                    |
|                                           | Takeoff Stab Trim                                              | NA                                                              |
|                                           | Takeoff Flap Setting                                           | 15                                                              |
|                                           | Takeoff Speeds (V <sub>1</sub> V <sub>R</sub> V <sub>2</sub> ) | V <sub>1</sub> - 106, V <sub>R</sub> – 111, V <sub>2</sub> -113 |
|                                           | Landing Flaps                                                  | 35                                                              |
|                                           | V <sub>REF</sub>                                               | Vref 114                                                        |

**\*\*\* NOTE:** Instructor actions on the IOS control panel in the simulator are indicated in **red**. Those items to be documented are indicated in **green**.

### **1.0 Run #1: Normal RNAV to landing**

#### **Objectives**

Observe normal RNAV procedures to landing

#### **Procedure**

- a. **Positioned sim outside the FAF – took a snapshot of position**
  - a. Observed cockpit (RNAV setup, alerts/warnings if any, etc.)
  - b. Observed HUD Setup
  - c. **Documented Cockpit**
  - d. **Documented HUD displays**
    - Cycled through various HUD settings and documented
- b. **Released position-freeze, flew RNAV (RNP) M approach**

- a. Executed normal RNAV to 50 feet agl
  - 1. Autopilot on until 3,700 feet (or pilot's discretion)
  - 2. Observe SOP procedures
  - 3. Observe configuration changes
    - a. Note pitch change with flap settings
  - 4. Observe callouts
  - 5. Note HUD
    - a. Clarity, brightness, displays
- c. Position-froze at 120 feet agl
  - a. Documented HUD displays
- d. Released and flew to a landing.

**Run began: 0828**

| Time | Notes                                                                                                                                                                                                                                                                                   |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      | <p>1. Cockpit documentation:</p>  <p><b>Photo 1: Simulator set-up</b></p>  <p><b>Photo 2: Simulator set-up</b></p> |



Photo 3: HUD display (repeater at instructor station) in Primary mode.



Photo 4: HUD display (repeater at instructor station) in IMC mode.

## 2. Document HUD display



Photo 5: Run 1, 3,700 feet msl view out forward window.



**Photo 6: Run 1 HUD (repeater) view at 3,700 feet msl.**



**Photo 7: Run 1 HUD (repeater) view at 120 feet.**



**Photo 8: Run 1 PFD at 120 feet (no course deviation).**



**Photo 9: Run 1 HUD (repeater) at 120 feet agl, with flare cues.**

### 3. Observed SOPs:

- Approach briefing should occur prior to the top of descent, followed by the descent checklist
- Began at flaps 5
- Flaps 10, landing checklist
- Flaps 15 (very minimal pitch change (about 1-2 degrees) with flap selection
- Flaps 35 (NLT than 1,000 above the ground)
-

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ol style="list-style-type: none"> <li>4. Observed configuration changes <ul style="list-style-type: none"> <li>- Larger pitch change with flaps selected to 35 (about 4-5 degrees down)</li> </ul> </li> <li>5. Observe HUD Setup: <ul style="list-style-type: none"> <li>- HUD Control panel on center console should be set to PRI (primary), IMC Standby, for RNAV RNP approaches</li> <li>- Elevation, glideslope angle, and runway length<sup>1</sup> was entered (for this approach, 2538 for runway length, LN set to 6199, -3.00° for glide path – which appears as a dotted line in the HUD display).</li> </ul> </li> <li>6. Document HUD displays: <ul style="list-style-type: none"> <li>- RNP 0.11 occurs once the airplane flies to the FAF inbound.</li> <li>- Flare cue visible in HUD display beginning at about 60-120 feet RA.</li> <li>- No runway edge lights visible when HUD is set to PRI mode.</li> </ul> </li> </ol> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## RUN COMPLETE (0845)

### 2.0 Run #2: Normal RNAV to Go-around

#### Objectives

Observe normal RNAV procedures to landing to a go-around at 50 feet

#### Procedure

- a. Repositioned outside the FAF
  - a. Observed cockpit (RNAV setup, alerts/warnings if any, etc.)
  - b. Observed HUD Setup
  - c. Documented HUD Displays
- b. Released position freeze, flew RNAV (RNP) M 06 approach
  - a. Executed normal RNAV to a go-around
  - b. Autopilot on until 3,700<sup>2</sup> feet
- c. Position-froze at 3,700 feet

<sup>1</sup> Runway length is not required unless performing a CAT III approach.

<sup>2</sup> FDR indicates that the autopilot was disconnected at 3,700 feet. According to the Captain's interview, he disconnected the autopilot once the runway became visible.

- a. Documented visuals, HUD displays
- b. Noted runway and taxiway lights positioned in HUD and out forward window (looking to the right)
- c. Noted: Runway edge lines, flare cues
- d. Released sim and flew approach to 90 feet
- a. Position-freeze at 90 feet
  - a. Documented visuals, HUD displays
  - b. Noted runway and taxiway lights positioned in HUD and out forward window (looking to the right)
  - c. Noted: Runway edge lines, flare cues
- b. Released and flew a go-around
- c. Position-froze after go-around climb established

**Run began: 0850**

| Time | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      | <ol style="list-style-type: none"> <li>1. Observed HUD setup and various settings</li> <li>2. Observed SOPs:           <ul style="list-style-type: none"> <li>- For go-arounds, hand flown to 1,000, then autopilot on and navigate via LNAV for MAP</li> </ul> </li> <li>3. Observed configuration changes:           <ul style="list-style-type: none"> <li>- Flaps 5 = 2° pitch down</li> <li>- Gear down with checklist = 2-3° pitch down with flaps</li> <li>- Flaps 35 = 5-6° degree pitch down</li> </ul> </li> <li>4. Observed callouts</li> <li>5. Documented HUD displays:</li> </ol> |
|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|      | <b>Photo 10: Run 2 HUD display at 3,700 msl.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



Photo 11: Run 2 looking right of the HUD at 3,700 msl.



Photo 12: Run 2 PFD at 3,700 msl



**Photo 13: Run 2 HUD at 90 feet agl.**



**Photo 14: Run 2 looking to the right of the HUD at 90 feet agl.**



Photo 15: Run 2 PFD at 90 feet agl.

6. Other: Each time the PF disconnected the autopilot for the approach, the lateral path of the airplane drifted to the left of course (with the right crosswind), requiring a slight turn to the right to get back on RNAV centerline.

## RUN COMPLETE (0906)

### Initial Simulator Setup (Runs 3 and 4):<sup>3</sup>

- Pangborn Memorial Airport (EAT), Wenatchee, Washington, USA
- EAT RNAV (RNP) rwy 12 approach
- Position freeze at CIRZI (FAP) RNAV (RNP) approach, 3,700 feet msl
- Speed; normal configuration speed (Vref: 114 knots)
- Configuration: Gear down, Flaps 35
- HUD
  - Combiner down; brightness set to AUTO
  - HCP: Primary mode

<sup>3</sup> The Q-400 visual database does not contain a PUW specific airport layout. EAT has a similar RNAV approach to the RNAV approach and runway/airport configuration to PUW, and airport lighting can be adjusted in the simulator for observation work.

- Autopilot ON (NAV/FMS, ALT hold modes used)
  - Autopilot disconnected once runway visually obtained
- Approach Procedures/configurations: Per Horizon Air
- Weather:
  - Winds 215° at 10 knots (to match the crosswind for the PUW runs) 5SM -RA BR FEW024 BKN030 OVC035 04/02 A2986
- Left seat pilot will be Pilot Flying (PF), right seat pilot will be Pilot Monitoring (PM)
- Simulator motion: OFF (5 person max seating in the sim for motion)
- Assumption: All turns made at standard rate (except where noted)
- Runway lights and taxiway lights illuminated
- Position/configuration for future runs (Snap shot)

### 3.0 Run #3: RNAV to runway (runway lights illuminated)

#### Objectives

Observe normal RNAV procedures to landing, with runway lights illuminated

#### Procedure

- a. Positioned sim outside the FAP – took a snapshot of position
  - a. Observed cockpit (RNAV setup, alerts/warnings if any, etc.)
  - b. Observed HUD Setup
  - c. Documented HUD Displays
- b. Released position freeze, flew RNAV
  - a. Executed normal RNAV to landing
    1. Autopilot on until 2,280 feet (or when visual with the airport)
- c. At 2,280 (for EAT) feet, position-froze simulator
  - a. Documented visuals, HUD displays
  - b. Noted runway and taxiway lights positioned in HUD and out forward window (looking to the right)
- d. Released position-freeze and continue to landing
- e. Position-froze at 150 feet agl
  - a. Documented visuals, HUD displays
- f. Released to landing on runway
- g. Position-froze, repositioned for run #4.

#### Run began at 0927

| Time | Notes                                                                         |
|------|-------------------------------------------------------------------------------|
|      | 1. Observed HUD setup and various settings<br><br>2. Documented HUD displays: |



**Photo 16: Run 3 HUD display at 2,280 msl.**



**Photo 17: Run 3 looking to the right of the HUD at 2,280 msl.**



Photo 18: Run 3 PFD at 2,280 msl.



Photo 19: Run 3 HUD (repeater) at 2,280 msl.

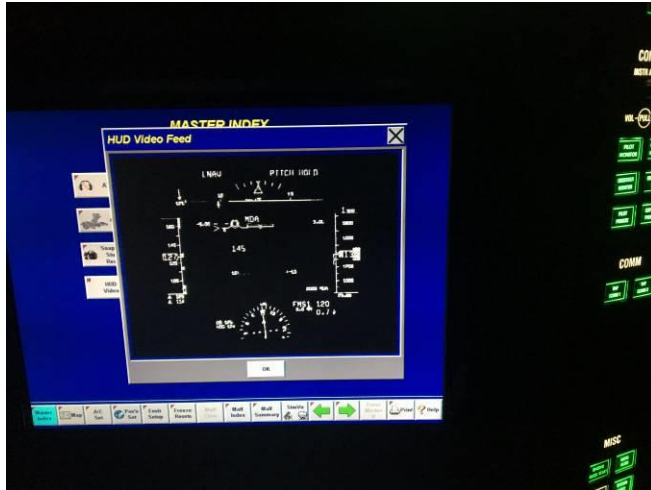


Photo 20: Run 3 HUD at 150 feet agl.



Photo 21: Run 4 PFD at 150 feet agl.



Photo 22: Run 3 runway lights at 150 feet agl.

## RUN COMPLETE (0945)

### 4.0 Run #4: RNAV with sidestep to left (runway light NOT illuminated)

#### Objectives

Observe normal RNAV procedures to landing, with side-step to taxiway with runway lights NOT illuminated

#### Procedure

- a. Position sim outside the FAP – take a snapshot of position
- b. Remove the runway lights on the airport setup page
  - a. Observed cockpit (RNAV setup, alerts/warnings if any, etc.)
- c. Released position-freeze, flew RNAV
  - a. Executed normal RNAV to 2,400 feet
    1. Autopilot on until 2,400 feet
- d. At 2,400, position-freeze simulator
  - a. Documented visuals, HUD displays
  - b. Noted runway and taxiway lights positioned in HUD and out forward window (looking to the right)
    - Taxiway lights were illuminated on the brightest setting in the simulator.
- e. Released position-freeze and side-step to left and align with taxiway (manually flown) to 190 feet agl
- f. Position-freeze once aligned with taxiway
  - a. Documented maneuvering necessary to align with taxiway
  - b. Documented visuals, HUD displays
- g. Released to landing on taxiway
- h. Position freeze after rollout on landing

Run began: 0950

| Time | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      | <ol style="list-style-type: none"> <li>1. Maneuvering: minimal banking required to align with taxiway.</li> <li>2. Documented HUD displays: <div> </div> <div> <p><b>Photo 23: Run 4 HUD (repeater) at 2,400 msl.</b></p> </div> <div> </div> <div> <p><b>Photo 24: Run 4 HUD (repeater) at 1,400 msl.</b></p> </div> </li> </ol> |



**Photo 25: Run 4 PFD at 190 feet agl.**



**Photo 26: Run 4 taxiway light at 190 feet agl.**

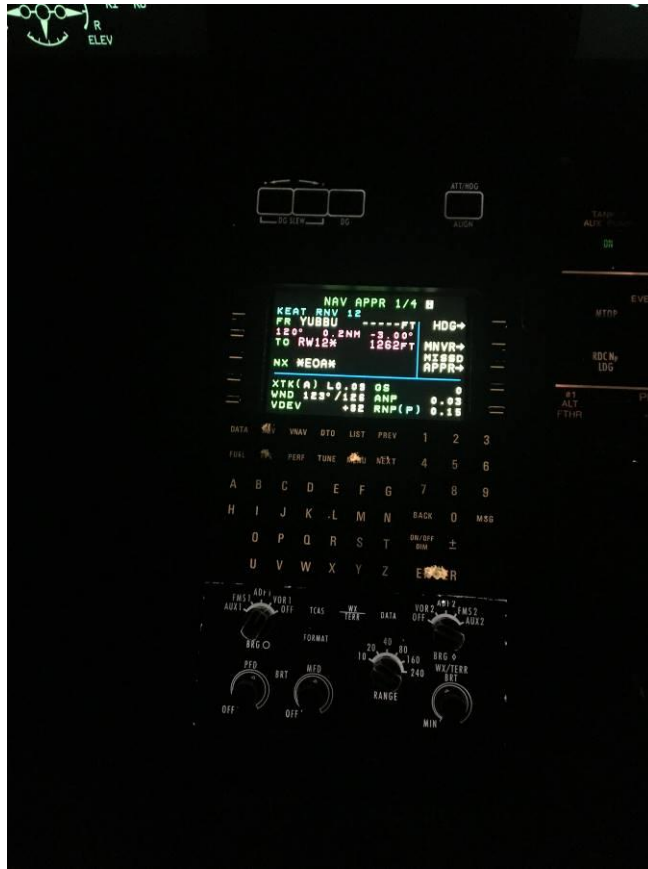


Photo 27: Run 4 FMS with left deviation.

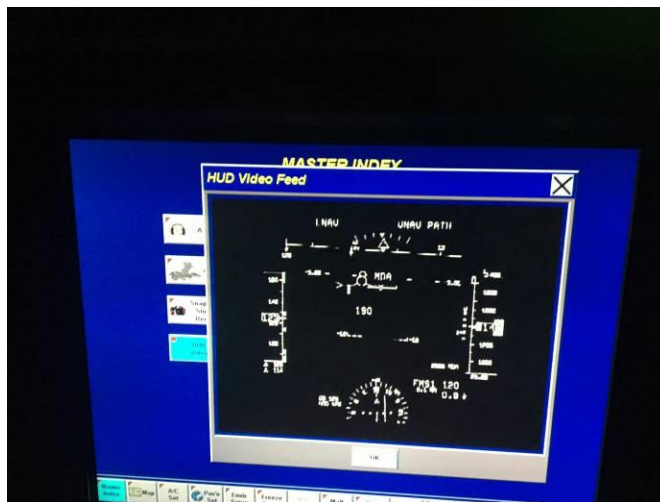
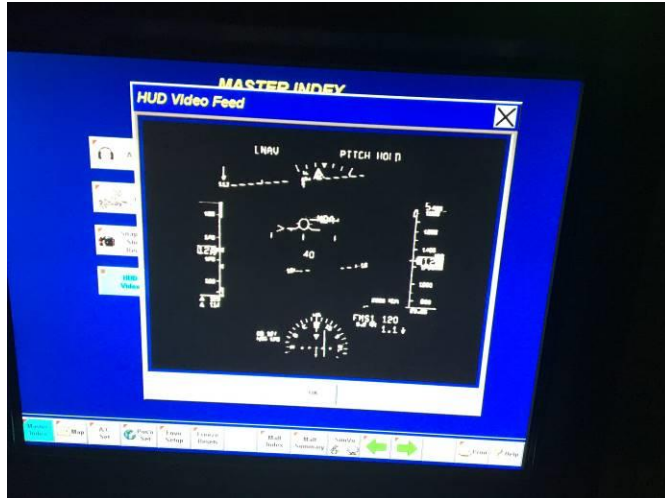


Photo 28: Run 4 HUD (repeater) at 190 feet agl, offset to the left of runway centerline.



**Photo 29: Run 4 flare cues.**

3. Other:

- Taxiway in the simulator for EAT is 2x further from the runway than PUW taxiway/runway.
- No runway edge lines available in HUD display
- Flare cues were visible for landing on taxiway.

## 5.0 Run 5: SEA ILS 16R CAT III approach

Horizon pilots set up a SEA ILS 16R CAT III approach for demonstration purposes to observe the decluttered mode (AIII) of the HUD, and the runway edge lines in the HUD display.

**Run began: 1008**



Photo 30: Run 5 HUD display (Cat III approach).

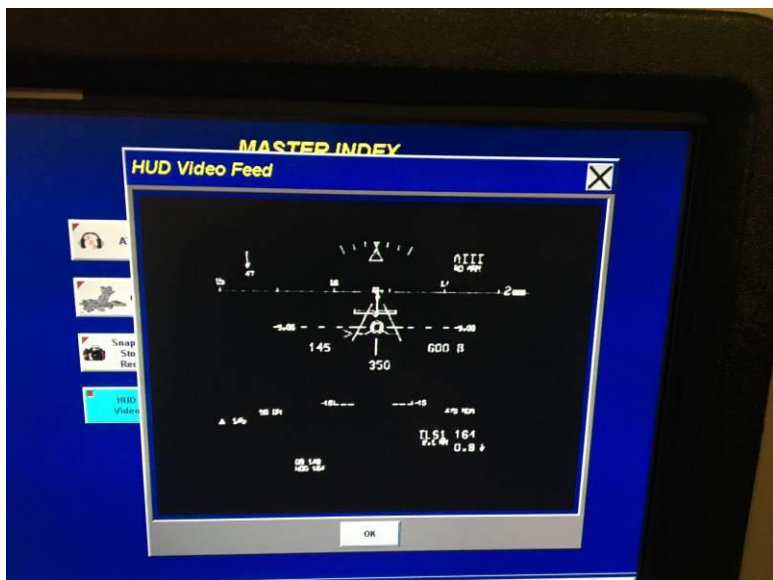


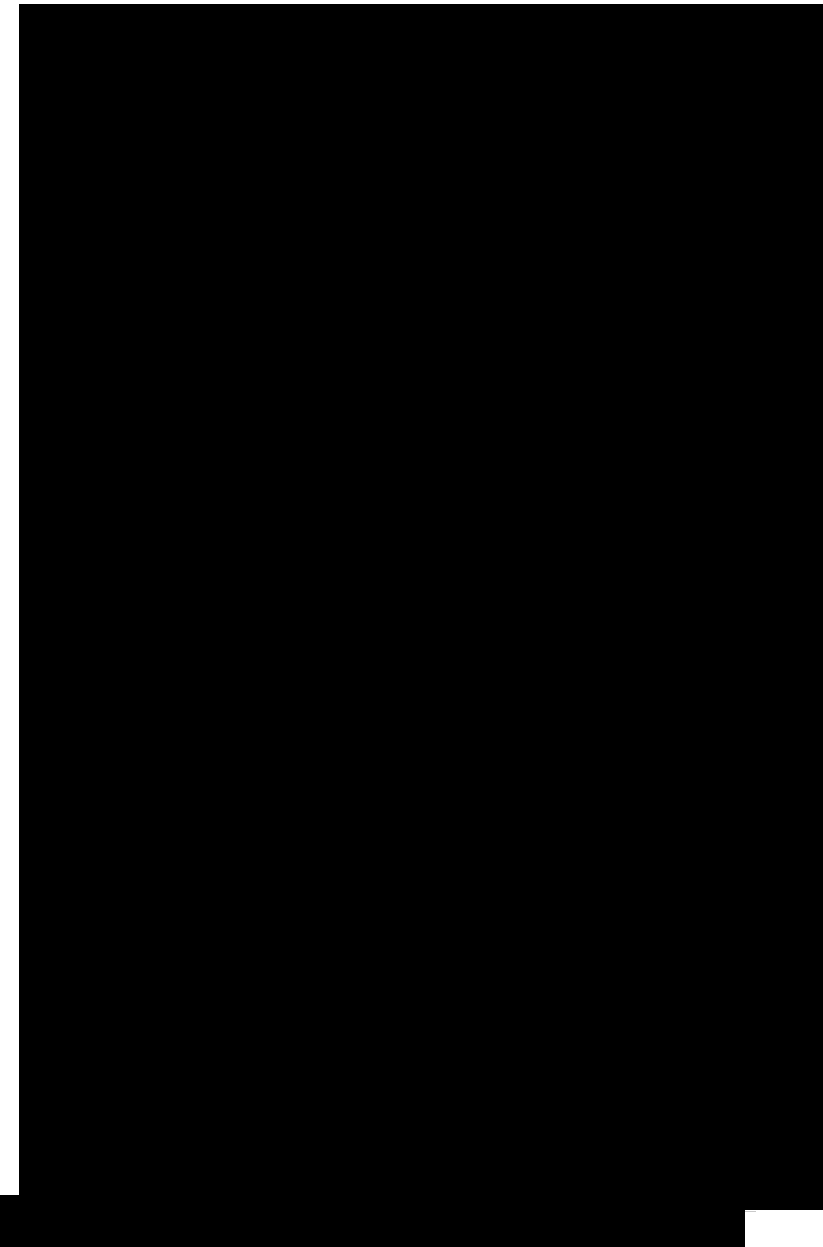
Photo 31: Run 5 HUD Cat III (repeater) displays.

**TEST COMPLETE**

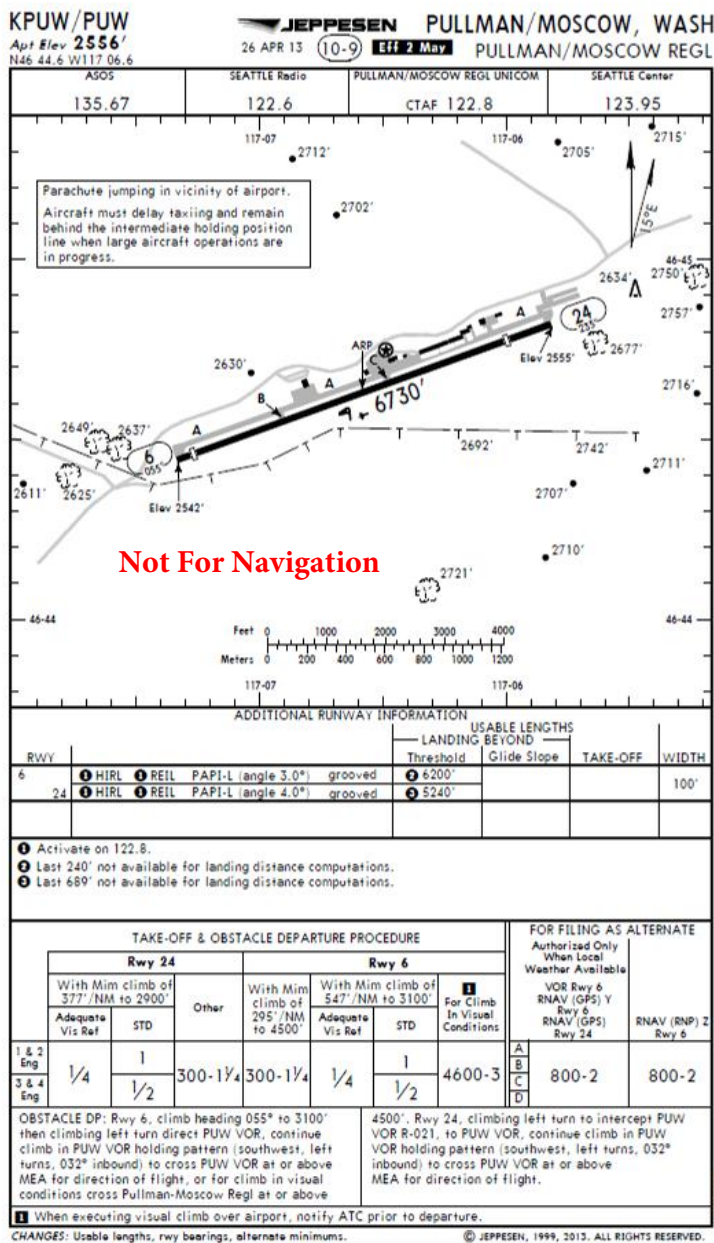
## **D. APPENDIX**

### **6.0 Charts**

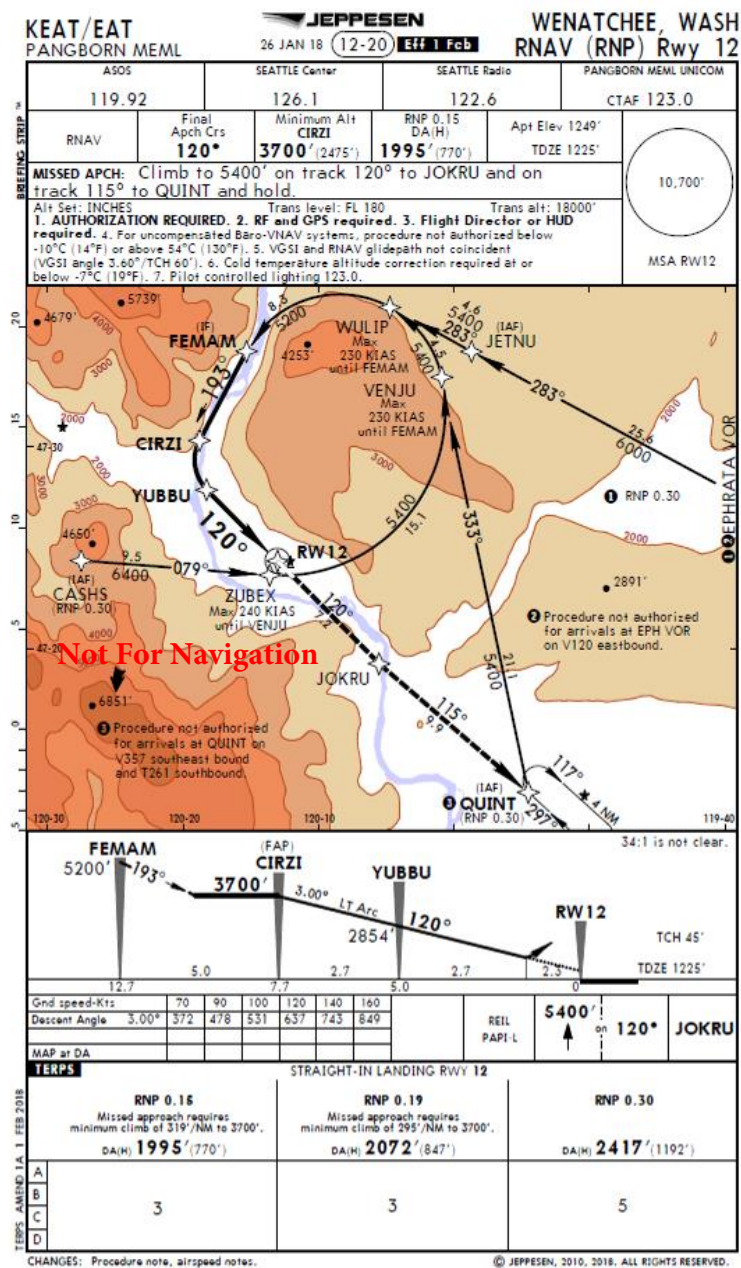
#### **6.1 RNAV (RNP) M Runway 06**



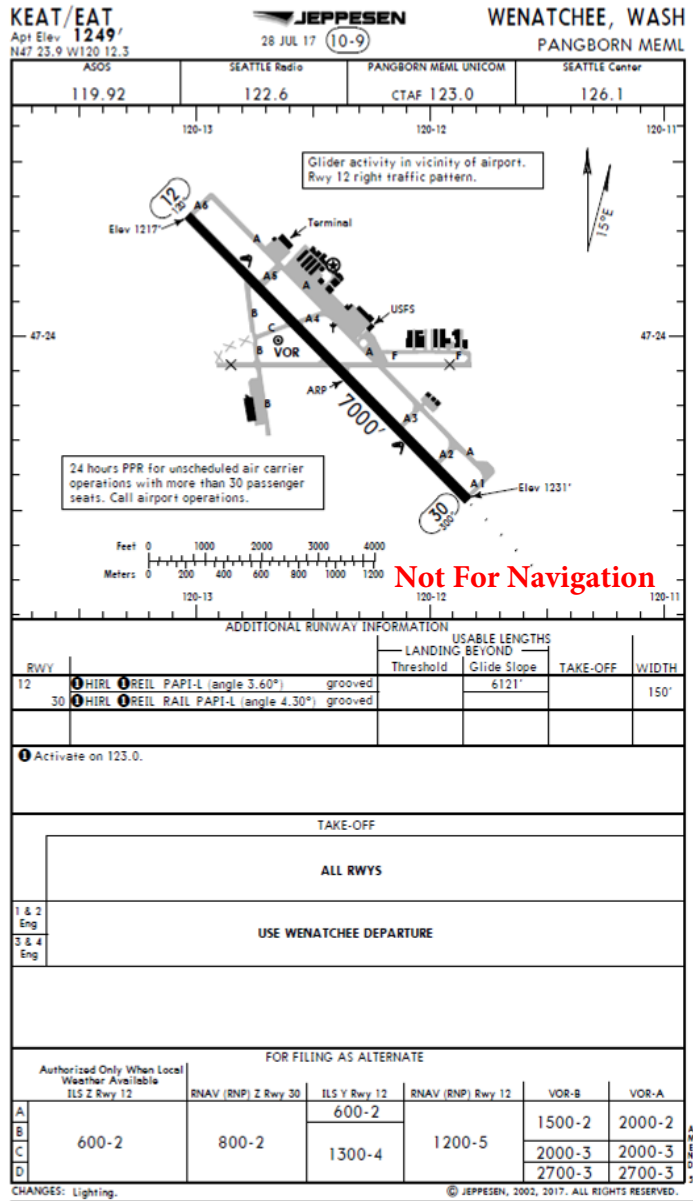
6.2 PUV Airport



6.3 EAT RNAV (RNP) rwy 12



6.4 EAT Airport chart



## 7.0 Horizon Air RNAV Profile

Rev 18.01 Eff 01/30/18

Policy  
Flight

2.3.12  
08/23/17

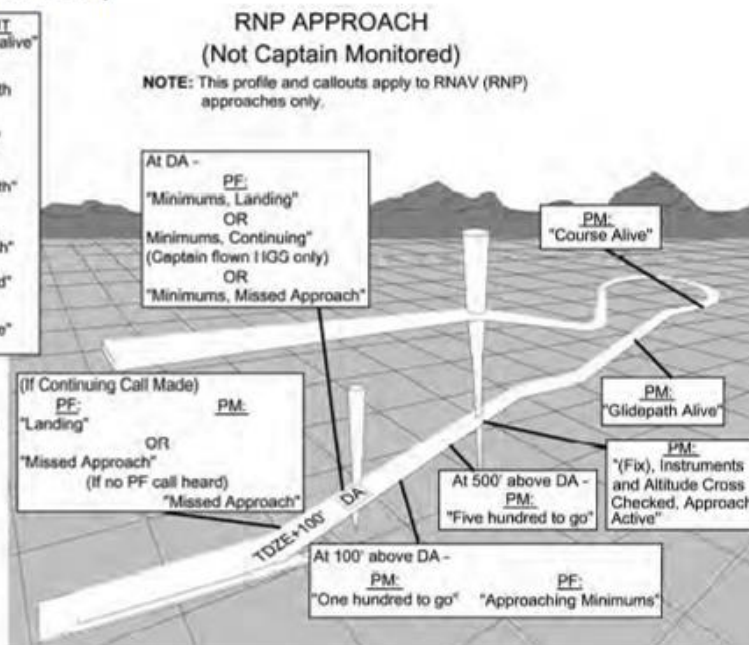
### RNP Approach (Not Captain Monitored)

| CONDITION                                          | CALLOUT           |
|----------------------------------------------------|-------------------|
| First positive inward motion of the CDI            | "Course alive"    |
| First positive motion of VPATH Bar                 | "Glidepath alive" |
| Course deviations of more than one dot             | "Course"          |
| Glidepath deviations of more than 1/2 dot          | "Glidepath"       |
| Glidepath deviations of more than 75 ft (3/4 dot)  | "Missed approach" |
| Airspeed deviations from Target of -5 or +10 knots | "Airspeed"        |
| Sink rate in excess of 1,000 FPM                   | "Sink rate"       |

NOTE 1: The PM, when becoming aware the runway environment is in view, will state what is seen. (Example, "Strobes," "Approach lights," "Runway.")

NOTE 2: When it is determined visual contact with the runway can be maintained and standard callouts are no longer desired, the PF will state "Landing."

NOTE 3: For FMS Approach without VPATH, see Non-Precision Straight-In Approach (Not Captain Monitored).



### Instrument Approaches

14 CFR: 121.507  
CEME: E13

Flight crews shall not proceed with instrument approaches contrary to approved Ops Spec IFR weather minimums and instrument approach procedures.

#### Flight Crew Coordination and Pilot Monitoring

The Captain shall designate the pilot responsible for flying the aircraft. That pilot is responsible for aircraft control, navigation, and compliance with ATC Clearances and instructions.

While monitoring is a primary responsibility of both pilots, the Pilot Not Flying (PNF) is designated as the Pilot Monitoring (PM) to further define this essential role. The PM is responsible for monitoring aircraft flight path, navigation, systems, radio communications, and actively crosschecking the actions of the PF. As such, he is monitoring all aspects of the flight in order to detect deviations or errors.

#### NOTE:

References to Pilot Not Flying (PNF) in this and other manuals, such as Flight Standards Manuals, are replaced with Pilot Monitoring (PM). Actual text changes to reflect the replacement of PNF with PM will be accomplished in future revisions.

- Reading checklists is accomplished by the First Officer during ground operations and by the PM during flight operations.
- ATC/Company communications are normally accomplished by the First Officer during ground operations and by the PM during flight operations.
- The PF (Captain during ground operations) may assume communications when the PM is occupied with other tasks.
- The Automation Policy governs PF and PM roles in managing FMS programming and FD mode selections.

## 8.0 Horizon Air SOPs

Normal Procedures  
Approach

3.15.1  
02/07/17

### 3.15 APPROACH

CEME: E1A E20

#### Approach Preparation

The PF calls for the Approach Checklist as close as practical to 10,000 AFE after the Approach Flows have been accomplished. This allows adequate time for flightdeck and cabin preparations to be completed prior to commencing the approach. Upon completion of the flows the PM reads the checklist.

For FD/Autopilot procedures during approach, refer to AFCS Procedures in section 7, Supplementary Normal Procedures.

For FMS approach requirements and procedures, refer to FMS Operating Procedures in section 7, Supplementary Normal Procedures.

#### PM Approach Flow (10,000 AFE)

1. WINDSHIELD subpanel  
If SAT is 10°C or greater and windshield is clear:
  - **HEAT – Select OFF**
2. EXTERIOR LIGHTS subpanel
  - **LANDING APPROACH lights – On**
  - **LANDING FLARE lights – On**
  - **TAXI switch – Verify PULSE (if PulseLite® system installed)**
  - **WING INSP lights – On for Night operations**

**NOTE:**  
*If PulseLite® system installed: During night operations in clouds, the TAXI switch may be selected OFF at pilot's discretion if the pulse function is distracting.*
3. Signs and lights subpanel
  - **FASTEN BELTS – On**  
Whenever possible, the PM shall inform the passengers to return to their seats and fasten their seat belts. In smooth air, the FASTEN BELTS sign may be turned ON during descent at Captain's discretion.
4. INSTRUMENT PANEL
  - **Altimeter BARO SET – Verify set**  
Ensure Altimeter is set to most current setting.
  - **Displays – Set**  
Set PFD and MFD for approach, including:
    - Nav and Flight instruments properly set for approach.
    - RMI needles set appropriately for approach.
5. CENTER CONSOLE
  - **ARCDUs – Set**  
Set and identify both ARCDUs nav frequencies (VOR and ILS) for the approach.
  - **Cabin CHIME – Press**  
Pressing the CHIME provides a high-low chime to the Flight Attendants to indicate a sterile cockpit condition exists.
6. **MFD Reasonableness Check** – When able, the PM conducts the MFD reasonableness check. (See FMS Verification, in this section.)

Horizon Air

Q400 Flight Standards Manual

**PF Approach Flow (10,000 AFE)**

**INSTRUMENT PANEL**

- **Altimeter BARO SET – Verify set**  
Ensure Altimeter is set to most current setting.
- **Displays – Set**  
Set PFD and MFD for approach, including:
  - Nav and Flight instruments properly set for approach.
  - RMI needles set appropriately for approach.

**Captain 10,000 AFE Flow (10,000 AFE)**

**OVERHEAD PANEL**

- **HGS – Verify the combiner is down and HGS display is set properly**

**Amplified Approach Checklist**

| APPROACH                                                                                                                                                                                                                                                                                                                                                                                                          |                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>FASTEN BELTS</b> .....                                                                                                                                                                                                                                                                                                                                                                                         | <b>PM</b> ..... <b>ON</b>       |
| Verify seat belt signs are on.                                                                                                                                                                                                                                                                                                                                                                                    |                                 |
| <b>Altimeters</b> .....                                                                                                                                                                                                                                                                                                                                                                                           | <b>PM/PF</b> ..... <b>set</b>   |
| Confirm most recent altimeter setting is set.                                                                                                                                                                                                                                                                                                                                                                     |                                 |
| <b><sup>A</sup>HGS</b> .....                                                                                                                                                                                                                                                                                                                                                                                      | <b>C/F</b> ..... <b>Set/ckd</b> |
| <ul style="list-style-type: none"> <li>• Captain verifies the combiner is down and HGS display is set properly.</li> <li>• First Officer verifies RWY ELV (elevation) and G/S (glideslope) are set in the HCP.</li> </ul>                                                                                                                                                                                         |                                 |
| If All approach is flown, ensure:                                                                                                                                                                                                                                                                                                                                                                                 |                                 |
| <ul style="list-style-type: none"> <li>• Runway length or the intended runway is set in HCP.</li> <li>• The green LED lights on the HCP are extinguished.</li> <li>• #3 NAV receiver is tuned to localizer frequency.</li> </ul>                                                                                                                                                                                  |                                 |
| <div style="border: 1px solid black; padding: 5px;"> <b>NOTES:</b> <ul style="list-style-type: none"> <li>• If #1, #2, and #3 NAV receivers are not tuned to localizer frequency, All mode will not arm.</li> <li>• If TDZ elevation is not set correctly, the Runway Edge Line symbols will not display properly.</li> </ul> </div>                                                                              |                                 |
| <b><sup>A</sup>Displays</b> .....                                                                                                                                                                                                                                                                                                                                                                                 | <b>PM</b> ..... <b>Set</b>      |
| Verify both PFDs and MFDs are set properly for approach, including:                                                                                                                                                                                                                                                                                                                                               |                                 |
| <ul style="list-style-type: none"> <li>• No amber or red indications.</li> <li>• FMS course and approach displayed on MFDs match FMS programming with no visible gaps.</li> <li>• EGPWS is displayed on at least one MFD.</li> <li>• MDA/DH references set to appropriate minimums on PFD.</li> <li>• DME HOLD as required.</li> <li>• For ILS or LOC approaches, verify course set on inbound course.</li> </ul> |                                 |
| <div style="border: 1px solid black; padding: 5px;"> <b>NOTE:</b><br/>           If PFD is displaying FMS LNAV, change the MFD format to display and verify the localizer course.         </div>                                                                                                                                                                                                                  |                                 |
| <b><sup>A</sup>ARCDUs</b> .....                                                                                                                                                                                                                                                                                                                                                                                   | <b>PM</b> ..... <b>Set</b>      |
| Ensure the ARCDUs are set properly for arrival, including:                                                                                                                                                                                                                                                                                                                                                        |                                 |
| <ul style="list-style-type: none"> <li>• NAV 1 and NAV 2 frequencies set for arrival.</li> </ul>                                                                                                                                                                                                                                                                                                                  |                                 |

- ADF frequency if required or desired.
- COM 1 on ATC
- COM 2 on Company

**Approach Review Items**

If a change occurs following the completion of the Approach Checklist that requires a different instrument approach or flap configuration than planned, the required changes will be programmed and briefed as soon as practical. After the FMS Flight Plan changes have been reviewed and the approach briefed, the PF calls for "Approach review items" (**items** denoted on the Descent and Approach Checklists).

**NOTE:**

*In visual conditions, at Captain's discretion, the Approach Review items need not be accomplished for runway changes that do not require changes to configuration (e.g., sidestep approach).*

**Alerting the Cabin Crew for Approach**

CEME: L1J

The PM selects the NO SMOKING sign On no later than five minutes prior to landing. This provides a chime to the Flight Attendants signalling time remaining to prepare the cabin for landing.

**PM**

- Signs and lights subpanel
  - **NO SMOKING –On**

The review checklist items annotated with an A (appearing in bold on the Descent and Approach Checklists) only need to be accomplished if the ATC Clearance or FMS has been changed since last reviewed prior to the top of descent. Verify each item is set as appropriate.

**Approach and Landing Profiles**

Standard profiles provide maximum speeds and aircraft configuration for segments of an instrument approach. The maximum speeds are predicated on standard design criteria used for establishing the width of protected airspace and the aircraft's ability to navigate the lateral course.

Some approach procedures may have charted maximum speeds associated with a specific segment accommodating design considerations for that procedure. Charted speeds may be either faster or slower than the speeds provided in the profile pictorials.

In cases where a speed is published on the approach chart, the charted speed is controlling.

Charted speeds or the speeds provided in the standard profiles should be considered the maximum speed authorized for a stabilized approach under good conditions.

**NOTE:**

*Maximum speeds established for approach operations cannot be waived by ATC.*

- Maximum speeds on approach transitions (IAF to FAF):
  - Procedure turn or holding pattern course reversal, 200 kts maximum (reduce as necessary for conditions).
  - Radius-to-Fix (RF), DME arc, Terminal Arrival Area, or other transition, 240 kts maximum (reduce as necessary for conditions).

**NOTE:**

*Radius-to-Fix (RF) Legs are also referred to as Curved Legs. The terms are synonymous. The term RF Leg is more commonly used. An RF leg is only that portion of an approach segment that is curved.*

- Maximum speeds on RF legs in final approach segment (FAF to DA):
  - For Airspeed  $\leq 140$  kts during the RF leg, CAT C landing minimums apply. If airspeed exceeds 140 kts during any portion of the RF leg, CAT D approach minimums shall be used.
  - For Airspeed 141-165 kts during the RF leg, CAT D landing minimums apply. Airspeed above 165 kts on RF legs in the final approach segment is not authorized.
- Maximum speeds for RF legs in the missed approach segment (DA to missed approach holding point):  
Airspeed  $\leq 240$  kts during the RF leg. Airspeed above 240 kts on RF legs in the missed approach is not authorized.

**NOTE:**

*If a missed approach is initiated prior to the MAP/DA, any speed limits applicable to the final approach segment shall be maintained until the aircraft passes the MAP/DA.*

**Policy**

The speeds above are considered maximum. When determining the appropriate speed to fly the aircraft on an instrument procedure, judgment shall be used when considering:

- Effect of wind component on ground speed
- Magnitude of turn and turn radius
- Effect of turbulence

If there is any question regarding the aircraft's ability to remain within the lateral and vertical bounds of protected airspace, the aircraft speed should be reduced.

The following additional restrictions apply to RF legs:

- Use of Flight Director is required.
- Attention to flight guidance and compliance to the desired path by both pilots is essential to maintain the intended ground track.
- If initiating a missed approach or go-around during or shortly after an RF leg, close adherence to course centerline shall be maintained.

**ATC Profile**

Unless otherwise specified, ATC generally expects large category aircraft to maintain at least 170 KIAS to the FAF or 5 miles, then slow consistently to final approach speed as appropriate. Because some of our approaches require Flaps 15 at the FAF, ATC has agreed to a minimum speed at the FAF to 160 kts for the Q400. However, it is important to consider 170 minimum is preferred.

We are able to support this profile by maintaining at least 170 kts with Flaps 5 or 10 as long as practical, then slow to cross the FAF at 160 – 165 kts with Flaps 15. If not able to maintain at least 160 kts to the FAF, it is imperative to coordinate with ATC as early as possible prior to slowing.

**Flap and Gear Configuration**

The aircraft is configured for landing at the appropriate time for the type of approach being conducted.

Flaps 0°, 5°, and 10° are not used for landing unless required by an Emergency or Abnormal procedure. Minimum speeds for Flaps 0°, 5°, and 10° when slowing for approach are:

- **Flaps 0° – 180 KIAS**
- **Flaps 5° – 160 KIAS**
- **Flaps 10° – 150 KIAS**

These values provide conservative protection margins, including maneuvering with ice contamination and with bank angles up to 30°, up to MLW of 62,000 lbs.

**Flaps 35°.** Open Bug speed is the standard landing flap configuration. This configuration provides a safe pitch margin for tail strike avoidance, while reducing landing speed to minimize brake wear during deceleration on landing rollout.

**Flaps 15°** are used for the following approach and landing situations only:

- HGS AIII Approaches below Category I minimums
- If required to meet landing performance requirements
- Single-engine approach and landings

**NOTE:**

- *Flaps 15° landing should be flown by the Captain utilizing the HGS. Captains may conduct Flaps 15° landings as required to maintain proficiency.*
- *Maximum ten-knot tailwind limitation with Flaps 15°.*

**Flap and Gear Sequence**

The normal sequence of flap and gear extension is:

1. Flaps 5° (195 KIAS or below) – Flaps 5° will assist in stabilizing speed without the need for early gear extension.
2. Landing Gear down (195 KIAS or below).
  - On an approach with vertical guidance, select gear down no later than:
    - One dot below glidepath, or
    - Published Glideslope Intercept Altitude if already established on the glidepath.
  - On an approach without vertical guidance, select gear down no later than:
    - Two miles from the FAF, or
    - In the absence of an FAF, intercepting the final approach course.
  - On a visual approach:
    - Straight in: approximately FAF/5 mile final.
    - Downwind: Abeam landing threshold.

**CAUTION:**

*When Landing Gear is extended, take care not to move the NWS tiller. If the NWS tiller is moved prior to all three landing gear being on the runway (weight-on-wheels), the nosewheel steering may be disabled. The NOSE STEERING caution light will not illuminate until the aircraft is on the ground, even though the system has been disabled.*

3. Condition Levers selected to MAX (N<sub>R</sub> 1020) when Landing Gear extended.

**NOTE:**

*During unexpected cases where the aircraft is high and fast (e.g., ATC restrictions, unexpected tailwinds, etc.), the Condition Levers may be selected to MAX earlier than at gear extension, if required to assist in slowing the aircraft.*

4. Flaps 10° (175 KIAS or below) – Optional setting.
5. Flaps 15° (165 KIAS or below).  
Prior to the FAF for all approaches requiring Flaps 15°.
6. Flaps 35° (155 KIAS or below) shall be selected no later than:
  - The FAF for instrument approaches without vertical guidance.
  - 1,000' AFE for all other approaches (instrument or visual).

**Final Approach Speed****Wing Contamination/REF SPEEDS Selection**

On final approach, no later than 1,000' AFE, if the aircraft has operated in icing conditions, both pilots conduct a wing contamination check. Observe the visible portion of the wing leading edges and wing tips to determine if the aircraft is aerodynamically clean. Each pilot communicates his observations.

- If ice accumulation is visible on the wing leading edges or wingtips, the PF states "Ref speeds increase." The PM ensures the REF SPEED switch is selected to INCR.
- If the wing leading edges are aerodynamically clean and the ICE DETECTED advisory is not illuminated on the ED, the PF states "Ref speeds off." The PM ensures REF SPEEDS switch is selected to OFF.

**NOTE:**

*The aircraft is only considered aerodynamically clean when all ice is removed from the visible leading edges and wing tips.*

**Stabilizing Final Approach Speed**

The normal approach speed is the Open Bug. If the Solid Bug speed is required (as described below), the PF shall announce "Solid Bug" no later than 1,000' AFE. (If no announcement is made, the PM will assume the Open Bug will be used.)

The airspeed shall be stabilized at the appropriate bug by 500' AFE and maintained to landing. (Refer to Stabilized Approach in FOM section 10, Descent/Approach/Landing.)

**Solid Bug**

The approach is stabilized at the Solid Bug if:

- The REF SPEEDS switch is selected to INCR, or
- Maneuvering at bank angles greater than 15° is required, or
- Wind gusts greater than ten knots or windshear are reported.

**CAUTION:**

- *Do not fly final approach speed above Solid Bug. Excess speed is not required, and may result in exceeding design limits, a nosewheel landing, or delay in weight-on-wheels (WOW) sensing.*
- *If the aircraft is aerodynamically clean, ensure the REF SPEEDS switch is selected OFF, even if the approach is flown at Solid Bug; e.g., windshear (the airspeed may need to be slowed to Open Bug in the event of a windshear recovery or a single-engine missed approach).*

**Open Bug**

The Open Bug represents the normal approach speed. If the conditions for use of the Solid Bug are not present, the approach is stabilized at the Open Bug. This speed provides a 23% margin over the stall speed and good controllability in wind gusts up to ten knots and up to maximum crosswind limits. It also minimizes wear on landing gear and brakes.

Prior to decreasing airspeed below the Solid Bug, both pilots will ensure (silently):

- The REF SPEEDS switch is selected OFF and INCR REF SPEEDS advisory in NOT displayed on ED.
- No evidence of windshear or wind gust >10 knots exists.
- Bank angle is less than 15°.

**CAUTION:**

- Prior to decreasing airspeed below the Solid Bug, ensure INCR REF SPEEDS advisory is NOT displayed on ED. If REF SPEEDS switch is not selected to OFF, Stall Warning may occur at airspeeds close to the Open Bug.
- If the Open Bug is used for final approach, but new ice accumulation is detected on the wing leading edges, revert to the Solid Bug if practical. Do not destabilize the approach below 500' AGL.

For detailed description of the use of the Open and Solid Bugs, refer to Use of Airspeed Indexes and Bugs in section 4, Performance.

The PF calls for the Landing Checklist when calling for "Gear down" (e.g., "Gear down – Landing checklist"). The PM accomplishes the LANDING Flow and Checklist to the line. When landing flaps are called for (15° or 35°), the PF calls "Below the line" (e.g., "Flaps 35°, below the line"), after which the PM completes the Landing Flow and Checklist. If the Final Approach Fix is crossed prior to reading the Landing Checklist, the PM accomplishes the FAF Standard Callouts and Procedures prior to reading the checklist.

**PF Landing Flow – (None)**

**PM Landing Flow**

CME: E1A

The PM initiates the Landing Flow when the PF calls for "Gear down – Landing Checklist."

INSTRUMENT PANEL

1. LANDING GEAR subpanel

- **LANDING GEAR – Select DN**

Confirm Landing Gear extension initiates.

**CAUTION:**

*If any abnormal gear indication is observed after extension, do NOT retract or cycle the gear. Exit the Critical Phase of flight and refer to the appropriate Emergency/Abnormal Checklist for guidance.*

2. HYDRAULIC CONTROL subpanel

- **STBY HYD PRESS – Press in (ON)**
  - Switch ON light indicates switch selected on.
  - Verify STBY hydraulic pressure raises.
- **PTU CONTROL – Press in (ON)**
  - Switch ON light indicates PTU is providing pressure.
- Main 1 and Main 2 should read 2,900 – 3,100 psi.
- STBY should read 2,800 – 3,000 psi.

CENTER CONSOLE

3. FUEL CONTROL subpanel

- **TANK 1 and 2 AUX PUMP switches – Press in (ON)**

4. ENGINE CONTROL subpanel

- **RDC NP LDG switch (Open Bug landing) – Press in**
  - The normal configuration for approach and landing is to press the RDC NP LDG switch before selecting the Condition Levers to MAX.
  - If landing is planned at the Solid Bug or performance requires normal N<sub>R</sub> 1020, then the PM will not press the RDC NP LDG switch. In either case, the Condition Levers are set to MAX when the landing gear is extended.

**CAUTION:**

- Prior to decreasing airspeed below the Solid Bug, ensure INCR REF SPEEDS advisory is NOT displayed on ED. If REF SPEEDS switch is not selected to OFF, Stall Warning may occur at airspeeds close to the Open Bug.
- If the Open Bug is used for final approach, but new ice accumulation is detected on the wing leading edges, revert to the Solid Bug if practical. Do not destabilize the approach below 500' AGL.

For detailed description of the use of the Open and Solid Bugs, refer to Use of Airspeed Indexes and Bugs in section 4, Performance.

The PF calls for the Landing Checklist when calling for "Gear down" (e.g., "Gear down – Landing checklist"). The PM accomplishes the LANDING Flow and Checklist to the line. When landing flaps are called for (15° or 35°), the PF calls "Below the line" (e.g., "Flaps 35°, below the line"), after which the PM completes the Landing Flow and Checklist. If the Final Approach Fix is crossed prior to reading the Landing Checklist, the PM accomplishes the FAF Standard Callouts and Procedures prior to reading the checklist.

**PF Landing Flow – (None)**

**PM Landing Flow**

CEME: E1A

The PM initiates the Landing Flow when the PF calls for "Gear down – Landing Checklist."

**INSTRUMENT PANEL**

1. LANDING GEAR subpanel

• **LANDING GEAR – Select DN**

Confirm Landing Gear extension initiates.

**CAUTION:**

*If any abnormal gear indication is observed after extension, do NOT retract or cycle the gear. Exit the Critical Phase of flight and refer to the appropriate Emergency/Abnormal Checklist for guidance.*

2. HYDRAULIC CONTROL subpanel

• **STBY HYD PRESS – Press in (ON)**

- Switch ON light indicates switch selected on.
- Verify STBY hydraulic pressure raises.

• **PTU CONTROL – Press in (ON)**

Switch ON light indicates PTU is providing pressure.

- Main 1 and Main 2 should read 2,900 – 3,100 psi.
- STBY should read 2,800 – 3,000 psi.

**CENTER CONSOLE**

3. FUEL CONTROL subpanel

• **TANK 1 and 2 AUX PUMP switches – Press in (ON)**

4. ENGINE CONTROL subpanel

• **RDC NP LDG switch (Open Bug landing) – Press in**

- The normal configuration for approach and landing is to press the RDC NP LDG switch before selecting the Condition Levers to MAX.
- If landing is planned at the Solid Bug or performance requires normal NP 1020, then the PM will not press the RDC NP LDG switch. In either case, the Condition Levers are set to MAX when the landing gear is extended.

**CAUTION:**

- Prior to decreasing airspeed below the Solid Bug, ensure INCR REF SPEEDS advisory is NOT displayed on ED. If REF SPEEDS switch is not selected to OFF, Stall Warning may occur at airspeeds close to the Open Bug.
- If the Open Bug is used for final approach, but new ice accumulation is detected on the wing leading edges, revert to the Solid Bug if practical. Do not destabilize the approach below 500' AGL.

For detailed description of the use of the Open and Solid Bugs, refer to Use of Airspeed Indexes and Bugs in section 4, Performance.

The PF calls for the Landing Checklist when calling for "Gear down" (e.g., "Gear down – Landing checklist"). The PM accomplishes the LANDING Flow and Checklist to the line. When landing flaps are called for (15° or 35°), the PF calls "Below the line" (e.g., "Flaps 35°, below the line"), after which the PM completes the Landing Flow and Checklist. If the Final Approach Fix is crossed prior to reading the Landing Checklist, the PM accomplishes the FAF Standard Callouts and Procedures prior to reading the checklist.

**PF Landing Flow – (None)****PM Landing Flow**

CEME: E1A

The PM initiates the Landing Flow when the PF calls for "Gear down – Landing Checklist."

**INSTRUMENT PANEL**

## 1. LANDING GEAR subpanel

- **LANDING GEAR – Select DN**

Confirm Landing Gear extension initiates.

**CAUTION:**

*If any abnormal gear indication is observed after extension, do NOT retract or cycle the gear. Exit the Critical Phase of flight and refer to the appropriate Emergency/Abnormal Checklist for guidance.*

## 2. HYDRAULIC CONTROL subpanel

- **STBY HYD PRESS – Press in (ON)**
  - Switch ON light indicates switch selected on.
  - Verify STBY hydraulic pressure raises.
- **PTU CONTROL – Press in (ON)**
  - Switch ON light indicates PTU is providing pressure.
- Main 1 and Main 2 should read 2,900 – 3,100 psi.
- STBY should read 2,800 – 3,000 psi.

**CENTER CONSOLE**

## 3. FUEL CONTROL subpanel

- **TANK 1 and 2 AUX PUMP switches – Press in (ON)**

## 4. ENGINE CONTROL subpanel

- **RDC NP LDG switch (Open Bug landing) – Press in**
  - The normal configuration for approach and landing is to press the RDC NP LDG switch before selecting the Condition Levers to MAX.
  - If landing is planned at the Solid Bug or performance requires normal N<sub>1</sub> 1020, then the PM will not press the RDC NP LDG switch. In either case, the Condition Levers are set to MAX when the landing gear is extended.

**CAUTION:**

- Prior to decreasing airspeed below the Solid Bug, ensure INCR REF SPEEDS advisory is NOT displayed on ED. If REF SPEEDS switch is not selected to OFF, Stall Warning may occur at airspeeds close to the Open Bug.
- If the Open Bug is used for final approach, but new ice accumulation is detected on the wing leading edges, revert to the Solid Bug if practical. Do not destabilize the approach below 500' AGL.

For detailed description of the use of the Open and Solid Bugs, refer to Use of Airspeed Indexes and Bugs in section 4, Performance.

The PF calls for the Landing Checklist when calling for "Gear down" (e.g., "Gear down – Landing checklist"). The PM accomplishes the LANDING Flow and Checklist to the line. When landing flaps are called for (15° or 35°), the PF calls "Below the line" (e.g., "Flaps 35°, below the line"), after which the PM completes the Landing Flow and Checklist. If the Final Approach Fix is crossed prior to reading the Landing Checklist, the PM accomplishes the FAF Standard Callouts and Procedures prior to reading the checklist.

**PF Landing Flow – (None)**

**PM Landing Flow**

CME: E1A

The PM initiates the Landing Flow when the PF calls for "Gear down – Landing Checklist."

**INSTRUMENT PANEL**

1. LANDING GEAR subpanel
  - **LANDING GEAR – Select DN**  
Confirm Landing Gear extension initiates.

**CAUTION:**

*If any abnormal gear indication is observed after extension, do NOT retract or cycle the gear. Exit the Critical Phase of flight and refer to the appropriate Emergency/Abnormal Checklist for guidance.*

2. HYDRAULIC CONTROL subpanel
  - **STBY HYD PRESS – Press in (ON)**
    - Switch ON light indicates switch selected on.
    - Verify STBY hydraulic pressure raises.
  - **PTU CONTROL – Press in (ON)**  
Switch ON light indicates PTU is providing pressure.
  - Main 1 and Main 2 should read 2,900 – 3,100 psi.
  - STBY should read 2,800 – 3,000 psi.

**CENTER CONSOLE**

3. FUEL CONTROL subpanel
  - **TANK 1 and 2 AUX PUMP switches – Press in (ON)**
4. ENGINE CONTROL subpanel
  - **RDC NP LDG switch (Open Bug landing) – Press in**
    - The normal configuration for approach and landing is to press the RDC NP LDG switch before selecting the Condition Levers to MAX.
    - If landing is planned at the Solid Bug or performance requires normal N<sub>R</sub> 1020, then the PM will not press the RDC NP LDG switch. In either case, the Condition Levers are set to MAX when the landing gear is extended.

## 8.1 QRH RNAV Checklist

| ORIGINATING            |      |           | DAILY SYSTEMS CHECKS |   |        |
|------------------------|------|-----------|----------------------|---|--------|
| Preflight Checks.....  | F(C) | Complete  | Stall Warning.....   | C | Ckd    |
| Pressurization.....    | C    | Ckd       | ADC.....             | C | Ckd    |
| Caution/Adv. Lts.....  | C    | Ckd       | VOR.....             | C | Ckd    |
| Glareshield.....       | C    | Dark      | Eng Fire.....        | F | Ckd    |
| ANTISKID.....          | F    | ON        | Bag Aft/Fwd.....     | F | Ckd    |
| Standby Inst.....      | C    | Ckd       | APU Fire.....        | F | Ckd    |
| Landing Gear.....      | F    | Ckd       | EGPWS.....           | F | Ckd    |
| HYD. CONTROL.....      | F    | Dark      | Autofeather.....     | F | Ckd    |
| PITCH & ROLL DISC..... | C    | IN        | TCAS.....            | F | Ckd    |
| FMS Database.....      | C/F  | Ckd       | Display pwr.....     | C | Cycled |
| EFIS Source.....       | F    | Both NORM | ICE PROTECTION.....  | C | Ckd    |
| Mask & Interphone..... | C/F  | Ckd       |                      |   |        |
| iPads.....             | C/F  | Set       |                      |   |        |

| FMS Requirements     |                                                                                                                                                                                                                        |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FMS                  | <ul style="list-style-type: none"> <li>• 2 FMS &amp; WAAS sensors required for LPV minima and all RNP approaches</li> <li>• 1 FMS required for all other FMS approaches.</li> </ul>                                    |
| Approach Programming | The approach shall be loaded from FMS database. Ensure same procedure on both FMSs                                                                                                                                     |
| TEMP COMP            | FMS Temp Comp required when reported OAT is: <ul style="list-style-type: none"> <li>• &lt; Warmest published cold temperature restriction, or</li> <li>• ≤ -20°C (if no temperature restrictions published)</li> </ul> |

| RNP & LPV Requirements |                                                                                                                                                                                                      |                      |                 |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------|
| LPV                    | LPV LOS light required above PF FMS.                                                                                                                                                                 |                      |                 |
| RNP                    | <ul style="list-style-type: none"><li>• DME sensors shall be deselected on both FMSs</li><li>• RNP 0.3 – Use of Flight Director required</li><li>• RNP &lt;0.3 – Use of Autopilot required</li></ul> |                      |                 |
|                        | Max Airspeed                                                                                                                                                                                         |                      |                 |
|                        | Final approach segment<br>(RF leg segments only)                                                                                                                                                     | CAT C<br>140 KT      | CAT D<br>165 KT |
|                        | All other approach segments                                                                                                                                                                          | 240 KT or as charted |                 |
|                        | Review Operator Notes for specific requirements                                                                                                                                                      |                      |                 |

| FMS Approach Review                                                 |                                                                                                                                |                                                                          |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| OTS NOTAM                                                           | Verify approach is not listed in the FMS OTS NOTAM.                                                                            |                                                                          |
| Brief Approach                                                      | Brief the instrument approach chart as outlined in FOM section 10, Descent/Approach/Landing.                                   |                                                                          |
| Clearance Page Verification                                         | Press <b>FPL&gt;MENU&gt;CLEARANCE</b><br>Verify the approach named on the <b>CLEARANCE</b> page of both FMSs matches chart.    |                                                                          |
| VNAV Waypoint Review<br>(If any waypoints IAF through MAP modified) | <b>PF</b>                                                                                                                      | <b>PM</b>                                                                |
|                                                                     | State approach waypoint names and altitudes from FMS FPL pages.                                                                | Verify each VNAV crossing altitude is at or above the charted procedure. |
| MFD Check                                                           | When visible on MFD, PM conducts a reasonableness check by comparing the approach chart depiction against the MFD map display. |                                                                          |
| FMS NAV Page                                                        | Ensure FMSs are on NAV page FAF inbound.                                                                                       |                                                                          |

MELANIE WEDDLE – DATE \*  
 PRINCIPAL OPERATIONS INSPECTOR  
 PDX CMO NM-19

Horizon Air

## 9.0 Horizon Air Normal Checklist

### Q400 NORMAL CHECKLIST

02/07/17

| BEFORE START                      |     |            |
|-----------------------------------|-----|------------|
| FASTEN BELTS                      | C   | On         |
| N numbers                         | C/F | 3 verified |
| AML                               | C/F | Reviewed   |
| Release                           | C   | All signed |
| Fuel Quantity                     | C   | MIN, O.B.  |
| FUELING ON                        | F   | Dark       |
| Gear Pins                         | C   | 2 & dark   |
| EFBs                              | C/F | Set/Ckd    |
| Pressurization                    | F   | Set        |
| EMER LIGHTS                       | F   | ARM        |
| FLIGHT/TAXI                       | C   | TAXI       |
| ED Messages                       | C   | Ckd        |
| Park Brake                        | C   | PARK, ckd  |
| POWER Levers                      | C   | DISC       |
| Condition Levers                  | C   | FUEL OFF   |
| TRIMs                             | F   | Set        |
| <sup>D</sup> Flight Plan Briefing | PF  | Complete   |
| <sup>D</sup> Flight Director      | F   | Set        |
| <sup>D</sup> Displays             | F   | Set        |
| Altimeters                        | F/C | set        |
| <sup>D</sup> FMS                  | F/C | Set/Ckd    |
| <sup>D</sup> ARCDUs               | F   | Set        |
| IRS                               | C   | NAV        |

|                   |     |               |
|-------------------|-----|---------------|
| PEDs              | C/F | Set           |
| DOORS             | C   | Clsd & locked |
| <sup>D</sup> Bugs | F/C | set/Set       |
| STEERING          | C   | OFF           |
| DC CTRL/BUS TIE   | C/F | All ON/Ckd    |
| A/COL             | C   | Red           |
| HYD #3 ISO VLV    | F   | Ckd           |
| Transponder       | F   | ON ALT        |

| AFTER START        |     |          |
|--------------------|-----|----------|
| EXT PWR/BUS TIE    | F   | OFF      |
| ICE PROTECTION     | C   | (All) ON |
| APU CONTROL        | F   | Dark     |
| <sup>D</sup> Power | F/C | set/Ckd  |
| A/F SELECT (ED)    | F/C | Ckd      |
| ELEC SYS           | F   | Ckd      |
| HYD PRESS          | F   | Ckd      |
| Pumps              | F   | 4 ON     |
| Controls           | F/C | Free     |
| STEERING           | C   | ON       |
| <sup>D</sup> FLAPS | F/C | set/ckd  |

| BEFORE TAKEOFF   |     |              |
|------------------|-----|--------------|
| T/O WARN Test    | C   | Ckd          |
| <sup>D</sup> HGS | C/F | Set/Ckd      |
| Caution panel    | F   | Dark         |
| YD/FD            | F   | On/set       |
| FA               | F   | Notified     |
| Briefing         | PF  | Complete     |
| FLIGHT/TAXI      | F   | FLIGHT       |
| BLEEDs           | F   | MIN/On (OFF) |

| AFTER TAKEOFF |  |          |
|---------------|--|----------|
| GEAR          |  | UP       |
| FLAPS         |  | UP       |
| Power         |  | MCL      |
| AUTOFEATHER   |  | Dark     |
| Pumps         |  | 4 dark   |
| BLEEDs        |  | ON, NORM |

| DESCENT                |       |          |
|------------------------|-------|----------|
| Pressurization         | PM    | Set      |
| <sup>A</sup> GPWS Flap | PM    | set      |
| <sup>A</sup> Bugs      | PM/PF | set/Set  |
| <sup>A</sup> Briefing  | PF    | Complete |
| <sup>A</sup> FMS       | PM/PF | Set/Ckd  |

| APPROACH              |       |         |
|-----------------------|-------|---------|
| FASTEN BELTS          | PM    | On      |
| Altimeters            | PM/PF | set     |
| <sup>A</sup> HGS      | C/F   | Set/Ckd |
| <sup>A</sup> Displays | PM    | Set     |
| <sup>A</sup> ARCDUs   | PM    | Set     |

| LANDING          |    |      |
|------------------|----|------|
| GEAR             | PM | DOWN |
| Pumps            | PM | 4 on |
| Condition Levers | PM | MAX  |

|            |    |              |
|------------|----|--------------|
| FLAPS      | PM | set          |
| FMS (both) | PM | NAV Page     |
| BLEEDs     | PM | On (OFF)/MIN |
| REF SPEEDS | PM | OFF/INCR     |

| AFTER LANDING |  |      |
|---------------|--|------|
| FLIGHT/TAXI   |  | TAXI |
| FLAPS         |  | Up   |
| Radar         |  | STBY |

| PARKING            |   |           |
|--------------------|---|-----------|
| Steering           | C | OFF       |
| Transponder        |   | STBY      |
| TRIMs              |   | Set       |
| Park Brake         |   | PARK      |
| Controls           |   | Locked    |
| Condition Levers   |   | FUEL OFF  |
| AUX PUMPS 1 & 2    |   | Out       |
| STBY HYD/PTU       |   | Out       |
| YD                 |   | OFF       |
| EMER LIGHTS        |   | OFF       |
| FASTEN BELTS       |   | OFF       |
| BLEEDs             |   | OFF       |
| APU                |   | ON/OFF    |
| A/COL              |   | OFF       |
| ICE PROTECTION     |   | All OFF   |
| MAIN BUS TIE       |   | TIE       |
| <u>If APU ON:</u>  |   |           |
| Batteries          |   | All ON    |
| EXT Power          |   | OFF       |
| APU GEN            |   | Verify ON |
| <u>If APU OFF:</u> |   |           |
| EXT POWER          |   | ON        |
| Batteries          |   | All OFF   |

<sup>D</sup>Departure Review if departure changes

<sup>A</sup>Approach Review if approach changes

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**MELANIE WEDDLE - DATE**  
PRINCIPAL OPERATIONS INSPECTOR